

10 October 2017

NSW Department of Planning & Environment
GPO Box 39
Sydney NSW 2001

Attention: Genevieve Seed

Dear Genevieve,

Re: Tweed Sand Quarry (DA 152-6-2005) Application to Increase Extraction Limit – Environmental Assessment – Response to Submissions

Hanson Construction Materials (HCM) commissioned Gilbert & Sutherland (G&S) to liaise with the New South Wales Department of Planning and Environment (DPE) regarding Tweed Sand Quarry's (TSQ) application to increase its annual sand extraction limit under DA 152-6-2005. G&S provided the details of that application to DPE on 12 June 2017 by means of an email attaching an Environmental Assessment (EA). Following the receipt of that documentation, DPE commenced the exhibition period (effective 29 June to 31 July 2017 inclusive), whereby other relevant department agencies and the public were invited to review the documentation and provide comments for further consideration. Following the completion of the exhibition period, responses were made by the following agencies:

1. Tweed Shire Council (Council).
2. Department of Primary Infrastructure (DPI).
3. Department of Planning & Environment – Division of Resources & Geoscience, Geological Survey of New South Wales (GSNSW).
4. Office of Environment and Heritage (OEH).
5. Roads and Maritime Services (RMS).

Those responses are included as Attachment 1. DPE received no public submissions.

We also acknowledge your email of 31 August 2017 (a copy of which is also included in Attachment 1) requesting additional information regarding proposed truck movements. A response to that request is also included within this letter (under item 6).

DPE has requested a 'Response to Submission' to address the comments raised in each piece of agency correspondence. This report constitutes that Response to Submissions, and augments our 12 June 2017 application. For ease of reference, the relevant issues and consultation outcomes are reproduced below using *italic text*, followed by our comments in normal text.

1. Council

Council's response, dated 4 August 2017, is summarised below.

1. Traffic / Maintenance

These calculations are acceptable in demonstrating no significant traffic impact from the development on the road network, and in determining a reasonable contribution to distributor road funding. The impact assessment is based on maximum operations under the proposed modified conditions, although actual production is unlikely to reach those levels, except in isolated peak periods, unless there are other significant changes in site layout, dredging operations or loading, which are not part of the application.

One issue which was raised in pre-lodgement meetings with the proponents was maintenance arrangements for Altona Road. Altona Road is not maintained by Tweed Shire Council as a public road asset, and operates as a shared access road between the sand extraction facility, Council's Waste Water Treatment Plant, and adjoining rural properties. The proposal significantly increases the likely impact of sand trucks on Altona Road, and will require increased maintenance, if not upgrading of the roadway. It is currently very narrow in sections, it runs alongside an open drain, and sections of the roadway are located on private land rather than the road reserve. Council (acting as an interested party in the roadway, rather than as road manager) requires the proponents to negotiate a suitable road maintenance arrangement to offset the impacts of the development. S94 contributions are not available for road maintenance, as assumed in the traffic impact assessment – contributions are for upgrades to distributor roads such as Tweed Coast Road. It is recommended that negotiations for Altona Road maintenance be based on equivalent standard axle calculations for daily traffic (not peak hours as provided in the traffic impact assessment).

As such, it is recommended that the proposed modification be supported on the condition that a suitable legally binding road maintenance agreement be formalised between the proponent, Council and other benefitting parties, based on the increased truck haulage on Altona Road.

Altona Road forms part of TSQ's primary haul route (discussed further in the response to RMS). TSQ currently performs 'as required' maintenance on Altona Road, mostly in the form of provision of asphalt to rectify emerging potholes and other road defects.

TSQ maintenance works are performed within the abilities of the staff members and engaged contractors to ensure safe passage for traffic entering and leaving TSQ. The

loss of equipment, product, time and/or personnel associated with a vehicle incident on Altona Road is preventable with appropriate maintenance performed when required. It is therefore in TSQs interest that Altona Road remains in good working order.

In response to Council's comments, HCM agrees to develop a suitable legally-binding road maintenance agreement to address on-going road maintenance on Altona Road. This agreement would include, but not be limited to, the following nominal conditions:

- Road maintenance on Altona Road between the TSQ site entrance and the intersection with Crescent Street. This agreement will not provide road maintenance for any other roads along the primary haul route.
- It is relevant to those who currently have approval to access Altona Road, being at the time of writing; TSQ, Council's Waste Water Treatment Plant, and Gales Holding Pty Ltd (operators of Cudgen Sand Lake Quarry – approved in June 2009 but operations only commenced in mid to late 2017).
- The agreement will be based on a negotiated rate in terms of equivalent standard axle (ESA) calculations for daily traffic. For TSQ, ESA calculations will be applicable to heavy vehicle movements above what is currently approved (i.e. heavy vehicle movements relating to the additional 115,000 m³ in extraction rate being sought under this approval).
- Monies will be held in trust, and only accessible for road maintenance on Altona Road (between TSQ site entrance and intersection with Crescent Street).
- The agreement will be binding until a user no longer accesses Altona Road for its operations and/or changes in access / usage occur. If additional parties wish to access Altona Road, they may also need to become party to the agreement. This can be assessed on a case by case basis.

HCM proposes to have a draft agreement developed within a four (4) month period from the date of Modification Application approval, and sign-off by the relevant other parties within a further two (2) month period. It is considered this would be included as a condition of approval of this application. However, if HCM and the other parties cannot come to an agreement for maintenance of Altona Road, this will be formally documented to Council and DPE. A path forward regarding maintenance of Altona Road will be discussed at that point. In the interim, TSQ will continue to perform 'as required' maintenance of Altona Road.

2. Noise

The NIA is considered adequate to address noise concerns from the expanded extraction rates. Adequate arrangements appear to be in place with the closest impacted resident and there appears to be little history of noise complaints. The NIA also identified attenuation and mitigation measures that will be adopted to ensure noise emissions from dredging operations do not exceed the adopted noise criteria.

The existing Noise Monitoring Plan prepared by SLR Global Environmental Solutions, dated September 2016 and approved by the Department of Planning

and Environment is considered to be sufficient to ensure compliance and ongoing monitoring against the adopted noise criteria for the amended extraction rates.

No response is required to address this comment.

3. Air Quality

Council's pre-lodgement comments to the proponent in this regard are summarised below.

'Air Quality Assessment dated January 2017 prepared by Katestone identifies that adequate measures will be in place to mitigate against air quality impacts. The report is considered adequate and has been prepared by a suitably qualified and experienced consultant'.

The Environmental Assessment provides further information relating to air quality modelling requirements as requested by the SEAR's. This was not a requirement of Council and therefore no further comments are provided in this regard.

No response is required to address this comment.

4. Flora / Fauna

Upon review of the Environmental Assessment Report dated 12 June 2017 prepared by Gilbert & Sutherland, the following comments are provided:

- a. Consistent with the recommendation provided in Attachment 6 - Letter prepared by Gilbert & Sutherland dated 06 February 2016 (pp. 185), Council supports the proposed amendments to the Revised Rehabilitation and Landscape Management Plan (RLMP) dated December 2016 prepared by JWA Ecological Consultants as follows:*
 - i. Modify the timing of the 'Long Term Rehabilitation' period to occur after 14 years as opposed to the current 16 years. This has been recommended due to the anticipated decrease in quarry lifespan by virtue of increasing the extraction rate as proposed under the current consent modification.*
- b. In addition (to that recommended by Gilbert & Sutherland), Council recommend that the 'Medium Term Rehabilitation' timeframe (referred to in the RLMP) also be modified by 2 years to commence at Year 6 (this should not change as operations have extended beyond this time-period) to be completed by the end of the 13th year.*
- c. All components of the RLMP (including Figures) referencing timeframes should be modified to reflect the altered timeframes mentioned above.*

It is noted that in accordance with the current RLMP, Council is to receive a report detailing the results of monitoring of the rehabilitation works (including water-quality) prepared by an ecologist engaged by the proponent. Monitoring is to occur 6 months after initial planting and on an annual basis thereafter. The last report on file is the 2011 Annual Environmental Management Report. From review of the

2011 report, comment is made on the premature commencement of 'Medium Term Rehabilitation' works, yet does not specify that the works had been undertaken in accordance with the RLMP. Furthermore the recommendation of the report includes that "...the maintenance and monitoring schedules outlined in the RLMP including the recommendations for formal monitoring by a Qualified Ecologist be followed".

With regards to the above, Council requests an update on rehabilitation works and water-quality monitoring, if this is considered appropriate.

In response to items a through c, G&S and HCM agree to amend the RLMP accordingly to reflect the changes in medium and long-term nominated timeframes. As requested, this would also include amendments to figures within the RLMP referencing timeframes. These amendments will be completed within a four (4) month period from the date of Modification Application approval. It is considered that this could reasonably form a condition of approval for this application.

In response to the comment raised "...Council is to receive a report detailing the results of monitoring of the rehabilitation works (including water-quality) prepared by an ecologist engaged by the proponent.", the Annual Environmental Monitoring Report (AEMR) includes summaries of monitoring of the rehabilitation works and biannual water quality monitoring (surface and groundwater). The Financial Year 2016-17 AEMR has been prepared for TSQ and will be issued to Council during the month of October 2017 to satisfy this comment. Further, TSQ commit to ensuring Council receive a copy of the AEMR within 1-month of its completion.

5. Developer Contributions

Council is satisfied with the proponent's traffic assessment which states that proposed increase in extraction rates will generate an additional 38.19 daily trips. At today's rate, the proposed additional trip generation will result in a total of \$46,630.00 in S94 developer contributions (TRCP).

As noted above, the S94 contributions are separate to any maintenance requirements for Altona Road.

No response is required to address this comment.

To summarise the key points arising from Council's 4 August 2017 response, we note:

- **Altona Road Maintenance** – HCM agrees to develop a suitable legally-binding road maintenance agreement to address on-going road maintenance on Altona Road. This will be drafted between TSQ, Council's waste water treatment plant and Gales Holding Pty Ltd. The proposed timeframe for developing and signing this agreement is six (6) months from date of this Modification Application's approval, and would be a condition of this approval.
- **RLMP** – HCM agrees to amend the RLMP to reflect the changes in medium and

long-term nominated timeframes. These amendments will be completed within a four (4) month period from the date of Modification Application approval, and would be a condition of approval. Further to this, G&S will ensure that Council receives a copy of the latest AEMR providing an update on site rehabilitation (and water quality).

2. DPI

DPI's response, dated 3 August 2017, is summarised below.

Recommendations

- *Prior to Project Approval it is recommended that an assessment be made of increased water requirements for dust suppression and water supply requirements and sources be confirmed to understand the water supply risks and to ensure any requirement for additional licensing or entitlement is identified.*
- *Encroachments onto Crown roads within the development would be best addressed through road closure and acquisition processes. For other Crown roads, the development should be sited with appropriate setbacks to ensure Crown roads are not impacted.*

Comment

Increased extraction will result in an increased number of truck movements which may result in an increased requirement for dust suppression. The volume of water currently used for dust suppression is not quantified, nor is an assessment made of the additional amount of water which will be required for increased dust suppression requirements.

In response to DPI's points, water supply for dust suppression is not expected to increase significantly on current usage due to the area available for product stockpiling remaining consistent in size to what is currently approved. There are no changes proposed to the internal haul route which has an existing dust suppression system in place (semi-automated sprinkler system). The haul road is approximately 1,250 m in length (full loop) and under the current usage scenario the sprinklers are used approximately once every 2 hours during peak traffic periods (operated for approximately 5 to 10 minutes each time, or until the haul route is damp with no runoff or ponding of water). Based on the type of sprinklers used, and the haul route area requiring watering, the estimated application rate of water is 2 to 4 kilolitres (KL) each use.

With additional trucks using the haul road it is possible that road surfaces will dry out more quickly due to additional soil churning by tyre movement. However evaporation through natural processes will remain unchanged and a continual factor for how quickly the haul routes dry out (and therefore require dust suppression via the sprinkler system).

Water used for dust suppression is taken from the dredge lake, via the same offtake point as that used for the washplant. This would also remain unchanged for the Modification Application. While the increase in truck movements may increase the frequency of

sprinkler usage to mitigate dust suppression, the volume of the dredge lake (i.e. the source) far surpasses¹ the requirements for dust suppression. Any changes in the water volumes used for dust suppression are negligible when compared against the available water source.

This Modification Application relates to extraction of sands from the approved Phase 4 footprint of the existing Quarry. No Crown Roads will be encroached upon as part of the Phase 4 extraction works and no changes to the project footprint will occur as part of this application.

3. GSNSW

GSNSW's response, dated 27 July 2017, is summarised below.

GSNSW has no concerns with the modification; however provide the following comments relating to extraction area – GSNSW note that the phase 4 area will be extracted sooner due to the increased rate of extraction.

GSNSW collects data on the quantity and value of construction materials produced annually throughout the State. Forms are sent to all operating quarries at the end of each financial year for this purpose. The statistical data thus collected is of great value to Government and industry in planning and resource management, particularly as a basis for analysing trends in production and for estimating future demand for particular commodities or in particular regions. In order to assist in the collection of construction material production data, the proponent should be required to provide or continue to provide annual production data for the subject site to GSNSW as a condition of any new or amended development consent/modification.

TSQ currently provides annual production data to GSNSW via a 'Form S1'. This would continue under the approved Modification Application.

4. OEH

OEH's response, dated 28 July 2017, is summarised below.

We note, the submitted modification proposes to only vary Schedule 2, Condition 8 of the existing DA152-6-2005 approval, increasing the annual extraction rate from 150,000 to 265,000 cubic metres. On review of the documents provided, we highlight that no increase in the final extraction volume, depth or area for Phase 4 is requested, and no changes to the sand processing procedure, operational footprint,

¹ Estimated dredge lake is currently 28.5 ha, with an approximate average depth of 15 m. The calculated volume of the dredge lake is in the order of 4,275,000 KL. The estimated daily use for dust suppression is in the order of 0.000005% of the total dredge lake volume.

or stockpiling requirements is predicted as part of the increased extraction rate.

The only outstanding issue identified by the OEH involves the increased extraction rate, and predicted consumption of the sand resource being well in advance of the original approval. To address this resource consumption rate, and the modified timeline for completion, the rehabilitation program and schedules will need to be reviewed.

Therefore, OEH recommends

- 1. The Rehabilitation & Landscape Management Plan be revised to include:*
 - a. a summary of the Rehabilitation & Landscape Management Plan - Short term (0-5 years) and Medium term (6-15 years) implementation to date.*
 - b. a summary of monitoring data, explanation of trends as they relate to the listed completion criteria, and physiochemical and biological performance indicators.*
 - c. a new delivery timeline for the medium and long term rehabilitation outcomes to accommodate the projected quarry life and demonstrate that the proposed rehabilitation of the site can be achieved.*
 - d. a revised set of figures for the achieved short, and proposed medium and long-term rehabilitation, identifying the target plant community types (link provided below) to be formally rehabilitated, or as noted in the supplied report to be naturally regenerating on site. The figures should also show how the retained, plant community types identified in Figure 6 (RLMP JWA December 2016) are part of the overall rehabilitation of the site (specifically, Communities 1, 2, 3 & 8).*
 - e. A revised rehabilitation program based on the outcomes of points a to d above.*

Plant community type information is available on the OEH website at:
<http://www.environment.nsw.gov.au/research/Visclassification.htm>.
- 2. The Weed and Pest Management Plan be revised to include:*
 - a. an updated list of terrestrial and aquatic weeds, relative to the site.*
 - b. a review of weed control methods to ensure the most current methods are used in and around the wetland system.*
 - c. an assessment of threats associated with the vertebrate pests which are known or likely to occur on site, identification of control methods and implementation of those methods.*

In summary, the applicant is not proposing to increase the total volume of sand to be extracted and only seeks to increase the extraction rate (per annum). If the recommendations above are addressed to account for the new completion timeframe, then the OEH advises that we have no further issues with the proposed modification.

It is proposed that the RLMP will be amended within a four (4) month period from the date

of Modification Application approval to reflect the comments provided from OEH. This will include the required amendments to the Weed and Pest Management Plan, which forms part of the currently approved RLMP. It is considered that this could reasonably form a condition of approval for this application.

5. RMS

RMS's response, dated 7 August 2017, is summarised below.

Roads and Maritime has reviewed the referred information and provides the following comments to assist the consent authority in making a determination;

- 1. The identified haulage for the subject development is also the approved route for the Cudgen Lake Sand Quarry under Project Approval MP05_103. The supporting Traffic Impact Assessment (TIA) should address the cumulative traffic and road safety impacts of existing and proposed development in the subject area.*
- 2. Project Approval MP05_103 requires an upgrade of the Tweed Coast Road and Crescent Street intersection prior to the transportation of sand by road. Consideration should be given to identifying an equitable arrangement for delivery of any intersection improvements required to address the cumulative road safety and traffic impacts of approved developments in the subject area.*
- 3. The supporting TIA has focused primarily on capacity analyses of affected intersections along the designated haulage route. Further consideration should be given to road safety at the site access, along the designated haulage route and at affected intersections. Any assessment should consider, but not be limited to, the following;*
 - Available sight distances for the posted speed limits*
 - Intersection geometry, delineation and regulatory signage.*
 - Width of carriageway and objects or drainage structures within clear zones.*
- 4. It is recommended that a Driver Code of Conduct be adopted or updated to address the proposed increase in heavy vehicle movements. The Code should include, but not be limited to, the following;*
 - A map of the primary haulage routes highlighting critical locations.*
 - Safety initiatives for haulage through residential areas and/or school zones.*
 - An induction process for vehicle operators & regular toolbox meetings.*
 - A complaint resolution and disciplinary procedure.*
 - Any community consultation measures for peak haulage periods.*

All road works should be designed and constructed in accordance with the current Austroads Guidelines, Australian Standards and RMS Supplements.

G&S and HCM have instructed Bitzios to provide a Response to Submission Traffic Impact Assessment to specifically address RMS' points 1 to 3. Bitzios' letter (included herein as Attachment 2) is summarised below. For the purposes of the Bitzios letter, the 'priority controlled intersections' are the Altona Road and Crescent Street, and Crescent Street and Tweed Coast Road intersections.

In response to point 1, Bitzios concluded the following:

As an intersection approaches Degree of Saturation (DOS) 0.85 or 85% it's capacity begins to have impacts on the surrounding road network. The above SIDRA results [Table 2.2 and 2.3 of the Bitzios report] demonstrate that both priority controlled intersections perform acceptably ($DOS < 0.85$) and do not have any significant queuing impacts. Upgraded intersection layouts [as defined in the Cudgen Lakes Sand Quarry Report recommendations and proposed upgrades] are therefore considered appropriate to accommodate the proposed development combined with Cudgen Lakes Sand Quarry.

Furthermore, Bitzios concluded the following in response to point 2:

As per the above [paragraph responding to point 1], the Tweed Coast Road / Crescent Street and Crescent Street / Altona Road priority controlled intersections do not require intersection improvements above those already proposed due to the proposed Cudgen Lakes Sand Quarry development traffic when considering cumulative road and safety impacts with the Cudgen Lakes Sand Quarry development.

To join the dots between the two traffic impact assessments (reports dated 4 May 2017 and 28 September 2017), without the inclusion of the Cudgen Lakes Sand Quarry (and therefore upgraded intersections), the subject intersections in their current form operate below the acceptable performance limits for a priority-controlled intersection (i.e. $DOS < 0.85$) both with and without development traffic movements. With the inclusion of the Cudgen Lakes Sand Quarry (and upgraded intersections), both priority controlled intersections perform acceptably ($DOS < 0.85$) and do not have any significant queuing impacts. Therefore, the inclusion of the additional TSQ development traffic movements have been modelled to demonstrate compliance with the acceptable performance limits for a priority-controlled intersection, regardless of whether Cudgen Lakes Sand Quarry is operating or not.

The RMS response has noted 'Consideration should be given to identifying an equitable arrangement for delivery of any intersection improvements...'. Based on the above findings, this is not considered necessary due to the demonstrated compliance regardless of scenario considered, and in particular, the subject intersections in their current form comply with the acceptable performance limits for a priority-controlled intersection with the inclusion of the proposed TSQ development traffic movements.

In response to point 3, Bitzios concluded:

[T]he intersections are considered to provide sufficient sight distance to comply with the requirements prescribed by Austroads for heavy vehicles.

And,

[I]tems, presented in Table 2.5 [of the Bitzios report], were noted regarding intersection geometry, road delineation, regulatory signage, width of carriageway and objects or drainage structures within clear zones. It should be noted that no findings are expected to impact the safe operation of the intersections within the inclusion of additional development traffic. Any recommended improvements on Crescent Street or Tweed Coast Road are related to general road maintenance and are the responsibility of the road authority.

Table 2.6 [Impact Assessment and Mitigation Matrix of the identified items in Table 2.5] demonstrates that the proposed development has a negligible impact and is not considered to exacerbate existing maintenance issues along adjacent roads or at nearby intersections.

As per the above assessment, we conclude that there is no significant traffic or safety impacts associated with the proposed development that would preclude its approval and relevant conditioning by RMS and Council.

In response to RMS' point 4, HCM currently has a Driver Code of Conduct for TSQ. A copy of this Driver Code of Conduct is contained in Attachment 3. This is supplemented by a map showing the primary haulage route (Altona Road, Crescent Street, Tweed Coast Road, and Pacific Highway – see Drawing '11792_DA_P4_003' in Attachment 3), and identifies critical locations relevant to this primary haul route.

As shown on the primary haulage route map (Drawing '11792_DA_P4_003'), this route passes adjacent to residential areas (West Kingscliff), however does not pass directly through residential areas or school zones. The route that passes adjacent to West Kingscliff is on Tweed Coast Road (sign posted speed of 80 km/hr), and is separated by a noise barrier. The remaining haul route is along rural residential and industrial areas. No further safety initiatives outside those stated in the June 2017 EA submission are considered necessary.

The attached Driver Code of Conduct includes TSQ operating hours for sales commencing at 6:30 am on Monday to Saturday. HCM acknowledge this is incorrect in accordance with its currently approved Consent Conditions for TSQ. The operating hours for sales commence at 7:00 am NSW time (Monday to Saturday). This will be corrected for subsequent prints of this Driver Code of Conduct. Further, TSQ has erected a sign at the entrance to Altona Road advising no trucks are to enter the TSQ site prior to 7:00 am (NSW time, relevant to period during daylight savings). Photographic plate 1 below shows this sign.



Plate 1 – Hanson TSQ Signage – No Trucks Prior to 7:00 am NSW Time

6. DPE

DPE requested further clarification on truck movements, via email 31 August 2017. This request is summarised below.

I have been looking at the proposed truck movement figures for Tweed Mod 1. I am seeking further information as to how these figures have been calculated.

The EA notes that as a result of the proposed extraction rate increase, the average monthly extraction rate would be approximately 22,080 m³ per month, equating to approximately 54 average daily truckloads (108 truck movements). The rolling quarterly average proposed is 142 truck movements per day. I understand a contingency amount would be applied to the monthly average, but I am seeking justification as to why 142 movements has been chosen.

I am also seeking the same information regarding the proposed 'peak' hour and day movements. For example, I note that the existing limit of 20 truck movements per hour (peak) was based on the applicable road noise policy at that time. Is this the case for the proposed 36 movements?

The Traffic Impact Assessment (pg 43) proposes "36 per hour (peak)" and "354 per day (max)". However the EA (and the existing condition) proposed both figures as 'peak'. Can you please confirm if 'peak' is actually referring to the maximum limit

for both periods OR if the 36 per hour (peak) is referring specifically to limiting truck movements in the peak hours (8:00 AM-9:00 AM and 3:00PM – 4:00PM).

In response to paragraph 2, the proposed extraction limit increase is approximately 77% greater than what is currently approved (150,000 to 265,000 m³ per annum). The currently approved rolling quarterly average is 80 truck movements per day, which when increased by 77% equals a rolling quarterly average of 142 truck movements per day. This same increase has been applied to the peak hourly and daily movements.

In response to paragraph 3, a review of the Noise Impact Assessment from the 2005 EIS notes that with an assumed offset distance of 15 m, the number of truck movements per hour past a receptor is limited to no more than 20 truck movements to comply with 60 dBA LAeq(1hour) criterion. However, the Noise Impact Assessment in the 12 June 2017 application demonstrated that there were negligible increases in overall traffic noise (0.1 to 0.2 dBA) from Tweed Coast Road with the inclusion of additional truck movements calculated under the proposed increased extraction limit scenario. Further, road traffic noise levels at receptors adjacent to Tweed Coast Road will be dominated by non-TSQ related traffic. Therefore, any exceedance of the 60 dBA LAeq(15hour) traffic noise criterion will be the result of non-TSQ related traffic and out of the direct control of HCM.

In response to paragraph 4, peak hourly movements would apply to any 1-hour period during the approved site operating hours and constitute a maximum number of truck movements for the site. It is not applicable to a single defined hour. Page 5 of the 12 June 2017 application defines the proposed changes in traffic movements as follows. It is proposed that this text would replace the current text in the TSQ Consent Condition under Schedule 2, Condition 9.

The Applicant shall ensure that heavy vehicle movements (in and out) associated with the development do not exceed:

- a) 36 per hour (peak);*
- b) 354 per day (peak); and*
- c) 142 per day (rolling quarterly average).*

Note: For clarity, one (1) truckload leaving the project site is considered two (2) heavy vehicle movements. Therefore, the permissible truckloads figure is half the above numbers.

We trust that the original submission and the supplementary information provided herein addresses your requirements. Please do not hesitate to contact Hanson Construction Materials or the G&S Robina office should you require any further details or elaboration.

Yours sincerely,



Erin Holton
**Director / Principal Environmental Scientist
& Engineer**
BEnvSc MEng(Env)



Glyn Cowie
**Principal Environmental Scientist /
Manager**
BEnvMgmt MAAS

Author Glyn Cowie

Our Reference 11792_ADV3_ExR_CGC1F.docx

Your Reference

By ☐ Courier ☒ Email ☐ Facsimile ☐ Post

Enclosures – 3 (Response letters; Bitzios letter and Driver Code)

Attachment 1 – Agency Submission

Subject: Tweed Sand Quarry MOD 1 - Request for RTS
Date: Wednesday, 9 August 2017 at 4:50:40 PM Australian Eastern Standard Time
From: Gen Seed
To: Glyn Cowie
CC: Erin Holton
Attachments: image001.jpg, image002.jpg, image003.jpg, image004.jpg, image005.jpg, Council.pdf, DPI.pdf, DRG.pdf, OEH.pdf, RMS.pdf

Hi Glyn

Please find the attached agency submission that have been made regarding Tweed Sand Mod 1. No public submissions were received.

RMS have requested some additional information cumulative traffic impacts with the Cudgen Lakes Site. Following a discussion with them yesterday, I encourage you to consult with them before you submit your RTS.

Please let me know if you have any questions.

Kind regards,

Gen

Genevieve Seed

Senior Planning Officer
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Please address all communications
to the General Manager

ABN: 90 178 732 496

Attention: Genevieve Seed

Dear Sir/Madam

Development Application DA152-6-2005 MOD1 (Council reference DA05/0905.01) - amendment to Development Consent DA-152-6-2005 MOD1 (DA05/0905) expansion of existing sand extraction operation by dredging and use the expanded quarry pond(s) for recreational fishing - tourist facility at Lot 22 DP 1082435 & Lot 23 DP 1077509 & Lot 494 DP 720450; Crescent Street CUDGEN

I refer to your email of 27 June 2017 inviting Council to submit comments on the proposed modification, including any advice on recommended conditions of consent. Please find below Council's comments on the proposed expansion of the existing sand quarry.

1. Traffic / Maintenance

The subject modification application seeks to increase the extraction rate for the approved sand extraction facility, in order to meet increased demand for their sand product. There is no increase in total extraction or footprint of the sand quarry ponds.

The applicant seeks to increase sand extraction from 150,000m³ per annum to 265,000m³ per annum (Schedule 2 Condition 8). The development relies on truck movements to remove the sand from site and transport it to customers. As such, the applicant seeks to modify a condition relating to maximum heavy vehicle movements (Schedule 2 Condition 9).

The proposed increases, expressed as both vehicle movements and truck numbers (with 1 truck = 2 movements) are provided as follows:

	Peak / hour		Peak / day		Average / day (rolling quarterly ave)	
	Truck loads	Heavy vehicle movements	Truck loads	Heavy vehicle movements	Truck loads	Heavy vehicle movements
Approved max	10	20	100	200	40	80
Actual max (October 2015)		9	67	134	36	72
Proposed max (modification)	18	36	177	354	71	142
Forecast max (based on production)					54	108

These numbers are the basis of a traffic report which examines the likely impacts of the development on:

- The local traffic network;
- Local intersections; and
- Developer contributions.

These calculations are acceptable in demonstrating no significant traffic impact from the development on the road network, and in determining a reasonable contribution to distributor road funding. The impact assessment is based on maximum operations under the proposed modified conditions, although actual production is unlikely to reach those levels, except in isolated peak periods, unless there are other significant changes in site layout, dredging operations or loading, which are not part of the application.

One issue which was raised in pre-lodgement meetings with the proponents was maintenance arrangements for Altona Road. Altona Road is not maintained by Tweed Shire Council as a public road asset, and operates as a shared access road between the sand extraction facility, Council's Waste Water Treatment Plant, and adjoining rural properties. The proposal significantly increases the likely impact of sand trucks on Altona Road, and will require increased maintenance, if not upgrading of the roadway. It is currently very narrow in sections, it runs alongside an open drain, and sections of the roadway are located on private land rather than the road reserve. Council (acting an interested party in the roadway, rather than as road manager) requires the proponents to negotiate a suitable road maintenance arrangement to offset the impacts of the development. S94 contributions are not available for road maintenance, as assumed in the traffic impact assessment – contributions are for upgrades to distributor roads such as Tweed Coast Road. It is recommended that negotiations for Altona Road maintenance be based on equivalent standard axle calculations for daily traffic (not peak hours as provided in the traffic impact assessment).

As such, it is recommended that the proposed modification be supported on the condition that a suitable legally binding road maintenance agreement be formalised between the proponent, Council and other benefitting parties, based on the increased truck haulage on Altona Road.

2. Noise

A Noise Impact Assessment (NIA) has been prepared by Gilbert and Sutherland dated June 2017 and is consistent with the previous report provided. The NIA is considered adequate to address noise concerns from the expanded extraction rates. Adequate arrangements appear to be in place with the closest impacted resident and there appears to be little history of noise complaints. The NIA also identified attenuation and mitigation measures that will be adopted to ensure noise emissions from dredging operation do not exceed the adopted noise criteria.

The existing Noise Monitoring Plan prepared by SLR Global Environmental Solutions, dated September 2016 and approved by the Department of Planning and Environment is considered to be sufficient to ensure compliance and ongoing monitoring against the adopted noise criteria for the amended extraction rates.

3. Air Quality

Council's pre-lodgement comments to the proponent in this regard are summarised below.

'Air Quality Assessment dated January 2017 prepared by Katestone identifies that adequate measures will be in place to mitigate against air quality impacts. The report is considered adequate and has been prepared by a suitably qualified and experienced consultant'.

The Environmental Assessment provides further information relating to air quality modelling requirements as requested by the SEAR's. This was not a requirement of Council and therefore no further comments are provided in this regard.

4. Flora / Fauna

Upon review of the Environmental Assessment Report dated 12 June 2017 prepared by Gilbert & Sutherland, the following comments are provided:

- a. Consistent with the recommendation provided in Attachment 6 - Letter prepared by Gilbert & Sutherland dated 06 February 2016 (pp. 185), Council supports the proposed amendments to the *Revised Rehabilitation and Landscape Management Plan (RLMP) dated December 2016 prepared by JWA Ecological Consultants* as follows:
 - i. Modify the timing of the 'Long Term Rehabilitation' period to occur after 14 years as opposed to the current 16 years. This has been recommended due to the anticipated decrease in quarry lifespan by virtue of increasing the extraction rate as proposed under the current consent modification.
- b. In addition (to that recommended by Gilbert & Sutherland), Council recommend that the 'Medium Term Rehabilitation' timeframe (referred to in the RLMP) also be modified by 2 years to commence at Year 6 (this should not change as operations have extended beyond this time-period) to be completed by the end of the 13th year.
- c. All components of the RLMP (including Figures) referencing timeframes should be modified to reflect the altered timeframes mentioned above.

It is noted that in accordance with the current RLMP, Council is to receive a report detailing the results of monitoring of the rehabilitation works (including water-quality) prepared by an ecologist engaged by the proponent. Monitoring is to occur 6 months after initial planting and on an annual basis thereafter. The last report on file is the 2011 Annual Environmental Management Report. From review of the 2011 report, comment is made on the premature commencement of 'Medium Term Rehabilitation' works, yet does not specify that the works had been undertaken in accordance with the RLMP. Furthermore the recommendation of the report includes that *"...the maintenance and monitoring schedules outlined in the RLMP including the recommendations for formal monitoring by a Qualified Ecologist be followed"*.

With regards to the above, Council requests an update on rehabilitation works and water-quality monitoring, if this is considered appropriate.

5. Developer Contributions

Council is satisfied with the proponent's traffic assessment which states that proposed increase in extraction rates will generate an additional 38.19 daily trips. At today's rate, the proposed additional trip generation will result in a total of **\$46,630.00** in S94 developer contributions (TRCP).

As noted above, the S94 contributions are separate to any maintenance requirements for Altona Road.

Please contact Council if you wish to discuss any of the matters raised in the comments above, particularly in relation to drafting up an appropriate condition in relation to the legally binding agreement for road maintenance.

For further information regarding this matter please contact Colleen Forbes on (02) 6670 2596.

Yours faithfully



Per

 cosign

Lindsay McGavin

Manager Development Assessment and Compliance



Department of Primary Industries

OUT17/25616

Ms Genevieve Seed
Resource Assessments
NSW Department of Planning and Environment
GPO Box 39
SYDNEY NSW 2001

genevieve.seed@planning.nsw.gov.au

Dear Ms Seed

Tweed Sand Quarry modification (DA 152-6-2005 MOD 1) Comment on the Environmental Assessment

I refer to your email of 27 June 2017 to the Department of Primary Industries (DPI) in respect to the above matter. Comment has been sought from relevant branches of DPI. Views were also sought from NSW Department of Industry - Lands that are now a division of the broader Department and no longer within NSW DPI.

Any further referrals to DPI can be sent by email to landuse.enquiries@dpi.nsw.gov.au.

Recommendations

- Prior to Project Approval it is recommended that an assessment be made of increased water requirements for dust suppression and water supply requirements and sources be confirmed to understand the water supply risks and to ensure any requirement for additional licensing or entitlement is identified.
- Encroachments onto Crown roads within the development would be best addressed through road closure and acquisition processes. For other Crown roads, the development should be sited with appropriate setbacks to ensure Crown roads are not impacted.

Comment

Increased extraction will result in an increased number of truck movements which may result in an increased requirement for dust suppression. The volume of water currently used for dust suppression is not quantified, nor is an assessment made of the additional amount of water which will be required for increased dust suppression requirements.

Yours sincerely

Graeme White
A/Director, Planning Policy & Assessment Advice
03 August 2017

DPI appreciates your help to improve our advice to you. Please complete this three minute survey about the advice we have provided to you, here: <https://goo.gl/o8TXWz>

27 July 2017

Genevieve Seed
Senior Planning Officer
Resource Assessments
Level 22, 320 Pitt Street
GPO Box 39
Sydney NSW 2001

Your Reference: DA 152_6_2005 – MOD 1
Our Reference: OUT17/28794

Emailed: Genevieve.seed@planning.nsw.gov.au

Dear Ms Seed

**Re: Development Application No. 152-6-2005 – Modification 1 for
Tweed Sand Quarry**

Thank you for the opportunity to provide advice on the above matter. This is a response from the NSW Department of Planning & Environment – Division of Resources & Geoscience, Geological Survey of New South Wales (GSNSW).

I refer to your email dated 27 June 2017 requesting comment on Modification 1 for Tweed Sand Quarry involving increasing the annual rate of extraction from 150,000 to 265,000 cubic metre per annum and increasing the number of allowable truck movements.

GSNSW has no concerns with the modification; however provide the following comments relating to extraction area – GSNSW note that the phase 4 area will be extracted sooner due to the increased rate of extraction.

GSNSW collects data on the quantity and value of construction materials produced annually throughout the State. Forms are sent to all operating quarries at the end of each financial year for this purpose. The statistical data thus collected is of great value to Government and industry in planning and resource management, particularly as a basis for analysing trends in production and for estimating future demand for particular commodities or in particular regions. In order to assist in the collection of construction material production data, the proponent should be required to provide or continue to provide annual production data for the subject site to GSNSW as a condition of any new or amended development consent/modification.

Geoscience Information Services

The GSNSW has a range of online data related to mineral exploration, land use and general geoscience topics:

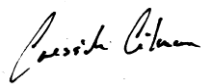
<http://www.resources.nsw.gov.au/geological/online-services>

The location of current exploration and mining titles in NSW, explanations of mining and production titles and the roles of community and government in the decision making process for mining/resource projects may be accessed by the general public using the following online utilities:

<http://www.commonground.nsw.gov.au/#/>

Queries regarding the above information, and future requests for advice in relation to this matter, should be directed to the GSNSW Land Use team at landuse.minerals@industry.nsw.gov.au.

Yours sincerely



Cressida Gilmore
Manager - Land Use



Office of
Environment
& Heritage

Our Ref: DOC17/344799
Your Ref: DA 152-6-2005

Ms Genevieve Seed
Senior Planning Officer
Department of Planning & Environment
GPO Box 39
Sydney NSW 2001

Dear Ms Seed

**Re: Hanson Construction Materials – Tweed Sand Quarry Development Application (DA)
152-6-2005 Modification 1**

Thank you for your email dated 27 June 2017 about the Tweed Sand Quarry Modification 1 (Mod 1) proposing a variation of the extraction rate, seeking comments from the Office of Environment and Heritage (OEH). I appreciate the opportunity to provide input.

We note, the submitted modification proposes to only vary Schedule 2, Condition 8 of the existing DA152-6-2005 approval, increasing the annual extraction rate from 150,000 to 265,000 cubic metres. On review of the documents provided, we highlight that no increase in the final extraction volume, depth or area for Phase 4 is requested, and no changes to the sand processing procedure, operational footprint, or stockpiling requirements is predicted as part of the increased extraction rate.

The only outstanding issue identified by the OEH involves the increased extraction rate, and predicted consumption of the sand resource being well in advance of the original approval. To address this resource consumption rate, and the modified timeline for completion, the rehabilitation program and schedules will need to be reviewed.

Therefore, OEH recommends

1. The Rehabilitation & Landscape Management Plan be revised to include:
 - a. a summary of the Rehabilitation & Landscape Management Plan - Short term (0-5 years) and Medium term (6-15 years) implementation to date.
 - b. a summary of monitoring data, explanation of trends as they relate to the listed completion criteria, and physiochemical and biological performance indicators.
 - c. a new delivery timeline for the medium and long term rehabilitation outcomes to accommodate the projected quarry life and demonstrate that the proposed rehabilitation of the site can be achieved.

- d. a revised set of figures for the achieved short, and proposed medium and long-term rehabilitation, identifying the target plant community types (link provided below) to be formally rehabilitated, or as noted in the supplied report to be naturally regenerating on site. The figures should also show how the retained, plant community types identified in Figure 6 (RLMP JWA December 2016) are part of the overall rehabilitation of the site (specifically, Communities 1, 2, 3 & 8).
- e. A revised rehabilitation program based on the outcomes of points a to d above.

*Plant community type information is available on the OEH website at:
<http://www.environment.nsw.gov.au/research/Visclassification.htm>*

2. The Weed and Pest Management Plan be revised to include:

- a. an updated list of terrestrial and aquatic weeds, relative to the site.
- b. a review of weed control methods to ensure the most current methods are used in and around the wetland system.
- c. an assessment of threats associated with the vertebrate pests which are known or likely to occur on site, identification of control methods and implementation of those methods.

In summary, the applicant is not proposing to increase the total volume of sand to be extracted and only seeks to increase the extraction rate (per annum). If the recommendations above are addressed to account for the new completion timeframe, then the OEH advises that we have no further issues with the proposed modification.

If you have any further questions about this issue, Ms Rachel Binskin, Regional Operations Officer, Regional Operations, OEH, can be contacted on 6659 8247 or at rachel.binskin@environment.nsw.gov.au.

Yours sincerely

 28 July 2017

DIMITRI YOUNG
Senior Team Leader Planning, North East
Regional Operations

Contact officer: RACHEL BINSKIN
6659 8247



File No: NTH07/01158/05
Your Ref: DA156-6-2005 MOD1

The Director
Resource Assessments
Department of Planning & Environment
GPO Box 39
SYDNEY NSW 2001

Attention: Genevieve Seed – Senior Planning Officer

Dear Sir / Madam,

Proposed Modification to Hanson's Tweed Sand Quarry (DA156-6-2005) Altona Road, Cudgen

I refer to your email of 27 June 2017 requesting comment from Roads and Maritime Services in relation to the abovementioned proposed modification.

Roles and Responsibilities

The key interests for Roads and Maritime are the safety and efficiency of the road network, traffic management, the integrity of infrastructure and the integration of land use and transport.

Tweed Coast Road (MR450) is a classified (regional) road under the *Roads Act 1993*. Tweed Shire Council is the Roads Authority for all public roads (other than freeways or crown roads) in the local government area pursuant to Section 7 of the Roads Act. Roads and Maritime is the Roads Authority for freeways and can exercise roads authority functions for classified roads in accordance with the Roads Act. Roads and Maritime's concurrence is required prior to Council's approval of works on this road under Section 138 of the *Roads Act 1993*.

In accordance with Clause 16 of the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*, Roads and Maritime is given the opportunity to review and provide comment on the subject development application.

Roads and Maritime Response

Roads and Maritime has reviewed the referred information and provides the following comments to assist the consent authority in making a determination;

1. The identified haulage for the subject development is also the approved route for the Cudgen Lake Sand Quarry under Project Approval **MP05_0103**. The supporting Traffic Impact Assessment (TIA) should address the cumulative traffic and road safety impacts of existing and proposed development in the subject area.
2. Project Approval **MP05_0103** requires an upgrade of the Tweed Coast Road and Crescent Street intersection prior to the transportation of sand by road. Consideration should be given to identifying an equitable arrangement for delivery of any intersection improvements required to address the cumulative road safety and traffic impacts of approved developments in the subject area.

3. The supporting TIA has focused primarily on capacity analyses of affected intersections along the designated haulage route. Further consideration should be given to road safety at the site access, along the designated haulage route and at affected intersections. Any assessment should consider, but not be limited to, the following;
 - Available sight distances for the posted speed limits
 - Intersection geometry, delineation and regulatory signage.
 - Width of carriageway and objects or drainage structures within clear zones.
4. It is recommended that a Driver Code of Conduct be adopted or updated to address the proposed increase in heavy vehicle movements. The Code should include, but not be limited to, the following;
 - A map of the primary haulage routes highlighting critical locations.
 - Safety initiatives for haulage through residential areas and/or school zones.
 - An induction process for vehicle operators & regular toolbox meetings.
 - A complaint resolution and disciplinary procedure.
 - Any community consultation measures for peak haulage periods.

All road works should be designed and constructed in accordance with the current Austroads Guidelines, Australian Standards and RMS Supplements.

Upon determination of the application, it would be appreciated if a copy could forward a copy of any amended project approval for our records. If you have any further enquiries regarding the above comments please contact Matt Adams, Acting Manager Land Use Assessment on (02) 6640 1344 or via email at: development.northern@rms.nsw.gov.au

Yours faithfully



24 August 2017 (Re-issued)

for Liz Smith
Network & Safety Manager, Northern Region

Subject: Tweed Sand MOD 1 - Clarification truck movements
Date: Thursday, 31 August 2017 at 10:21:53 AM Australian Eastern Standard Time
From: Gen Seed
To: Glyn Cowie
Category: Orange category
Attachments: image001.jpg, image010.jpg, image011.jpg, image012.jpg, image013.jpg

Hi Glyn

I have been looking at the proposed truck movement figures for Tweed Mod 1. I am seeking further information as to how these figures have been calculated.

The EA notes that as a result of the proposed extraction rate increase the average monthly extraction rate would be approximately 22,080 m³/ per month, equating to approximately 54 average daily truckloads (108 truck movements). The rolling quarterly average proposed is 142 truck movements per day. I understand a contingency amount would be applied to the monthly average, but I am seeking justification as to why 142 movements has been chosen.

I am also seeking the same information regarding the proposed 'peak' hour and day movements. For example, I note that the existing limit of 20 truck movements per hour (peak) was based on the applicable road noise policy at that time. Is this the case for the proposed 36 movements?

The Traffic Impact Assessment (pg 43) proposes "36 per hour (peak)" and "354 per day (max)". However the EA (and the existing condition) proposed both figures as 'peak'. Can you please confirm if 'peak' is actually referring to the maximum limit for both periods OR if the 36 per hour (peak) is referring specifically to limiting truck movements in the peak hours (8:00 AM-9:00 AM and 3:00PM – 4:00PM).

I am happy for you to respond to this in the RTS if preferred.

Thanks

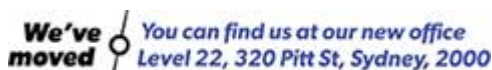
Gen

Genevieve Seed

Senior Planning Officer
Resource Assessments
Level 22, 320 Pitt Street | GPO Box 39 | Sydney NSW 2001
T 02 9274 6489



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Attachment 2 – Traffic Impact Assessment Response to Submission (Bitzios)

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P: (02) 9557 6202
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Our Reference: P2930.001L

Your Reference:

28 September 2017

Hanson Construction Materials
C/- Gilbert and Sutherland Pty Ltd
5/232 Robina Town Centre Drive
ROBINA QLD 4226

Attention: **Glyn Cowie**

Sent via email: cowie.gr@access.gs

Dear Glyn

RE: TWEED SAND QUARRY LOT 22, (DP1082435), LOT 23 (DP1077509) AND LOT 494 (DP720450) CRESCENT STREET CUDGEN RESPONSE TO RMS COMMENTS

1.0 INTRODUCTION

In response to the Road and Maritime Services NSW (referred to herein as RMS) comments regarding the above development dated 24th August 2017, this letter provides further information with regards to the Transport Planning items, specifically this letter responds to Items 1,2 and 3 of RMS comments.

2.0 INFORMATION REQUEST ITEMS

2.1. Item 1

The identified haulage for the subject development is also the approved route for the Cudgen Lakes Sand Quarry under Project Approval MP05_0103. The supporting Traffic Impact Assessment (TIA) should address the cumulative traffic and road safety impacts of existing and proposed development in the subject area.

The following traffic assessment addresses the cumulative impact of the Tweed Sand Quarry's proposed expansion and Cudgen Lakes Sand Quarry on the surrounding road network. The assessment will determine whether new mitigation measures are required in addition to those upgrades proposed for the Cudgen Lakes Sand Quarry project. It should be noted that the Cudgen Lakes Sand Quarry is defined as a major project for the area by RMS.

Cudgen Lakes Sand Quarry Report No.617/04 – Part 7 Traffic and Transport Assessment, prepared by Veitch Lister Consulting Pty Ltd, dated October 2007 presents the following results for the intersections of Tweed Coast Road / Crescent Street and Crescent Street / Altona Road, for a worst-case scenario (i.e. when all trips are to / from north of the site Scenario A).

Table 2.1: Performance of Existing Intersections in the 2011 Operation Scenarios at Cudgen Lakes Sand Quarry Report

Intersection (Scenario A - north)	Type	Degree of Saturation		Level of Service (LoS)	
		AM	PM	AM	PM
Tweed Coast Road / Crescent Street	Priority	0.5	0.4	A / E	A / D
Crescent Street / Altona Drive	Priority	0.04	0.03	A / B	A / B

Veitch Lister's report specifically noted that the intersection of Tweed Coast Road / Crescent Street, particularly the left-turn movement from Crescent Street, had the highest impact on the average delays and level of service.

- AM Peak – 39 seconds (LoS E); and
- PM Peak – 28 seconds (LoS D).

Considering the resulting SIDRA outputs, Cudgen Lakes Sand Quarry Report proposed the following recommendations for the surrounding priority controlled intersections:

“Minor improvements and realignment at various stages at the project to Altona Road / Crescent Street priority controlled intersection and improvements to the priority controlled intersection of Tweed Coast Road and Crescent Street, including:

- *amend the right turn off Tweed Coast Road from a type ‘AUR’ to a type ‘CHR’ treatment (Tweed Shire);*
- *ban the right turn from Crescent Street to Tweed Coast Road (Tweed Shire); and*
- *implement a 200m acceleration lane for the left turn from Crescent Street to Tweed Coast Road.”*

Bitzios has assessed the upgraded Tweed Coast Road / Crescent Street and Crescent Street / Altona Road priority controlled intersections considering the cumulative traffic generation of the proposed Tweed Sand Quarry development and Cudgen Lakes Sand Quarry.

Based on the proposed development and Cudgen Lakes Sand Quarry traffic generation, Figure 2.1 and Figure 2.2 details the combined traffic volumes assigned to the surrounding road network during the AM and PM peak hours.

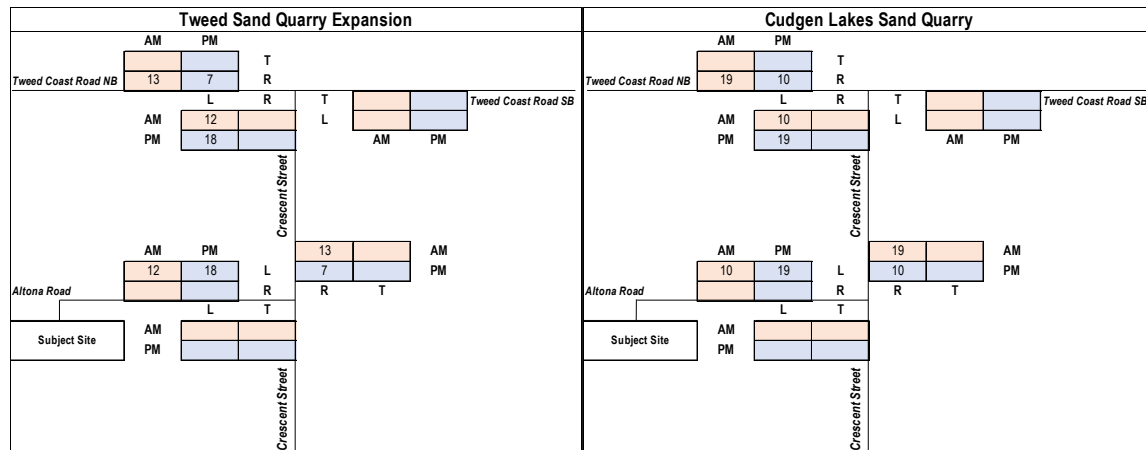


Figure 2.1: Development Traffic Generation

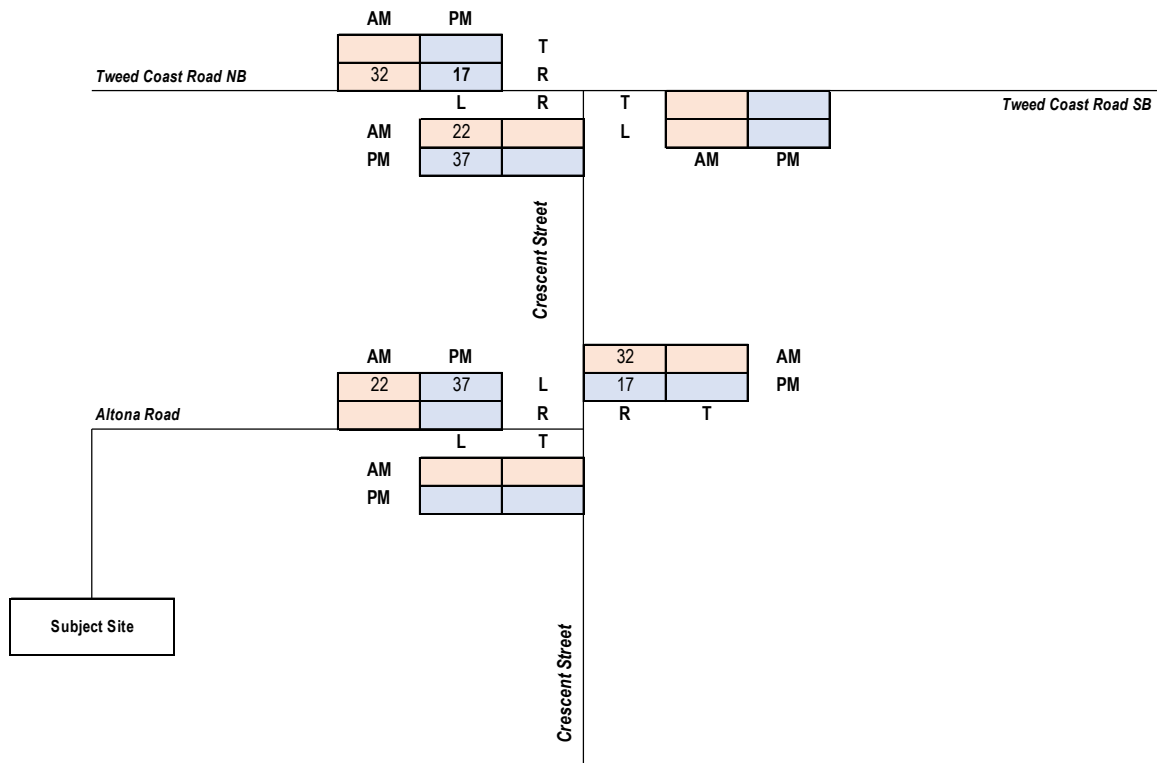


Figure 2.2: Combined Traffic Generation

The resulting 2017 and 2027 (10-year design period) design traffic volumes have been calculated by using background traffic volumes for the subject intersections (as per Bitzios previous report *P2930.001R Tweed Sand Quarry TIA*, dated 5th May 2017). Background volumes were based on traffic surveys undertaken by Traffic Data Control (TDC) in December 2016, using a traffic growth rate of 3% compounded per annum. Figure 2.3 and Figure 2.4 show the design traffic volumes for the 2017 and 2027 respectively.

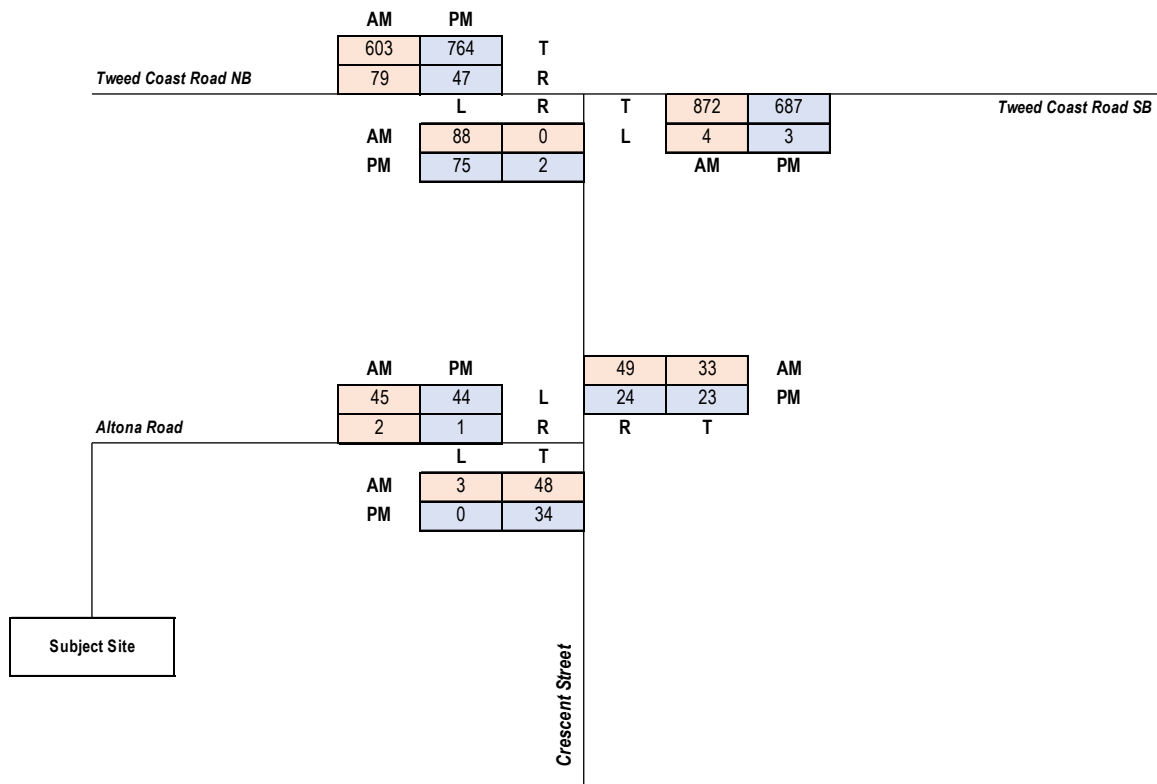


Figure 2.3: 2017 Peak Hour Design Traffic Volumes

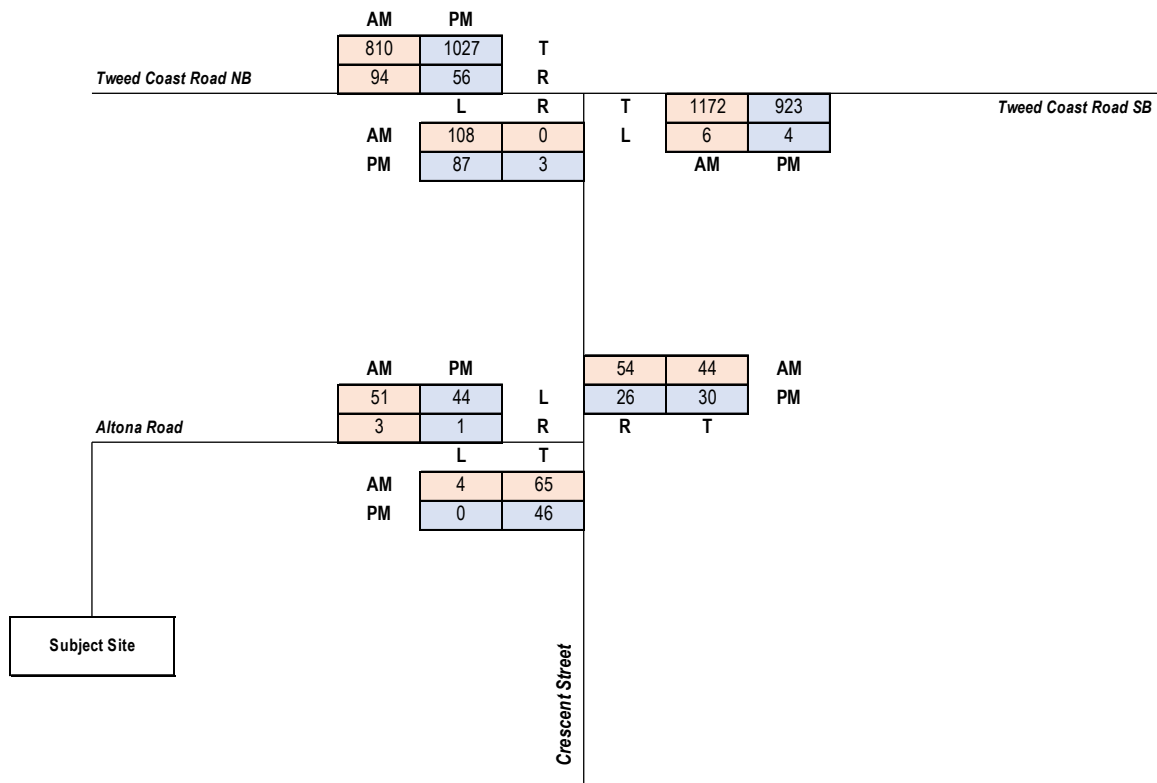


Figure 2.4: 2027 Peak Hour Design Traffic Volumes

In order to determine the impacts of the proposed development on the surrounding road network, SIDRA Intersection 7.0 software was used to quantify the effects of the design traffic. A SIDRA assessment was undertaken on the Tweed Coast Road / Crescent Street and Crescent Street / Altona Road priority controlled intersections.

It should be noted that, based on discussion with RMS, the following analysis has been undertaken to determine if the proposed TSQ development would cause the need for additional upgrades above those required by Cudgen Lakes Sand Quarry Consent Condition. As such, existing intersection layouts have not been modelled as part of this assessment.

Figure 2.5 and Figure 2.6 show the Tweed Coast Road / Crescent Street and Crescent Street / Altona Road priority controlled intersections respectively.

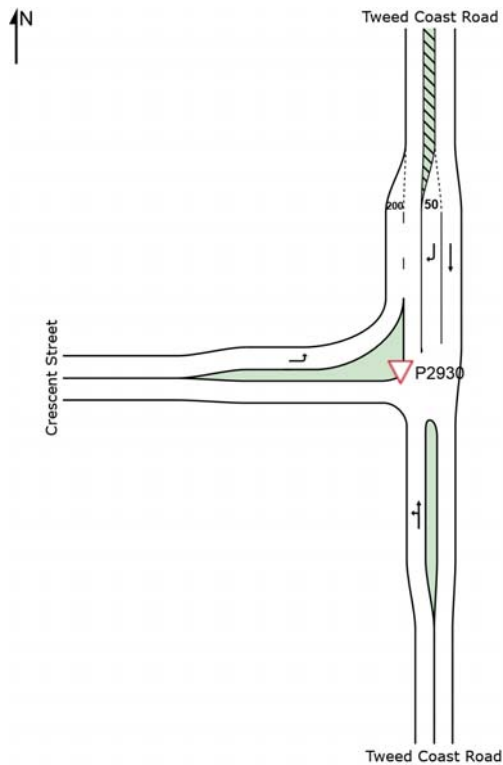


Figure 2.5: Tweed Coast Road / Crescent Street Intersection Layout

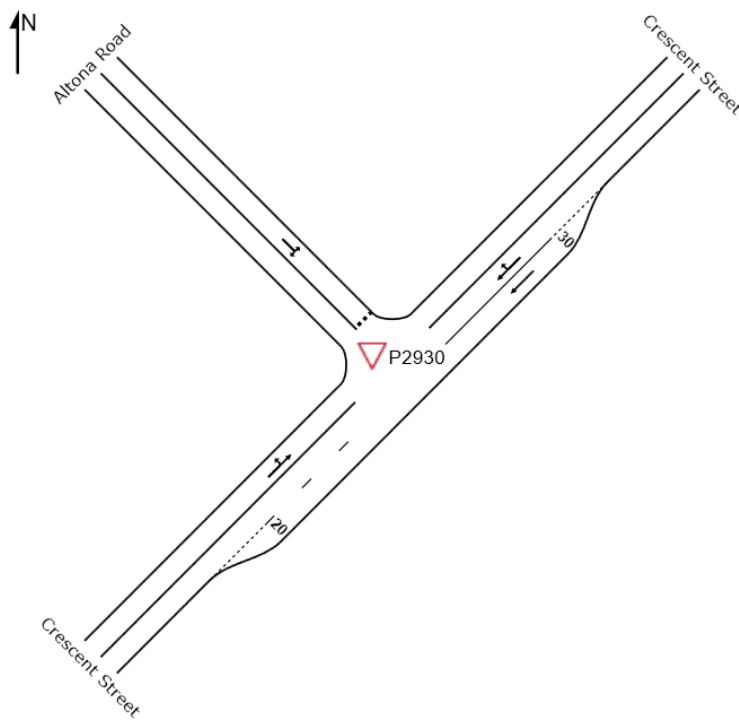


Figure 2.6: Crescent Street / Altona Road Intersection Layout

The AM and PM peak period results for the 2027 design year for the Tweed Coast Road / Crescent Street and Crescent Street / Altona Road intersections are presented in Table 2.2 and Table 2.3 respectively.

Table 2.2: 2027 SIDRA Results Summary – Tweed Coast Road / Crescent Street

Approach	Degree of Saturation (v/c)	Average Delay (sec)	Level of Service	95th Percentile Queue (m)
	Combined Intersection Model (2027)			
AM Peak				
Tweed Coast Road (South)	0.649	0.2	A	0
Tweed Coast Road (North)	0.469	3.0	D	12.2
Crescent Street (West)	0.068	5.8	A	0
Intersection	0.649	1.6	A	12.2
PM Peak				
Tweed Coast Road (South)	0.511	0.1	A	0
Tweed Coast Road (North)	0.595	0.8	B	3.4
Crescent Street (West)	0.055	5.8	A	0
Intersection	0.595	0.7	A	3.4

Table 2.3: 2027 SIDRA Results Summary – Crescent Street / Altona Road

Approach	Degree of Saturation (v/c)	Average Delay (sec)	Level of Service	95th Percentile Queue (m)
	Combined Intersection Model (2027)			
AM Peak				
Crescent Street (Northeast)	0.055	4.7	A	2.1
Altona Road (Northwest)	0.047	4	A	1.9
Crescent Street (Southwest)	0.038	0.4	A	0
Intersection	0.055	3.2	A	2.1
PM Peak				
Crescent Street (Northeast)	0.03	4.7	A	1.1
Altona Road (Northwest)	0.038	3.9	A	0.2
Crescent Street (Southwest)	0.026	0.1	A	0
Intersection	0.038	3	A	0.2

As an intersection approaches Degree of Saturation (DOS) 0.85 or 85% its capacity begins to have impacts on the surrounding road network. The above SIDRA results demonstrate that both priority controlled intersections perform acceptably (DOS < 0.85) and do not have any significant queuing impacts. Upgraded intersection layouts are therefore considered appropriate to accommodate the proposed development combined with Cudgen Lakes Sand Quarry. Detailed SIDRA Outputs are presented in Attachment 1.

2.2. Item 2

Project Approval MP05_0103 requires an upgrade of the Tweed Coast Road and Crescent Street intersection prior to the transportation of sand by road. Consideration should be given to identifying an equitable arrangement for delivery of any intersection improvements required to address the cumulative road safety and traffic impacts of approved developments in the subject area.

As per the above, the Tweed Coast Road / Crescent Street and Crescent Street / Altona Road priority controlled intersections do not require intersections improvements above those already proposed due to the proposed Cudgen Lakes Sand Quarry development traffic when considering cumulative road and safety impacts with the Cudgen Lakes Sand Quarry development.

2.3. Item 3

The supporting TIA has focused primarily on capacity analyses of affected intersections along the designated haulage route. Further consideration should be given to road safety at the site access, along the designated haulage route and at affected intersections. Any assessment should consider, but not be limited to, the following;

- Available sight distances for the posted speed limits
- Intersection geometry, delineation and regulatory signage.
- Width of carriageway and objects or drainage structures within clear zones.

The following assessment has been undertaken at the site access and along the designated haulage route and at affected intersections.

Sight Distance Assessment

Sight distance for the three affected intersections has been assessed in accordance with Austroads Guide to Road Design Part 4a, considering heavy vehicle use and taking into consideration the design speed. Required sight distance and achievable sight distance are summarised in Table 2.4.

Table 2.4: Safe Intersection Sight Distance Requirements for a Truck

Location	Design Speed**	Austroads: Guide to Road Design Part 4a Requirements	Minimum Achievable Sight Distance
Site Access / Altona Road	Site located at dead end*		
Altona Road / Crescent Street	60 km/h	99 m	220 m
Tweed Coast Road / Crescent Street	90 km/h	185 m	190 m

*stopping bays provided along length of Altona Road to allow inbound vehicles to yield to outbound vehicles and all light vehicles give way to heavy vehicles (see Bitzios traffic report presented in Attachment 2 for more information).

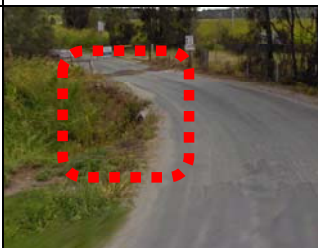
**Design speed = +10km/h over posted speed as per Austroads Guidelines

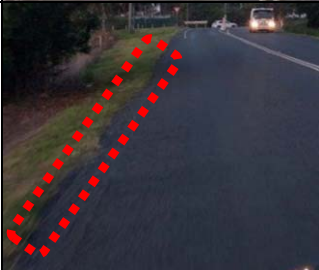
As demonstrated in Table 2.4, the intersections are considered to provide sufficient sight distance to comply with the requirements prescribed by Austroads for heavy vehicles.

Safety Review

The following items, presented in Table 2.5, were noted regarding intersection geometry, road delineation, regulatory signage, width of carriageway and objects or drainage structures within clear zones. It should be noted that no findings are expected to impact the safe operation of the intersections within the inclusion of additional development traffic. Any recommended improvements on Crescent Street or Tweed Coast Road are related to general road maintenance and are the responsibility of the road authority.

Table 2.5: Road Condition Review

Location	Findings	Illustration	Comments
Site Access / Altona Road	Absence of trucks turning signage and recommended speed signage		Investigate installing appropriate speed signage. Consider installing truck turning warning signs on approach to site access to assist in driver awareness
	Culvert/ditch hazard		Install guideposts at hazard.

Location	Findings	Illustration	Comments
	Soft Edges on Altona Road		It is understood that Altona Road is to be monitored and maintained by existing properties with access to the road. Cudgen Lakes Sand Quarry development has proposed significant works and realignment of Altona Road in the long term.
	Three formalised and signalised passing opportunities for trucks		Considered appropriate.
Altona Road / Crescent Street	Absence of give-way line marking for Altona Road approach		Install give-way line marking
	Absence of shoulders on Crescent Street		Investigate formalising shoulders on Crescent Street (Council)
	Absence of intersection signage at Crescent Street Approach		Consider installing intersection warning signs to assist driver awareness
	Culvert/ditch hazard at Crescent Street south approach		Improve the guideposts at hazard

Based on the findings within Table 2.5, an Impact Assessment and Mitigation Matrix was prepared comparing the 'without development' and 'with development' scenarios to determine any significant exacerbation of existing issues as a result of the proposed development traffic impacts. Table 2.6 shows the Impact Assessment associated with the development.

Table 2.6: Impact Assessment

Risk Item	Without the Development			With Development		
	Likelihood	Consequence	Result	Likelihood	Consequence	Result
Frequency of Heavy Vehicles	1	2	L	2	2	L
Crash due to culvert	1	2	L	1	2	L
Off-path crash due to soft road edges	1	3	L	1	3	L
Crash due to narrow shoulders	1	3	M	1	3	M
Crash due to absence of intersection signage	2	2	L	2	2	L

Likelihood and Consequence ratings utilised in the above table are ranked from one (1) to five (5) and are defined below. It should be noted that the resulting Low, Medium or High risk result is based on a combination of these two elements, site inspections and a professional understanding of the risks involved.

Likelihood - 1 (Rare/Very Unlikely) to 5 (Frequent/Highly Likely)

Consequence - 1 (Low Severity/Minor Incident) to 5 (Very High Severity/Death)

Table 2.6 demonstrates that the proposed development has a negligible impact and is not considered to exacerbate existing maintenance issues along adjacent roads or at nearby intersections.

As per the above assessment, we conclude that there is no significant traffic or safety impacts associated with the proposed development that would preclude its approval and relevant conditioning by RMS and Council.

Yours faithfully



Andrew Eke

Manager – Gold Coast & Northern NSW

Principal Traffic Engineer / Transport Planner

BITZIOS CONSULTING

ATTACHMENT 1

SIDRA OUTPUTS

MOVEMENT SUMMARY

▽ Site: P2930 [2027 AM Design]

Crescent Street / Altona Road Intersection
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: Crescent Street											
25	T1	46	6.0	0.055	3.9	LOS A	0.3	2.1	0.10	0.44	67.9
26	R2	57	30.0	0.055	5.4	LOS A	0.3	2.1	0.18	0.80	39.1
Approach		103	19.2	0.055	4.7	NA	0.3	2.1	0.15	0.64	48.3
NorthWest: Altona Road											
27	L2	54	50.0	0.047	4.0	LOS A	0.2	1.9	0.18	0.44	37.6
29	R2	3	0.0	0.047	4.5	LOS A	0.2	1.9	0.18	0.44	38.1
Approach		57	47.2	0.047	4.0	LOS A	0.2	1.9	0.18	0.44	37.6
SouthWest: Crescent Street											
30	L2	4	0.0	0.038	6.8	LOS A	0.0	0.0	0.00	0.04	72.2
31	T1	68	6.0	0.038	0.0	LOS A	0.0	0.0	0.00	0.04	76.7
Approach		73	5.7	0.038	0.4	NA	0.0	0.0	0.00	0.04	76.3
All Vehicles		233	21.8	0.055	3.2	NA	0.3	2.1	0.11	0.40	50.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

▽ Site: P2930 [2027 PM Design]

Crescent Street / Altona Road Intersection
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: Crescent Street											
25	T1	32	6.0	0.030	3.8	LOS A	0.1	1.1	0.09	0.52	67.9
26	R2	27	30.0	0.030	5.7	LOS A	0.1	1.1	0.14	0.82	39.9
Approach		59	17.1	0.030	4.7	NA	0.1	1.1	0.11	0.66	51.2
NorthWest: Altona Road											
27	L2	46	50.0	0.038	3.9	LOS A	0.2	1.5	0.14	0.43	37.6
29	R2	1	0.0	0.038	4.1	LOS A	0.2	1.5	0.14	0.43	38.2
Approach		47	48.9	0.038	3.9	LOS A	0.2	1.5	0.14	0.43	37.7
SouthWest: Crescent Street											
30	L2	1	0.0	0.026	6.9	LOS A	0.0	0.0	0.00	0.01	73.7
31	T1	48	6.0	0.026	0.0	LOS A	0.0	0.0	0.00	0.01	78.8
Approach		49	5.9	0.026	0.1	NA	0.0	0.0	0.00	0.01	78.6
All Vehicles		156	23.2	0.038	3.0	NA	0.2	1.5	0.09	0.38	51.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

▽ Site: P2930 [2027 AM Design]

Tweed Coast Road / Crescent Street Intersection
GiveWay / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Tweed Coast Road											
1	L2	6	25.0	0.649	6.0	LOS A	0.0	0.0	0.00	0.00	56.9
2	T1	1234	3.0	0.649	0.2	LOS A	0.0	0.0	0.00	0.00	59.7
Approach		1240	3.1	0.649	0.2	NA	0.0	0.0	0.00	0.00	59.7
North: Tweed Coast Road											
8	T1	853	13.0	0.469	0.1	LOS A	0.0	0.0	0.00	0.00	59.8
9	R2	99	5.0	0.447	28.2	LOS D	1.7	12.2	0.93	1.04	40.0
Approach		952	12.2	0.469	3.0	NA	1.7	12.2	0.10	0.11	56.9
West: Crescent Street											
10	L2	114	20.0	0.068	5.8	LOS A	0.0	0.0	0.00	0.52	54.2
Approach		114	20.0	0.068	5.8	NA	0.0	0.0	0.00	0.52	54.2
All Vehicles		2305	7.7	0.649	1.6	NA	1.7	12.2	0.04	0.07	58.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

▽ Site: P2930 [2027 PM Design]

Tweed Coast Road / Crescent Street Intersection
GiveWay / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Tweed Coast Road											
1	L2	4	25.0	0.511	5.9	LOS A	0.0	0.0	0.00	0.00	57.0
2	T1	972	3.0	0.511	0.1	LOS A	0.0	0.0	0.00	0.00	59.8
Approach		976	3.1	0.511	0.1	NA	0.0	0.0	0.00	0.00	59.8
North: Tweed Coast Road											
8	T1	1081	13.0	0.595	0.1	LOS A	0.0	0.0	0.00	0.00	59.7
9	R2	59	5.0	0.129	13.2	LOS B	0.5	3.4	0.77	0.90	47.9
Approach		1140	12.6	0.595	0.8	NA	0.5	3.4	0.04	0.05	59.0
West: Crescent Street											
10	L2	92	20.0	0.055	5.8	LOS A	0.0	0.0	0.00	0.52	54.2
Approach		92	20.0	0.055	5.8	NA	0.0	0.0	0.00	0.52	54.2
All Vehicles		2207	8.7	0.595	0.7	NA	0.5	3.4	0.02	0.05	59.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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ATTACHMENT 2

P2930.001R TWEED SAND QUARRY TIA

**TWEED SAND QUARRY
LOT 22 (DP1082435), LOT 23
(DP1077509) AND LOT 494 (DP720450)
CRESCENT STREET CUDGEN
TRAFFIC IMPACT ASSESSMENT**

FOR

**HANSON CONSTRUCTION
MATERIALS**

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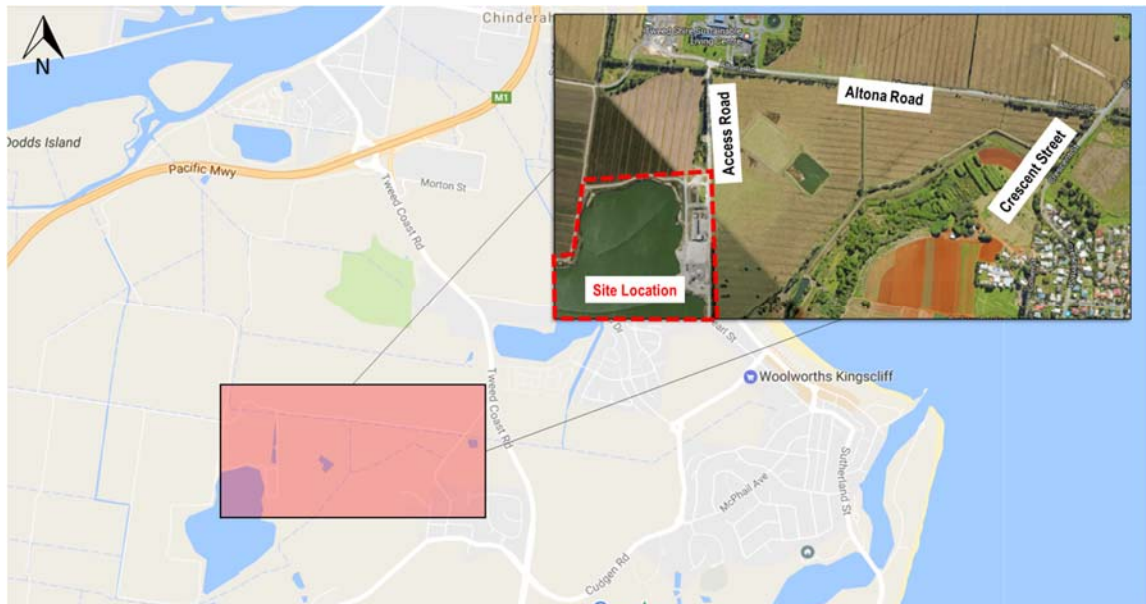
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1. INTRODUCTION

1.1 BACKGROUND

Bitzios Consulting has been engaged by Hanson Construction Materials to prepare a traffic impact assessment for the existing Tweed Sand Quarry (TSQ) located at Altona Road, Chinderah. The site for the existing development is located on Lot 22 (DP1082435), Lot 23 (DP1077509) and Lot 494 (DP720450), adjacent to the Kingscliff Wastewater Treatment Plant.



Source: Google Maps

Figure 1.1: Site Location

1.2 SCOPE

The purpose of this report is to undertake an assessment of the potential traffic and transport impacts associated with the proposed increase in extraction limit for the existing sand quarry on the external road network. This includes the impact of increased vehicle trips along Altona Road, as well as the Crescent Street / Altona Road and Tweed Coast Road / Crescent Street intersections. Specifically, this report includes:

- an estimation of development's increase in traffic generation and the distribution onto the external road network;
- assessment of the development's traffic impacts on the surrounding road network (including the Tweed Coast Road / Crescent Street and the Crescent Street / Altona Road intersections for the year 2017 and 10-year design horizon);
- the observation and calculation of the proportion of equivalent standard axles (heavy vehicles) attributed to the Tweed Sand Quarry and Councils SLC along Altona Road, both before and after the proposed development expansion;
- the increase in average annual daily traffic (AADT) traffic generation to assist in calculating Council's Section 94, Plan No. 4 Road Infrastructure Contributions;
- assessment of site access location and form;
- assessing the on-site parking layout for general traffic and service vehicle manoeuvring; and
- assessing any impacts to public transport, pedestrian and cycling networks and connectivity within vicinity of the site (as required by RMS).

2. EXISTING CONDITIONS

2.1 ROAD NETWORK

The site for the existing development is located on the southern side of Altona Road, Chinderah, with designated access from Tweed Coast Road via Crescent Street. The site is located approximately 2.75km to the south of the Pacific Highway. Table 2.1 provides details for the existing key roads and intersection configurations within close proximity to the subject site.

Table 2.1: Surrounding Road Network

Road Name	No. of Lanes	Median Divided?	Jurisdiction	Hierarchy	Comments
Altona Road	1*	No Lines	TSC	Access	Local access road connecting to development site and other large scale land uses (i.e. agricultural land, waste treatment facility). Provides stopping bays to inbound vehicles
Crescent Street	2	No	TSC	Local Collector	Connects to Cudgen residential area and provides access to Tweed Coast Road.
Tweed Coast Road	2	No	TSC	Sub-Arterial	Regional arterial road connecting to the highway in the north and running along the coast to the south via a number of local townships.

*stopping bays provided along length of road to allow inbound vehicles to yield to outbound vehicles. All light vehicles give way to heavy vehicles.

The following nearby intersections are to be assessed as part of the proposed development's traffic impacts:

- Tweed Coast Road / Crescent Street priority-controlled intersection; and
- Crescent Street / Altona Road priority-controlled intersection.

Crescent Street south of the Altona Road intersection is subject to load limit restrictions. Signage located to the immediate south of the intersection states that the road has a gross load limit of 14.5 tonnes. It should be noted that Schedule 3, Condition 31 of the site development consent states that "No heavy vehicles shall travel via Crescent Street through Cudgen Village, except for local deliveries to Cudgen Village".

2.2 BACKGROUND TRAFFIC VOLUMES

Background traffic volumes were obtained from traffic surveys undertaken by Traffic Data and Control (TDC) for:

- Tweed Coast Road / Crescent Street Intersection – AM (7:00AM to 9:00AM) and PM (3:00PM to 6:00PM) Intersection Counts – Thursday 15th December 2016; and
- Crescent Street / Altona Road Intersection – AM (7:00AM to 9:00AM) and PM (3:00PM to 6:00PM) Intersection Counts – Thursday 15th December 2016.

The traffic volumes for the surveyed three (3) hour periods by vehicle type is summarised in Table 2.2.

Table 2.2: Surveyed Total Traffic Volumes by Vehicle Type on Local Roads

Location		Two-Way Traffic Volume	
		AM (3-hr period)	PM (3-hr period)
Crescent Street	- Trucks	51	21
	- Light Vehicles	145	172
Altona Road	- Trucks	43	11
	- Light Vehicles	40	11

Survey video data was reviewed to determine all the truck traffic by vehicles types utilising Altona Road in the AM (8:00AM to 9:00AM) and PM (3:00PM to 4:00PM) peaks. Tweed Sand Quarry (TSQ) trucks were observed as Tuck and Dog (TD) and Articulating Vehicles (AV), all Medium Rigid Vehicles (MRV) were observed as related to Council's SLC. The surveyed heavy vehicle volumes by truck type is summarised in Table 2.3.

Table 2.3 Surveved Existing Truck Volumes by type using Altona Road

Vehicle Type AM	Tweed Sand Quarry (TD)		Tweed Sand Quarry (AV)		Council (MRV)	
Direction	Axles	Count*	Axles	Count	Axles	Count
In	6	5	6	2	2	3
					4	2
Out	7	1	-	-	4	1
	6	1			2	2
Vehicle Type PM	Tweed Sand Quarry (TD)		Tweed Sand Quarry (AV)		Council (MRV)	
Direction	Axles	Count	Axles	Count	Axles	Count
In	7	1	6	3	-	-
Out	7	1	6	4	--	-

*Each counted vehicle has its number of corresponding axles in the Axles column (i.e. there are five (5) TD's with six (6) axles each).

Using the above survey the proportion of trucks by total ESA's for the peak periods was calculated, as summarised in Table 2.4.

Table 2.4: ESA's by Truck type on Altona Road

Vehicle Type (AM Peak)	Tweed Sand Quarry (TD) 6 Axles	Tweed Sand Quarry (TD) 7 Axles	Tweed Sand Quarry (AV) 6 Axles	Council (MRV) 2 Axles	Council (MRV) 4 Axles
Number of Vehicles	6	1	2	5	3
ESA's Per Commercial Vehicle When Fully Loaded *	7.3	8	5.1	3	4.4
ESA Total	43.8	8	10.2	15	13.2
Vehicle Type (PM Peak)	Tweed Sand Quarry (TD) 6 Axles	Tweed Sand Quarry (TD) 7 Axles	Tweed Sand Quarry (AV) 6 Axles	Council (MRV) 2 Axles	Council (MRV) 4 Axles
Number of Vehicles	-	2	7	-	-
ESA's Per Commercial Vehicle When Fully Loaded *	7.3	8	5.1	3	4.4
ESA Total	0	16	35.7	0	0

*ESA values are as per Austroads Vehicle Classification and are for a typical fully loaded vehicle of each type.

The percentage split of truck volumes for the peak periods is summarised in Table 2.5

Table 2.5: Surveved Percentage Traffic Volumes by Trucks types in Altona Road *

Vehicle Type AM	Total Number of Trucks	Trucks over total vehicles%	Tweed Sand Quarry (TD) %	Tweed Sand Quarry (AV) %	Council (MRV) %
In	12	55%	42%	17%	42%
Out	5	29%	40%	0%	60%
Vehicle Type PM	Total Number of Trucks	Trucks over total vehicles %	Tweed Sand Quarry (TD) %	Tweed Sand Quarry (AV) %	Council (MRV) %
In	4	57%	25%	75%	0%
Out	5	71%	20%	80%	0%

*percentages by Tweed Sand Quarry plus Council's trucks equals 100%.

The background traffic volumes for the AM (8:00AM to 9:00AM) and PM (3:00PM to 4:00PM) peaks, including TSQ haulage truck volumes, is provided in Figure 2.1. The traffic survey data is provided in Appendix A.

It should be noted that for all network figures in this assessment, traffic movements are shown as 'T' (Through traffic), 'L' (Left turning traffic) and 'R' (Right turning traffic).

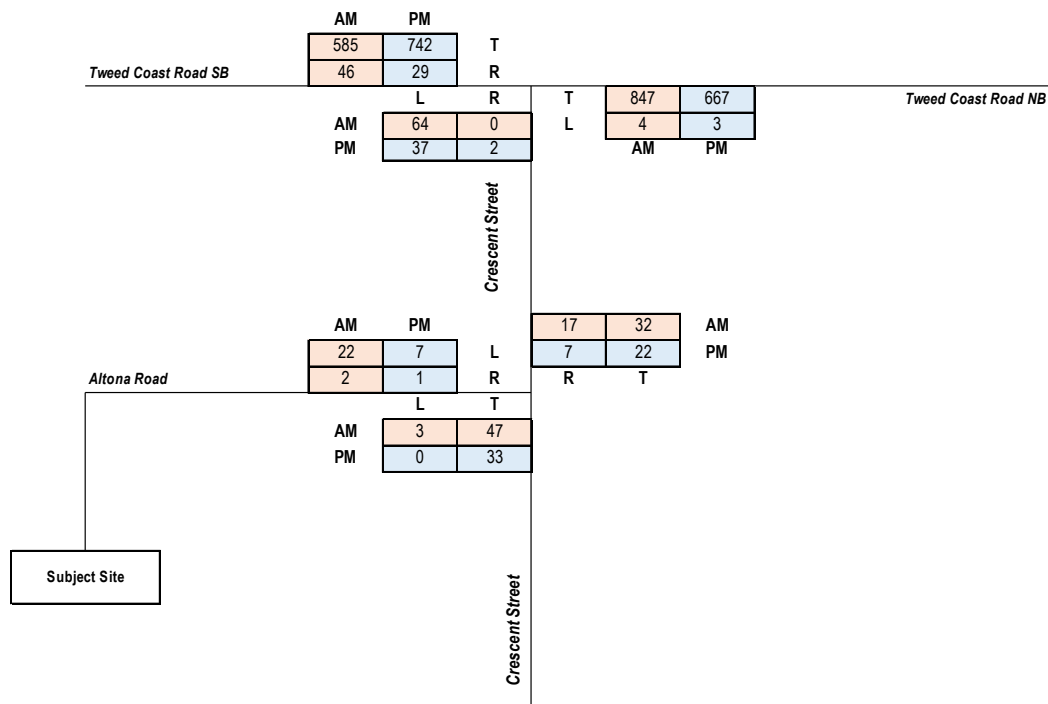


Figure 2.1: 2016 Peak Hour Background Traffic Volumes

Further to the above peak hour background traffic volumes, the existing haulage truck volumes generated by the development were recorded for the purposes of estimating the additional haulage truck movements associated with the extraction limit increase. The existing peak hour haulage truck volumes are provided in Figure 2.2.

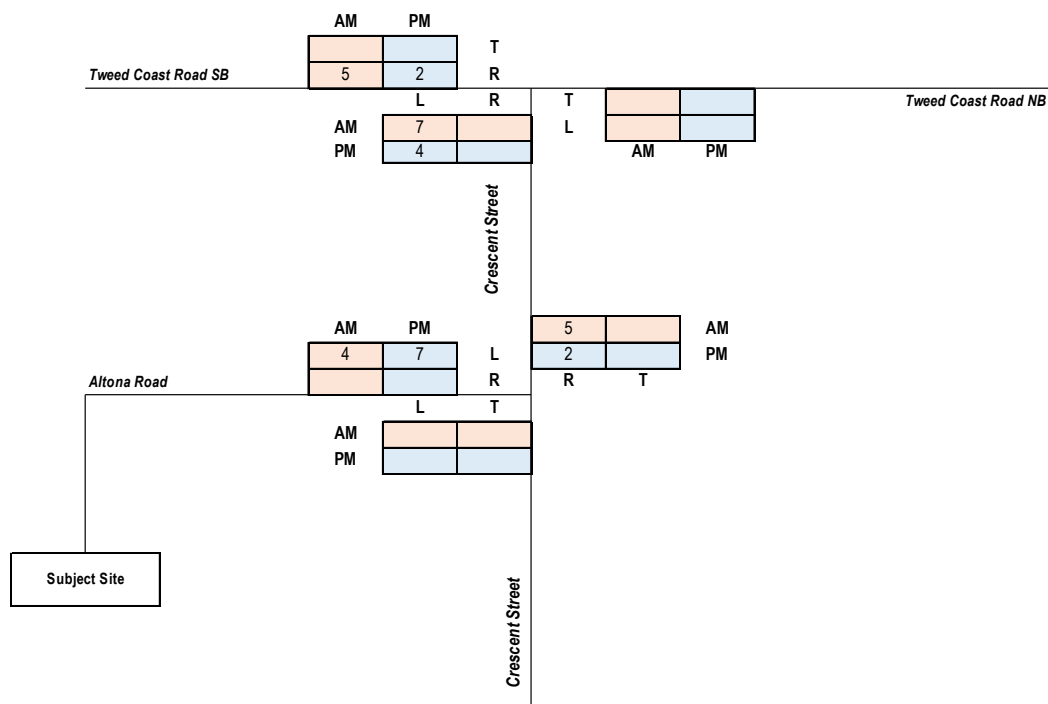


Figure 2.2: 2016 Peak Hour Tweed Sand Quarry Haulage Truck Movements

It is understood that the above peak hour haulage movements do not occur hourly throughout a typical day, site operations and truck movements are monitored (e.g. weigh station) to ensure conditioned daily truck

movement limits are not exceeded. Resulting in a typically lower number of movements throughout the middle of the day.

2.3 TRAFFIC GROWTH

Population data (*sourced from Profile ID online*) has been analysed alongside an understanding of the planned future growth in the area to provide an indication of expected background traffic growth. A linearly growth rate of 1.5% p.a. was extrapolated from the available data. In addition to this, the rate of future growth is expected to increase as a result of surrounding development, namely in the nearby Kings Forest area.

Given the above, a compounding growth rate of 3.0% p.a. has been applied to background traffic volumes (excluding TSQ haulage trucks) in order to forecast background traffic volumes in year 2017 (anticipated “year of opening”) and year 2027 (10-year design horizon).

With the assumption that the extraction limit increase at the site is approved, the site’s approved resources will be exhausted by year 2024 (approx. 7 years). Noting this, the assessment of the surrounding road network for a 10-year design horizon scenario is considered conservative.

3. DEVELOPMENT DETAILS

3.1 DEVELOPMENT OPERATIONS

The existing development is a sand extraction and processing facility which operates a single dredge to mine high-quality sand from an on-site lake. The dredge material is transferred to shore via a pipe where it is processed through a wash plant and stock-piled. A front-end loader transfers the material to road haulage trucks for delivery as required. The facility is currently limited to an annual extraction of 150,000m³ of processed material.

While the development operates for extended hours, truck movements to and from the development are restricted to the following periods:

- 7:00am to 5:00pm – Monday to Friday; and
- 7:00am to 12:00pm – Saturday.

Further to the above, Schedule 2, Condition 9 of the current TSQ Development Consent restricts development truck movements to the following:

- 200 per day (max);
- 80 per day (rolling quarterly average); and
- 20 per hour (max peak).

3.2 PROPOSED EXTRACTION LIMITS

It is understood that the development proposes to expand its annual extraction output to approximately 265,000m³, or approximately 503,500 tonnes.

Further to the above, a modification to Schedule 2, Condition 9 proposed an equivalent increase in development truck movements to the following:

- 354 per day (max);
- 142 per day (rolling quarterly average); and
- 36 per hour (peak).

4. TRAFFIC ASSESSMENT

4.1 DEVELOPMENT GENERATED TRAFFIC

Development generated traffic considers the truck movement limitations and existing haulage truck volumes provided in Figure 2.2 where a total of nine (9) truck trips were observed during both the AM and PM peaks. The site's proposed conditions are to allow for up to 36 truck trips during the peak period, as such the proposed development is restricted to generating a maximum of 25 additional haulage truck trips in the AM peak hour and a maximum of 25 additional haulage truck trips in the PM peak hour.

As the increase in extraction does not propose additional staff or servicing, only additional haulage truck trips have been considered in the development generated traffic for the purposes of this assessment.

It should be noted that the development is not expected to approach the maximum number of peak hour trips allowed within approval conditions across its lifespan. The proposed additional extraction of 115,000m³ applied as a ratio (150,000current:265,000future) to the surveyed peak hour truck trips can be used to estimate the number of additional trips that may occur during the peak hour.

$$\begin{aligned} & (9 / (150,000/265,000)) - 9 \\ & = 6.9 \text{ additional trips during the peak hour} \end{aligned}$$

Considering the above it is expected an additional 6.9 trips would occur during the both the AM and PM peak periods (assuming trucks arrive at equal intervals throughout a regular working day). However, the number of additional trips applied for this assessment (25 trips in each peak hour) takes the most conservative approach to determining traffic impacts on the road network.

4.1.1 Future Truck Volumes on Altona Road

Development is expected to generate an additional 6.9 trips during both, the AM and PM peak periods on Altona Road. Conservatively assuming that all trips will be truck movements, the future Tweed Sand Quarry and Council's truck volumes expected on Altona Road are shown in Table 4.1. Further, it is understood that the development makes use of Truck and Dog vehicles and as such it was assumed the increase of truck volumes would be designated as 6-axle Truck and Dog vehicles.

Table 4.1: Percentage Traffic by trucks types in Altona Road after the proposed development (2017)

Vehicle Type AM	Total Number of Trucks	Trucks %	Tweed Sand Quarry (TD) %	Tweed Sand Quarry (AV) %	Council (MRV) %
In	16	62%	56%	13%	31%
Out	8	40%	63%	0%	38%
Total	24	51%	59%	6%	34%
Vehicle Type PM	Total Number of Trucks	Trucks %	Tweed Sand Quarry (TD) %	Tweed Sand Quarry (AV) %	Council (MRV) %
In	7	70%	57%	43%	0%
Out	9	82%	56%	44%	0%
Total	16	76%	56%	44%	0%

The traffic generation is not expected to increase from the year of opening (2017) to the 10-year design horizon (2027).

It should be noted that the 6.9 additional trips were rounded to seven (7) trips for both the AM and PM peak periods. This would result in an additional four (4) trucks in and three (3) trucks out during the AM peak; and three (3) trucks in and four (4) trucks out during the PM peak on Altona Road.

The future truck volume proportions on Altona Road by ESA's for each the peak periods (with development scenario) were calculated as shown in Table 4.2

Table 4.2: ESA by Truck type on Altona Road after the proposed development (2017)

Vehicle Type (AM Peak)	Tweed Sand Quarry (TD) 6 Axles	Tweed Sand Quarry (TD) 7 Axles	Tweed Sand Quarry (AV) 6 Axles	Council (MRV) 2 Axles	Council (MRV) 4 Axles
Number of Vehicles	13	1	2	5	3
ESA's Per Commercial Vehicle When Fully Loaded *	7.3	8	5.1	3	4.4
ESA Total	94.9	8	10.2	15	13.2
Vehicle Type (PM Peak)	Tweed Sand Quarry (TD) 6 Axles	Tweed Sand Quarry (TD) 7 Axles	Tweed Sand Quarry (AV) 6 Axles	Council (MRV) 2 Axles	Council (MRV) 4 Axles
Number of Vehicles	7	2	7		
ESA's Per Commercial Vehicle When Fully Loaded *	7.3	8	5.1	3	4.4
ESA Total	51.1	16	35.7	0	0

**ESA values as found within Austroads Vehicle Classification and are for an average fully loaded typical vehicle.*

As shown in the table above, it is expected an additional ESA of 51.1 will occur due to the proposed development for both the AM and PM peak periods.

4.2 TRIP DISTRIBUTION

The distribution of haulage truck trips has been assigned on the basis of background traffic volumes, as well as the designated haulage route along Tweed Coast Road to the north.

Based on the development traffic generation, and the associated trip distributions, Figure 4.1 illustrates the additional haulage truck trip assignment for the surrounding road network during the AM and PM peak hours.

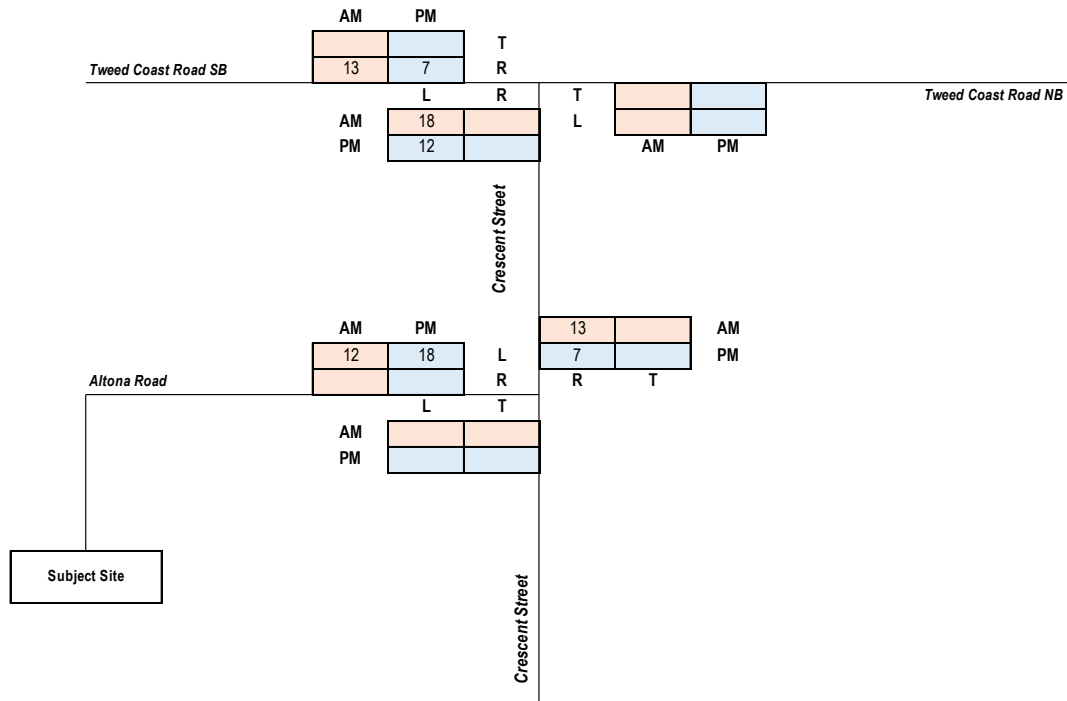


Figure 4.1: Peak Hour Development Traffic Assignment

4.2.1 Design Traffic Volumes

The 2017 and 2027 design traffic volumes (i.e. background + development) for the proposed development operations are shown below in Figure 4.2 and Figure 4.3 respectively.

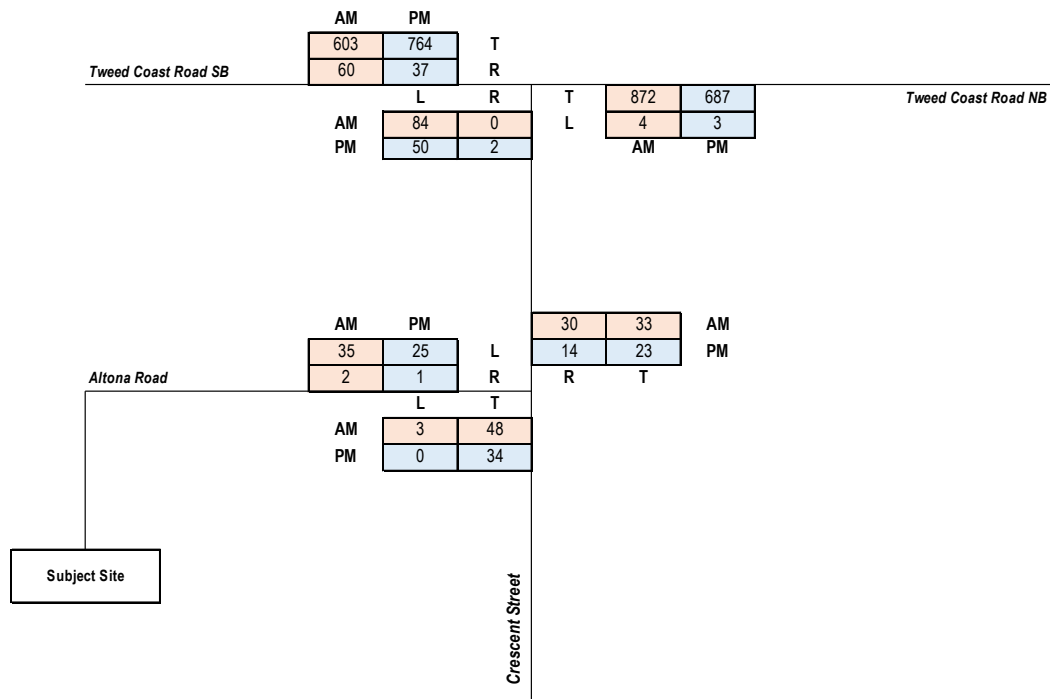


Figure 4.2: 2017 Design Peak Hour Traffic Volumes

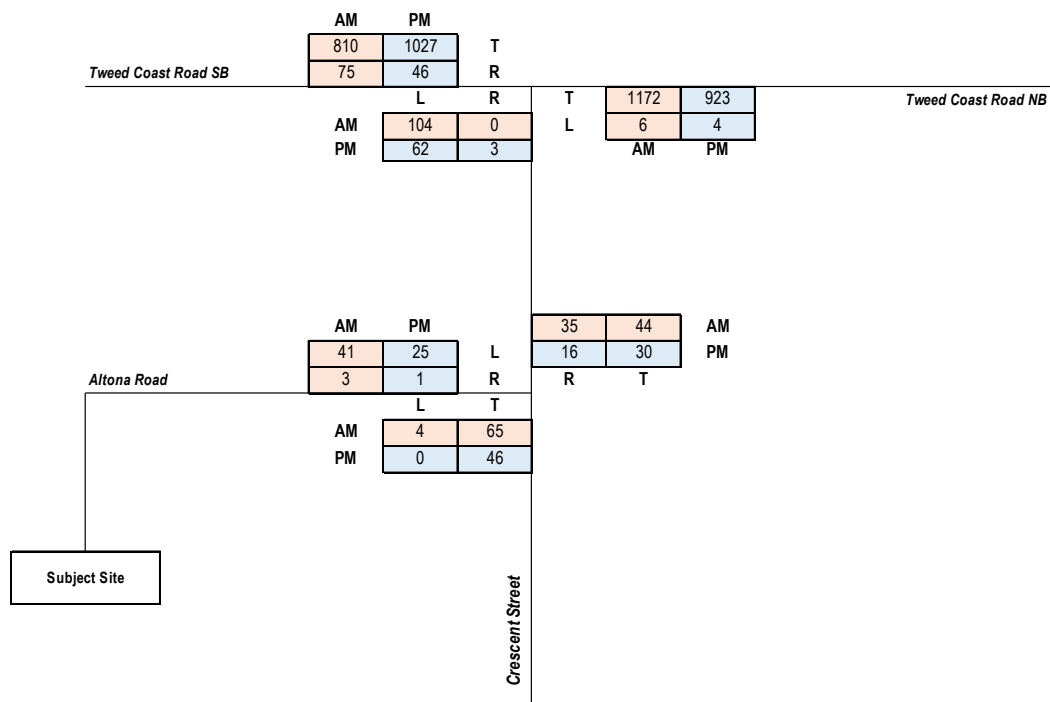


Figure 4.3: 2027 Design Peak Hour Traffic Volumes

4.3 SIDRA ANALYSIS

The operational performance of each intersection was analysed using SIDRA Intersection v7.0 software to assess the “without development” and “with development” scenarios for 2017 and 2027 design years. The assessment and findings are presented herein.

4.3.1 Tweed Coast Road / Crescent Street Intersection

The SIDRA output results for the Tweed Coast Road / Crescent Street Intersection in 2017 and 2027 weekday AM and PM peak periods for “base” and “design” scenarios are provided in Table 4.3.

Table 4.3: Tweed Coast Road / Crescent Street Intersection SIDRA Results Summary

Peak Period	Design Year	Base			Design (background + development)		
		DOS	Average Delay (s)	95% Back of Queue (m)	DOS	Average Delay (s)	95% Back of Queue (m)
AM	2017	0.483	1.8	13.5	0.483	2.3	17.1
	2027	0.649	6.2	87.1	0.727	7.7	90.9
PM	2017	0.412	0.9	7.2	0.419	1.1	8.9
	2027	0.579	2.1	22	0.591	2.5	25.9

The SIDRA results summarised in Table 4.3 indicate that the subject intersection operates below the acceptable performance limits for a priority-controlled intersection (i.e. $DOS < 0.8$) both with and without additional development traffic. Detailed SIDRA outputs are included in Appendix C.

4.3.2 Crescent Street / Altona Road Intersection

The SIDRA output results for the Crescent Street / Altona Road Intersection in 2017 and 2027 weekday AM and PM peak periods for “base” and “design” scenarios are provided in Table 4.4.

Table 4.4: Crescent Street / Altona Road Intersection SIDRA Results Summary

Peak Period	Design Year	Base			Design (background + development)		
		DOS	Average Delay (s)	95% Back of Queue (m)	DOS	Average Delay (s)	95% Back of Queue (m)
AM	2017	0.029	2.6	0.8	0.035	3.1	1.3
	2027	0.039	2.6	1.1	0.044	3.0	1.6
PM	2017	0.021	2.0	0.5	0.024	2.9	1.0
	2027	0.028	1.9	0.6	0.028	2.7	1.1

The SIDRA results summarised in Table 4.4 indicate that the subject intersection operates below the acceptable performance limits for a priority-controlled intersection (i.e. $DOS < 0.8$) both with and without additional development traffic. Detailed SIDRA outputs are included in Appendix C.

4.4 ALTONA ROAD CROSS-SECTION

The first 650m of Altona Road west of Crescent Street presently exists as a single lane two-way roadway with supplementary stopping bays. The stopping bays have been provided to allow traffic to pass along the one-way section of Altona Road. Signage observed on-site outlines that vehicles must “give way to trucks” while it is understood that typically westbound (inbound) trucks will yield to eastbound (outbound) trucks. Appropriate signage is provided along Altona Road indicating the operation of the stopping bays. The location of the stopping bays is illustrated in Figure 4.4.



Figure 4.4: Altona Road Layout

4.5 SECTION 94 ROAD CONTRIBUTIONS

The Tweed Shire Council (TSC) Section 94 Plan No. 4 – Tweed Road Contribution Plan (TRCP) does not include a specific trip rate for ‘Material Extraction Facility’. Furthermore, the Council’s TRCP indicates that *“Where a proposed traffic generation rate departs from the prescriptive rates in this table (excluding the dwelling house and multi house component) or is not stated, a detailed Traffic Study is required substantiating that the proposal conforms with the principles and objectives of this plan.”*. Given this, the total daily trip ends have been calculated based on the material extraction limits, as well as the developments existing and future operations. The development is located within Sector 6 – Kingscliff as specified in Schedule 3 – Boundary Definitions in the TRCP.

Section 94 contributions are applied based on a development’s number of “daily trips” using rates found within the latest version of the TRCP. As the TRCP does not include a specific trip rate for this development the number of average daily trips has been calculated using a “first principles” approach. The annual extraction limit and average truck capacity were used to determine the number of trucks per year. It was distributed across a typical year (365 days) to determine the daily average rate of truck movements.

The existing development site, with an extraction limit of 150,000m³, currently generates:

▪ Annual Extraction	150,000m ³
▪ Average Haulage Truck Capacity	16.5m ³
▪ Haulage Trucks per Year	9,091
▪ Haulage Trucks per Day	25
▪ Haulage Truck Trip Ends per Day	50
▪ Employee Trip Ends per Day	4
▪ Visitor Trip Ends per Week	6
▪ Visitor Trip Ends per Day	0.86
▪ Total Development Trip Ends	54.86

Based on the above, with an increase in extraction to 265,000m³, the proposed development operations are expected to generate:

▪ Increase in Annual Extraction	115,000m ³
▪ Average Haulage Truck Capacity	16.5m ³
▪ Haulage Trucks per Year	6,969.7
▪ Additional Haulage Trucks per Day	19.095
▪ Additional Haulage Truck Trip Ends per Day	38.19
▪ Additional Daily Development Trip Ends	38.19

The total additional daily trip ends calculated above reflects the proposed developments total impact on the road network.

Based on the current Tweed Road Contribution Plan, Section 94 (2016), a monetary rate of \$1,207 per trip is applied to new development generated trips, resulting in a total additional contribution of \$46,952.30. It should be noted that this applied rate is indexed by Council and would be expected to change for future years.

5. PARKING ASSESSMENT

5.1 INTERNAL LAYOUT

It is understood that the development site will retain its parking and queuing operations on the existing site layout, as shown in Figure 5.1. Visitors and employees to the site will park adjacent to the site office while trucks are provided sufficient queuing and temporary parking capacity within the allocated circulation area.



Figure 5.1: Internal Site Layout

The queuing and parking of trucks within the circulation area is considered acceptable given the type of development and the short-stay nature of trucks on-site. Further to this, the internal layout and roadway width provides sufficient width for heavy vehicles to pass and does not restrict access by other vehicles accessing the development.

5.2 SITE ACCESS

The existing site access to the development will be retained as part of the proposed extraction increase. The existing access off Altona Road is shown below in Figure 5.2 and is approximately 4.5 metres in width.



Figure 5.2: Site Access

6. ALTERNATE TRANSPORT

6.1 PUBLIC TRANSPORT

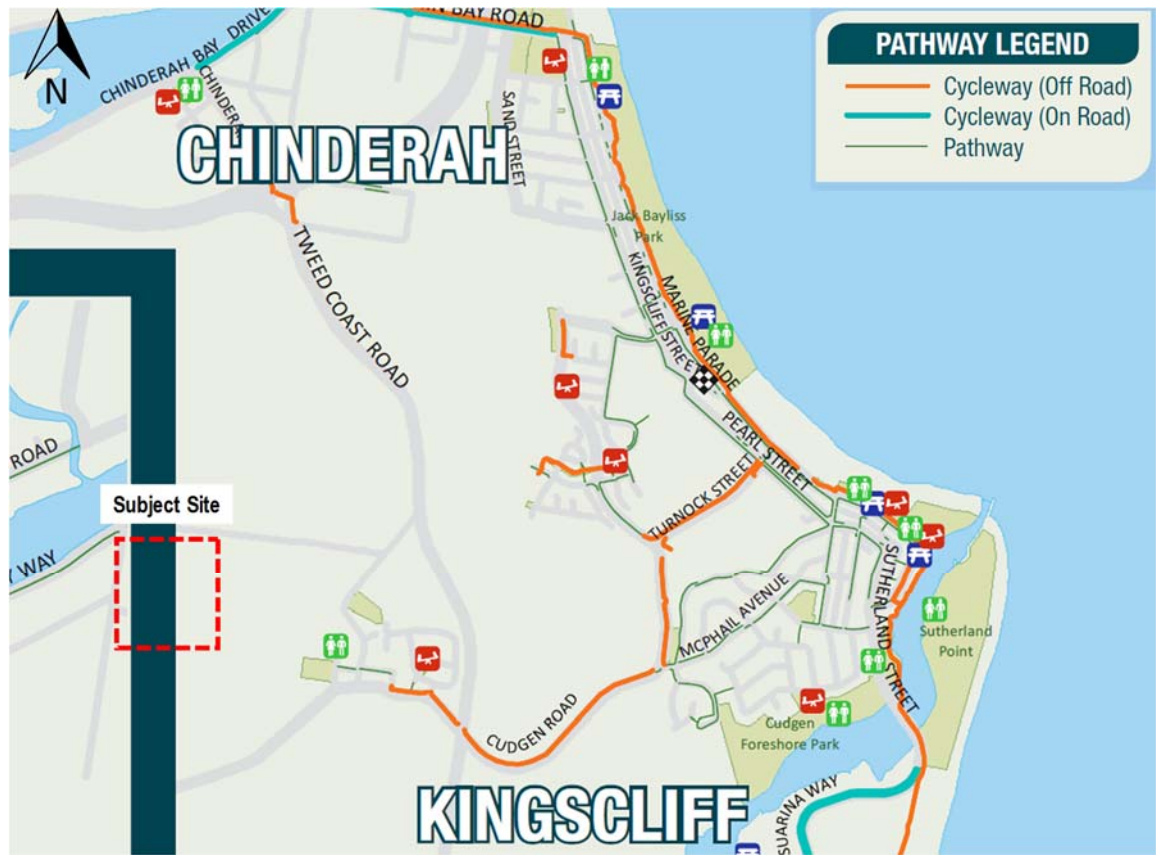
While the site is not located within proximity to bus stops, bus route 603 (Tweed Heads to Pottsville) runs along Crescent Street and onto Tweed Coast Road. However, the increased haulage truck movements generated by the development are not expected to impact on public transport services. It is understood that services along this route operation at hourly intervals. Figure 6.1 highlights public transport accessibility around the site.



Figure 6.1: Public Transport Accessibility

6.2 ACTIVE TRANSPORT

The areas surrounding the development are not conducive for pedestrian or cyclist use. Active transport facilities are located east of the site, as depicted by Figure 6.2.



Source: Tweed Shire Council Cycleway Map

Figure 6.2: Local Cycle Network

7. CONCLUSION

The key findings from the Tweed Sand Quarry (TSQ) proposed expansion traffic impact assessment are as follows:

- the development proposes to increase the extraction of material from 150,000m³ p.a. to 265,000m³ per p.a. (an increase of 115,000m³) and retains the existing access and site layout. Access to the site is provided from Altona Road via Crescent Street and Tweed Coast Road;
- the development proposes no increase in employees nor is an increase in visitors expected as a result of the extraction increase;
- the existing development provides a large internal circulation road which also acts as queuing space and temporary parking for trucks. Due to the short-stay nature of truck visits to the site the allocated queuing and parking space is suitable;
- approval conditions allow the development site to generate a maximum of an additional 25 haulage truck movements during the AM and PM peak periods (8am - 9am and 3pm - 4pm). However, it should be noted that the development's proposed additional resource extraction of 115,000m³ equates to an approximate increase of 6.9 truck trips in peak periods based on observed TSQ truck movements;
- based on the increase in truck trips from the proposed development, it is expected that the percentage split of truck types utilising Altona Road in AM peak will be approximately 59% for Tweed Sand Quarry and 41% for Council; and in the PM peak will be approximately 56% for Tweed Sand Quarry and 44% for Council;
- a detailed intersection analysis using SIDRA Intersection software was undertaken for the Tweed Coast Road / Crescent Street and Crescent Street / Altona Road priority-controlled intersections. It was found that both intersections operate well within acceptable performance criteria under a priority-controlled configuration in the 10-year design horizon based on the maximum allowable number of additional trips (25) under the existing approval conditions;
- based on the increase in extraction and associated haulage limits the development is expected to generate an additional 38.19 daily trips for the purposes of calculating Councils Section 94 Road Contribution requirements; and
- the development is not expected to introduce any impacts on the surrounding public transport (bus) network.

Based on the above assessment we conclude that there are no significant traffic or transport impacts associated with the development's proposed increase in extraction to preclude its approval and relevant conditioning on transport planning grounds.

APPENDIX A

TRAFFIC COUNT DATA

SURVEY INFORMATION

Site ID: 2

Location: Altona Rd & Crescent St, Chinderah

Date: 15 / Dec / 2016

Time Period 1: 07:00 to 09:00

Time Period 2: 15:00 to 18:00

Primary Classes:

- | | | |
|---|------------------|---|
| 1 | Light Vehicles | ▼ |
| 2 | Trucks | ▼ |
| 3 | Bicycles on Road | ▼ |
| 4 | None | ▼ |
| 5 | None | ▼ |

Secondary Classes:

- | | | |
|---|-------------|---|
| 1 | Pedestrians | ▼ |
| 2 | None | ▼ |

Weather Conditions 1: Fine Weather Conditions 2: Fine

Intersection Legs:

North	☒ Ch	Crescent St SB
East	☐ Ch	
South	☒ Ch	Crescent St NB
West	☒ Ch	Altona Rd EB

Output time interval: 15 mins ▼



MAP



Turning Movement Count Summary

Site ID: 2

Location: Altona Rd & Crescent St, Chinderah

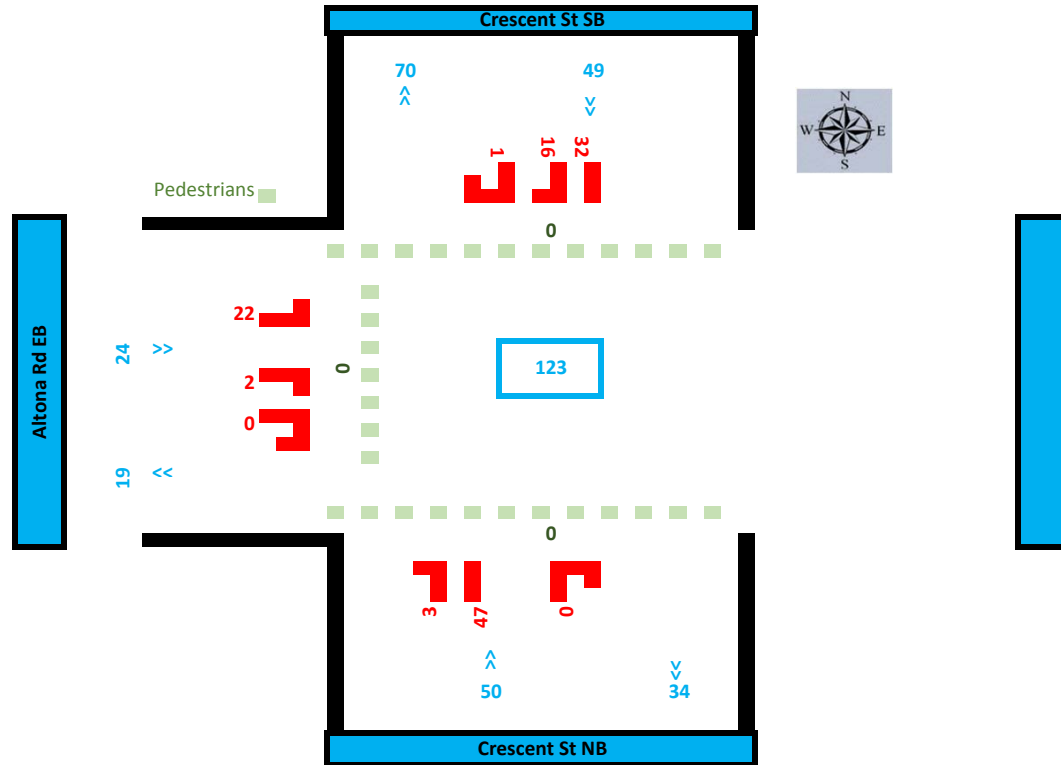
Date: 15-Dec-2016

Surveyed Time: 7:00 AM to 9:00 AM

Weather: Fine

Data for hour starting: 8:00 AM to 9:00 AM

Vehicle Class: ALL VEHICLES



Turning Movement Count Summary

Site ID: 2

Location: Altona Rd & Crescent St, Chinderah

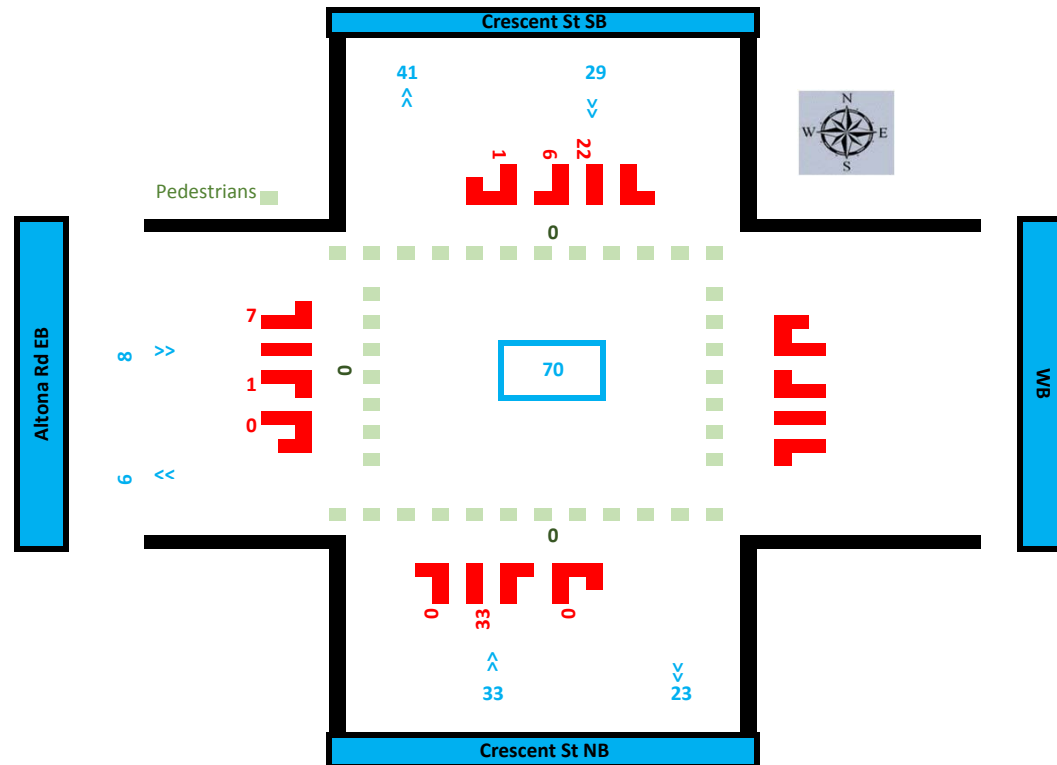
Date: 15-Dec-2016

Surveyed Time: 3:00 PM to 6:00 PM

Weather: Fine

Data for hour starting: 3:00 PM to 4:00 PM

Vehicle Class: ALL VEHICLES



SURVEY INFORMATION

Site ID: 1

Location: Tweed Coast Rd & Crescent St, Chinderah

Date: 15 / Dec / 2016

Time Period 1: 07:00 to 09:00

Time Period 2: 15:00 to 18:00

Primary Classes:

- | | | |
|---|------------------|---|
| 1 | Light Vehicles | ▼ |
| 2 | Trucks | ▼ |
| 3 | Bicycles on Road | ▼ |
| 4 | None | ▼ |
| 5 | None | ▼ |

Secondary Classes:

- | | | |
|---|-------------|---|
| 1 | Pedestrians | ▼ |
| 2 | None | ▼ |

Weather Conditions 1: Fine Weather Conditions 2: Fine

Intersection Legs:

North	☒ Ch	Tweed Coast Rd SB
East	☐ Ch	
South	☒ Ch	Tweed Coast Rd NB
West	☒ Ch	Crescent St EB

Output time interval: 15 mins ▼

MAP



Turning Movement Count Summary

Site ID: 1

Location: Tweed Coast Rd & Crescent St, Chinderah

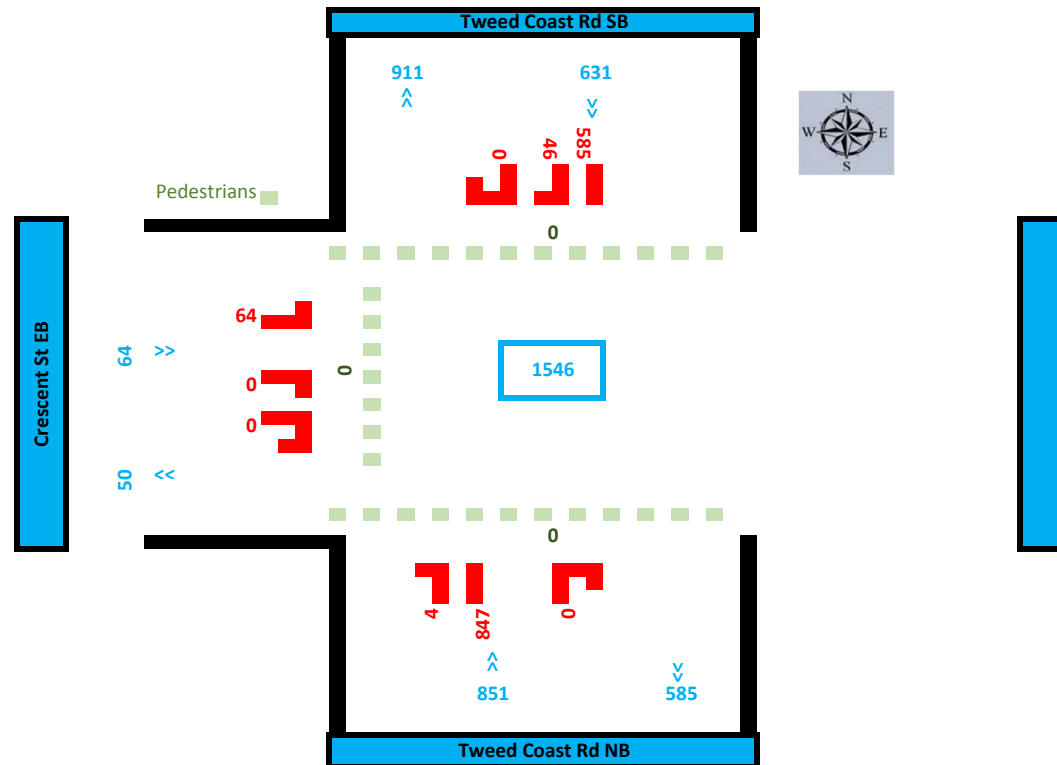
Date: 15-Dec-2016

Surveyed Time: 7:00 AM to 9:00 AM

Weather: Fine

Data for hour starting: 8:00 AM to 9:00 AM

Vehicle Class: ALL VEHICLES



Turning Movement Count Summary

Site ID: 1

Location: Tweed Coast Rd & Crescent St, Chinderah

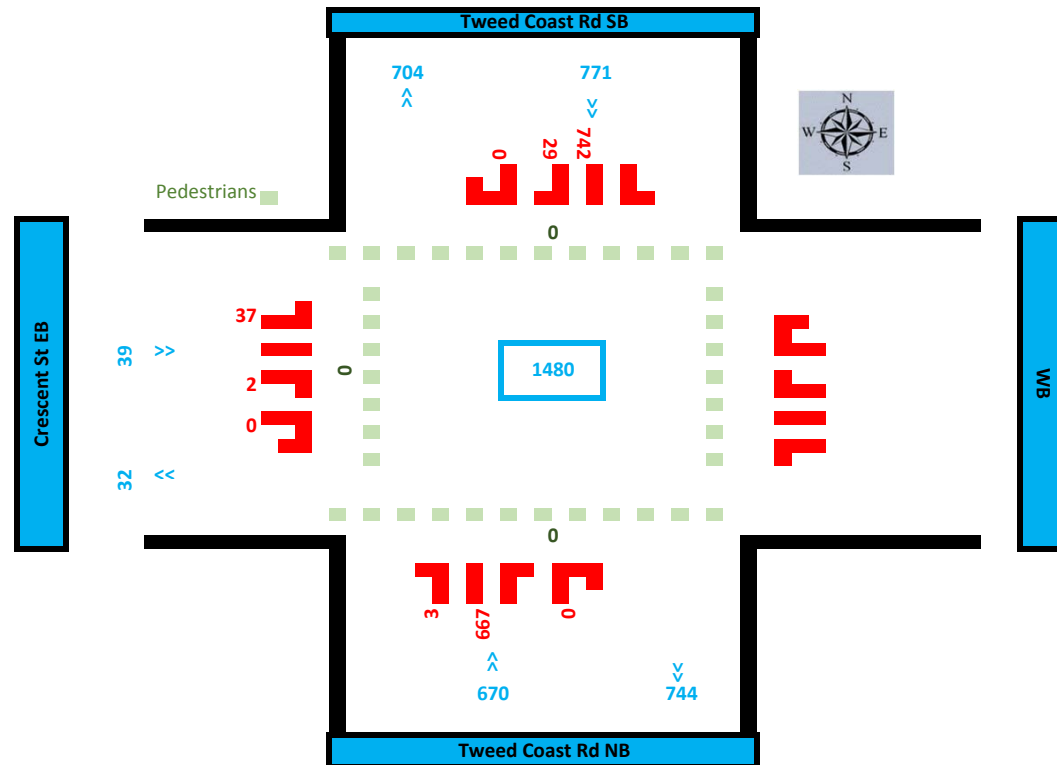
Date: 15-Dec-2016

Surveyed Time: 3:00 PM to 6:00 PM

Weather: Fine

Data for hour starting: 3:00 PM to 4:00 PM

Vehicle Class: ALL VEHICLES



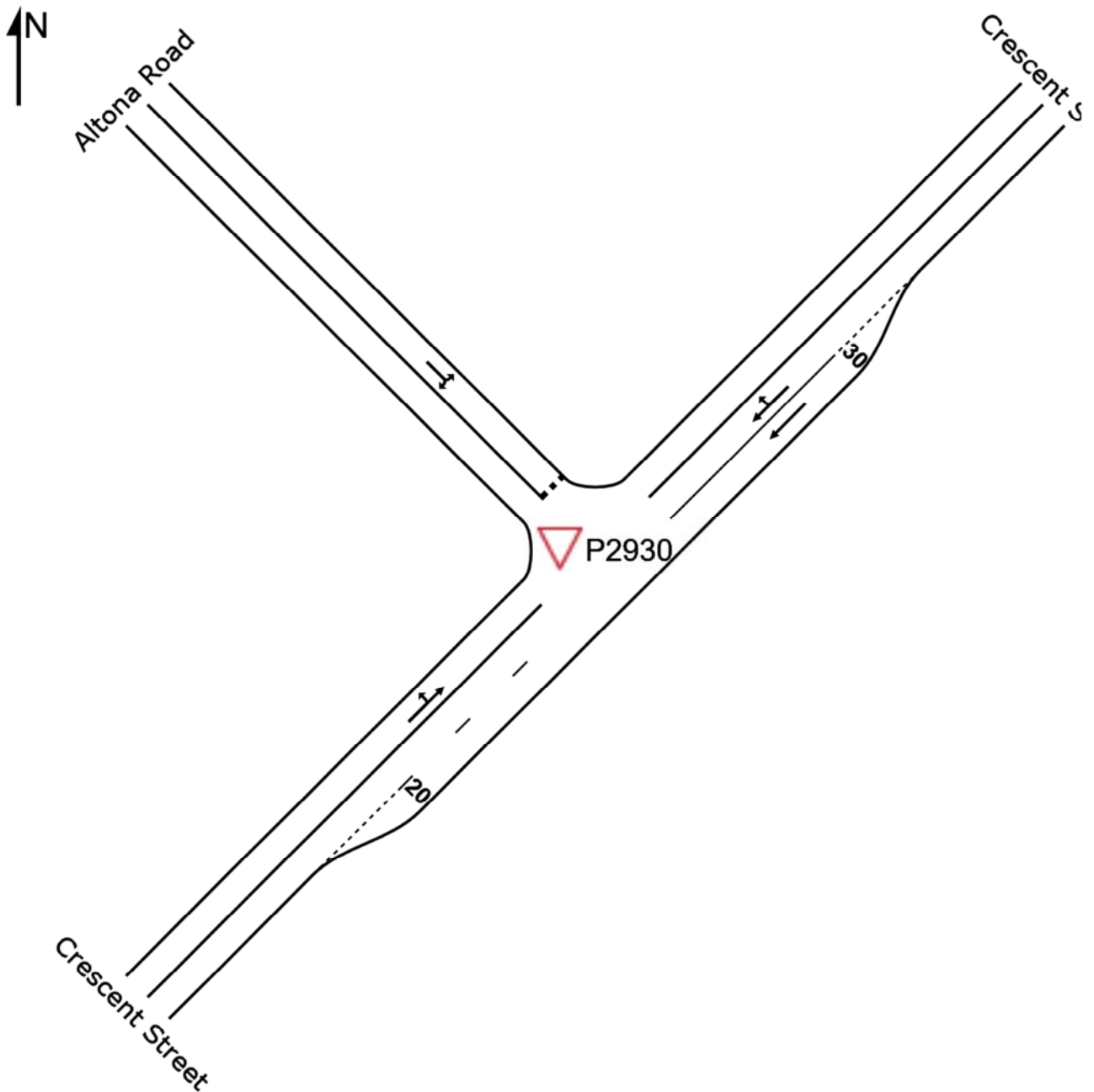
APPENDIX B

SIDRA ANALYSIS OUTPUTS

SITE LAYOUT

▽ Site: P2930 [2017 AM Base]

Crescent Street / Altona Road Intersection
Giveaway / Yield (Two-Way)



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Organisation: BITZIOS CONSULTING | Created: Thursday, 5 January 2017 2:24:03 PM

Project: P:\P2930 Tweed Sand Quarry TIA\Technical Work\Models\P2930.001 Crescent Street_Altona Road_Model.sip7

MOVEMENT SUMMARY

▽ Site: P2930 [2017 AM Base]

Crescent Street / Altona Road Intersection
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: Crescent Street											
25	T1	35	6.0	0.027	3.2	LOS A	0.1	0.8	0.09	0.53	69.2
26	R2	18	30.0	0.027	6.3	LOS A	0.1	0.8	0.12	0.74	41.0
Approach		53	14.2	0.027	4.3	NA	0.1	0.8	0.10	0.60	56.1
NorthWest: Altona Road											
27	L2	24	50.0	0.021	3.9	LOS A	0.1	0.8	0.15	0.43	37.6
29	R2	2	0.0	0.021	4.2	LOS A	0.1	0.8	0.15	0.43	38.1
Approach		26	46.0	0.021	3.9	LOS A	0.1	0.8	0.15	0.43	37.7
SouthWest: Crescent Street											
30	L2	3	0.0	0.029	6.8	LOS A	0.0	0.0	0.00	0.04	72.2
31	T1	51	6.0	0.029	0.0	LOS A	0.0	0.0	0.00	0.04	76.6
Approach		54	5.6	0.029	0.4	NA	0.0	0.0	0.00	0.04	76.3
All Vehicles		133	17.0	0.029	2.6	NA	0.1	0.8	0.07	0.34	56.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Organisation: BITZIOS CONSULTING | Processed: Tuesday, 24 January 2017 2:55:48 PM

Project: P:\P2930 Tweed Sand Quarry TIA\Technical Work\Models\P2930.003 Crescent Street_Altona Road_Model.sip7

MOVEMENT SUMMARY

▽ Site: P2930 [2017 AM Design]

Crescent Street / Altona Road Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: Crescent Street											
25	T1	35	6.0	0.035	3.8	LOS A	0.2	1.3	0.09	0.52	67.7
26	R2	32	30.0	0.035	5.8	LOS A	0.2	1.3	0.14	0.83	39.6
Approach		66	17.4	0.035	4.7	NA	0.2	1.3	0.12	0.67	50.6
NorthWest: Altona Road											
27	L2	37	50.0	0.032	3.9	LOS A	0.1	1.2	0.15	0.43	37.6
29	R2	2	0.0	0.032	4.3	LOS A	0.1	1.2	0.15	0.43	38.1
Approach		39	47.3	0.032	3.9	LOS A	0.1	1.2	0.15	0.43	37.7
SouthWest: Crescent Street											
30	L2	3	0.0	0.029	6.8	LOS A	0.0	0.0	0.00	0.04	72.2
31	T1	51	6.0	0.029	0.0	LOS A	0.0	0.0	0.00	0.04	76.6
Approach		54	5.6	0.029	0.4	NA	0.0	0.0	0.00	0.04	76.3
All Vehicles		159	20.8	0.035	3.1	NA	0.2	1.3	0.08	0.40	52.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Organisation: BITZIOS CONSULTING | Processed: Tuesday, 24 January 2017 2:55:51 PM

Project: P:\P2930 Tweed Sand Quarry TIA\Technical Work\Models\P2930.003 Crescent Street_Altona Road_Model.sip7

MOVEMENT SUMMARY

▽ Site: P2930 [2017 PM Base]

Crescent Street / Altona Road Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: Crescent Street											
25	T1	24	9.0	0.017	2.5	LOS A	0.1	0.5	0.06	0.46	72.2
26	R2	7	70.0	0.017	7.3	LOS A	0.1	0.5	0.09	0.62	42.3
Approach		32	23.2	0.017	3.6	NA	0.1	0.5	0.07	0.50	62.0
NorthWest: Altona Road											
27	L2	7	70.0	0.007	4.0	LOS A	0.0	0.3	0.13	0.43	37.6
29	R2	1	0.0	0.007	4.0	LOS A	0.0	0.3	0.13	0.43	38.1
Approach		8	61.3	0.007	4.0	LOS A	0.0	0.3	0.13	0.43	37.7
SouthWest: Crescent Street											
30	L2	1	0.0	0.021	6.9	LOS A	0.0	0.0	0.00	0.02	73.4
31	T1	36	12.0	0.021	0.0	LOS A	0.0	0.0	0.00	0.02	78.3
Approach		37	11.7	0.021	0.2	NA	0.0	0.0	0.00	0.02	78.1
All Vehicles		77	21.8	0.021	2.0	NA	0.1	0.5	0.04	0.26	63.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

▽ Site: P2930 [2017 PM Design]

Crescent Street / Altona Road Intersection
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: Crescent Street											
25	T1	24	9.0	0.022	3.6	LOS A	0.1	0.9	0.08	0.54	69.3
26	R2	15	70.0	0.022	6.6	LOS A	0.1	0.9	0.12	0.82	40.4
Approach		39	32.1	0.022	4.8	NA	0.1	0.9	0.09	0.65	54.6
NorthWest: Altona Road											
27	L2	26	70.0	0.024	4.0	LOS A	0.1	1.0	0.13	0.42	37.6
29	R2	1	0.0	0.024	4.0	LOS A	0.1	1.0	0.13	0.42	38.1
Approach		27	67.3	0.024	4.0	LOS A	0.1	1.0	0.13	0.42	37.6
SouthWest: Crescent Street											
30	L2	1	0.0	0.021	6.9	LOS A	0.0	0.0	0.00	0.02	73.4
31	T1	36	12.0	0.021	0.0	LOS A	0.0	0.0	0.00	0.02	78.3
Approach		37	11.7	0.021	0.2	NA	0.0	0.0	0.00	0.02	78.1
All Vehicles		103	34.1	0.024	2.9	NA	0.1	1.0	0.07	0.36	53.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

▽ Site: P2930 [2027 AM Base]

Crescent Street / Altona Road Intersection
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: Crescent Street											
25	T1	46	6.0	0.036	3.2	LOS A	0.1	1.1	0.10	0.51	69.2
26	R2	23	30.0	0.036	6.4	LOS A	0.1	1.1	0.14	0.72	41.1
Approach		69	14.0	0.036	4.3	NA	0.1	1.1	0.12	0.58	56.3
NorthWest: Altona Road											
27	L2	31	50.0	0.028	4.0	LOS A	0.1	1.1	0.18	0.44	37.5
29	R2	3	0.0	0.028	4.4	LOS A	0.1	1.1	0.18	0.44	38.0
Approach		34	45.3	0.028	4.0	LOS A	0.1	1.1	0.18	0.44	37.6
SouthWest: Crescent Street											
30	L2	4	0.0	0.039	6.8	LOS A	0.0	0.0	0.00	0.04	72.2
31	T1	68	6.0	0.039	0.0	LOS A	0.0	0.0	0.00	0.04	76.7
Approach		73	5.7	0.039	0.4	NA	0.0	0.0	0.00	0.04	76.3
All Vehicles		176	16.6	0.039	2.6	NA	0.1	1.1	0.08	0.33	57.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

▽ Site: P2930 [2027 AM Design]

Crescent Street / Altona Road Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: Crescent Street											
25	T1	46	6.0	0.044	3.8	LOS A	0.2	1.6	0.11	0.52	67.9
26	R2	37	30.0	0.044	6.0	LOS A	0.2	1.6	0.17	0.80	39.9
Approach		83	16.6	0.044	4.7	NA	0.2	1.6	0.14	0.64	51.8
NorthWest: Altona Road											
27	L2	43	50.0	0.039	4.0	LOS A	0.2	1.5	0.18	0.44	37.6
29	R2	3	0.0	0.039	4.5	LOS A	0.2	1.5	0.18	0.44	38.0
Approach		46	46.6	0.039	4.0	LOS A	0.2	1.5	0.18	0.44	37.6
SouthWest: Crescent Street											
30	L2	4	0.0	0.039	6.8	LOS A	0.0	0.0	0.00	0.04	72.2
31	T1	68	6.0	0.039	0.0	LOS A	0.0	0.0	0.00	0.04	76.7
Approach		73	5.7	0.039	0.4	NA	0.0	0.0	0.00	0.04	76.3
All Vehicles		202	19.6	0.044	3.0	NA	0.2	1.6	0.10	0.38	53.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

▽ Site: P2930 [2027 PM Base]

Crescent Street / Altona Road Intersection
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: Crescent Street											
25	T1	32	9.0	0.022	2.5	LOS A	0.1	0.6	0.08	0.45	72.2
26	R2	9	70.0	0.022	7.4	LOS A	0.1	0.6	0.10	0.61	42.3
Approach		41	23.1	0.022	3.7	NA	0.1	0.6	0.08	0.49	62.1
NorthWest: Altona Road											
27	L2	7	70.0	0.007	4.1	LOS A	0.0	0.3	0.15	0.43	37.5
29	R2	1	0.0	0.007	4.1	LOS A	0.0	0.3	0.15	0.43	38.1
Approach		8	61.3	0.007	4.1	LOS A	0.0	0.3	0.15	0.43	37.6
SouthWest: Crescent Street											
30	L2	1	0.0	0.028	6.9	LOS A	0.0	0.0	0.00	0.01	73.7
31	T1	48	12.0	0.028	0.0	LOS A	0.0	0.0	0.00	0.01	78.7
Approach		49	11.7	0.028	0.1	NA	0.0	0.0	0.00	0.01	78.6
All Vehicles		99	20.7	0.028	1.9	NA	0.1	0.6	0.05	0.25	65.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

▽ Site: P2930 [2027 PM Design]

Crescent Street / Altona Road Intersection
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: Crescent Street											
25	T1	32	9.0	0.028	3.5	LOS A	0.1	1.1	0.09	0.53	69.7
26	R2	17	70.0	0.028	6.9	LOS A	0.1	1.1	0.14	0.78	40.8
Approach		48	30.2	0.028	4.7	NA	0.1	1.1	0.11	0.61	55.9
NorthWest: Altona Road											
27	L2	26	70.0	0.024	4.1	LOS A	0.1	1.1	0.15	0.43	37.5
29	R2	1	0.0	0.024	4.2	LOS A	0.1	1.1	0.15	0.43	38.1
Approach		27	67.3	0.024	4.1	LOS A	0.1	1.1	0.15	0.43	37.6
SouthWest: Crescent Street											
30	L2	1	0.0	0.028	6.9	LOS A	0.0	0.0	0.00	0.01	73.7
31	T1	48	12.0	0.028	0.0	LOS A	0.0	0.0	0.00	0.01	78.7
Approach		49	11.7	0.028	0.1	NA	0.0	0.0	0.00	0.01	78.6
All Vehicles		125	31.0	0.028	2.7	NA	0.1	1.1	0.07	0.34	56.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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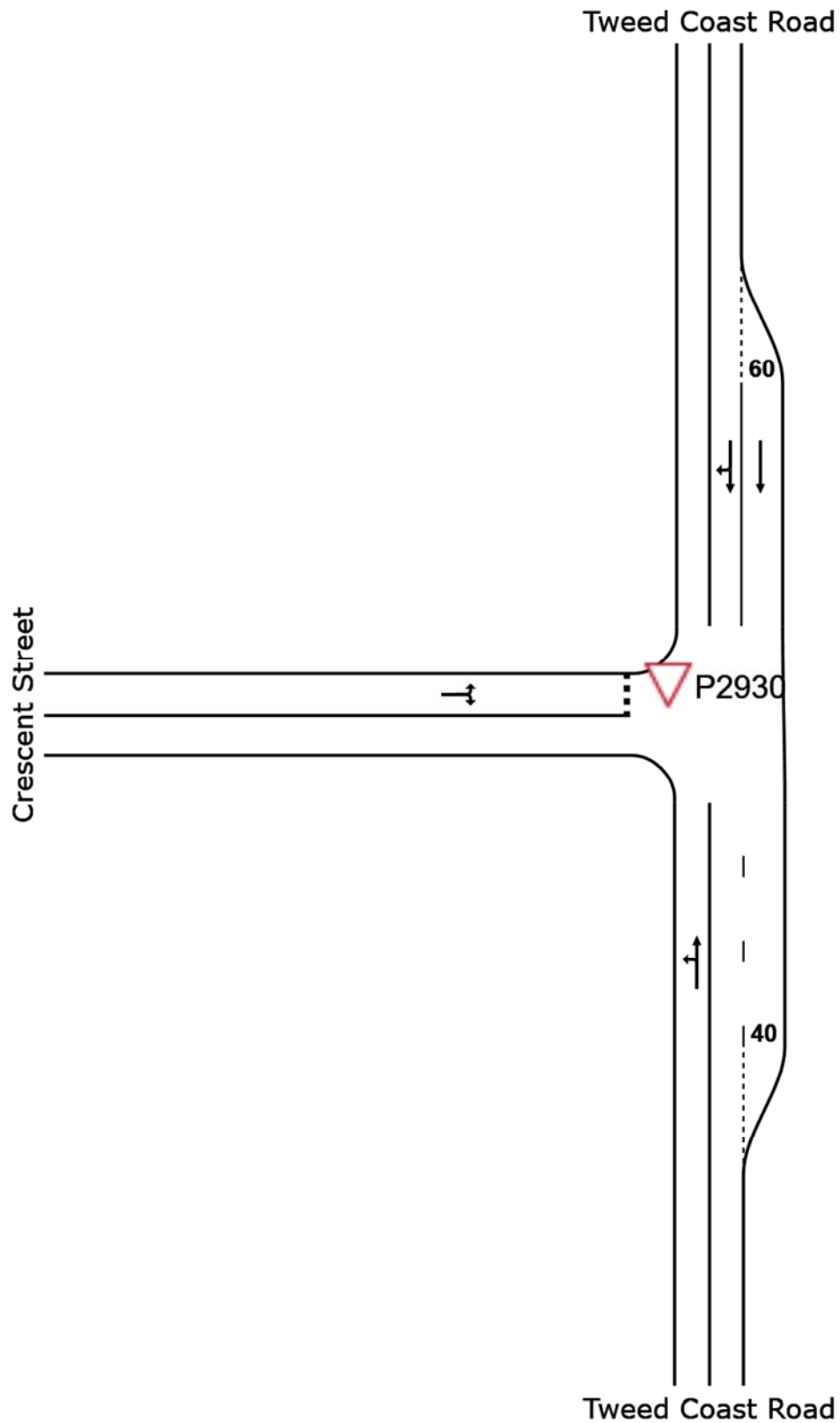
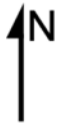
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SITE LAYOUT

▽ Site: P2930 [2017 AM Base]

Tweed Coast Road / Crescent Street Intersection
Giveway / Yield (Two-Way)



MOVEMENT SUMMARY

▽ Site: P2930 [2017 AM Base]

Tweed Coast Road / Crescent Street Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Tweed Coast Road											
1	L2	4	25.0	0.483	5.9	LOS A	0.0	0.0	0.00	0.00	57.0
2	T1	918	3.0	0.483	0.1	LOS A	0.0	0.0	0.00	0.00	59.8
Approach		922	3.1	0.483	0.1	NA	0.0	0.0	0.00	0.00	59.8
North: Tweed Coast Road											
8	T1	635	13.0	0.356	1.8	LOS A	1.7	13.5	0.23	0.06	57.4
9	R2	49	5.0	0.356	15.3	LOS C	1.7	13.5	0.31	0.08	54.3
Approach		684	12.4	0.356	2.8	NA	1.7	13.5	0.23	0.06	57.1
West: Crescent Street											
10	L2	69	20.0	0.184	14.0	LOS B	0.6	5.1	0.77	0.91	46.8
12	R2	1	0.0	0.184	54.8	LOS F	0.6	5.1	0.77	0.91	47.1
Approach		71	19.7	0.184	14.6	LOS B	0.6	5.1	0.77	0.91	46.8
All Vehicles		1677	7.6	0.483	1.8	NA	1.7	13.5	0.13	0.06	58.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

▽ Site: P2930 [2017 AM Design]

Tweed Coast Road / Crescent Street Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Tweed Coast Road											
1	L2	4	25.0	0.483	5.9	LOS A	0.0	0.0	0.00	0.00	57.0
2	T1	918	3.0	0.483	0.1	LOS A	0.0	0.0	0.00	0.00	59.8
Approach		922	3.1	0.483	0.1	NA	0.0	0.0	0.00	0.00	59.8
North: Tweed Coast Road											
8	T1	635	13.0	0.377	2.3	LOS A	2.2	17.1	0.27	0.07	56.8
9	R2	63	5.0	0.377	15.5	LOS C	2.2	17.1	0.39	0.10	53.5
Approach		698	12.3	0.377	3.5	NA	2.2	17.1	0.28	0.08	56.5
West: Crescent Street											
10	L2	88	20.0	0.231	14.6	LOS B	0.8	6.8	0.78	0.93	46.5
12	R2	1	0.0	0.231	57.4	LOS F	0.8	6.8	0.78	0.93	46.9
Approach		89	19.8	0.231	15.1	LOS C	0.8	6.8	0.78	0.93	46.5
All Vehicles		1709	7.7	0.483	2.3	NA	2.2	17.1	0.16	0.08	57.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

▽ Site: P2930 [2017 PM Base]

Tweed Coast Road / Crescent Street Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Tweed Coast Road											
1	L2	3	0.0	0.382	5.6	LOS A	0.0	0.0	0.00	0.00	58.3
2	T1	723	4.0	0.382	0.1	LOS A	0.0	0.0	0.00	0.00	59.9
Approach		726	4.0	0.382	0.1	NA	0.0	0.0	0.00	0.00	59.9
North: Tweed Coast Road											
8	T1	804	24.0	0.412	0.6	LOS A	0.9	7.2	0.10	0.03	59.0
9	R2	32	4.0	0.412	12.3	LOS B	0.9	7.2	0.13	0.04	56.4
Approach		836	23.2	0.412	1.0	NA	0.9	7.2	0.10	0.03	58.9
West: Crescent Street											
10	L2	40	24.0	0.093	10.7	LOS B	0.3	2.6	0.68	0.86	48.0
12	R2	2	0.0	0.093	47.0	LOS E	0.3	2.6	0.68	0.86	48.5
Approach		42	22.8	0.093	12.5	LOS B	0.3	2.6	0.68	0.86	48.0
All Vehicles		1604	14.5	0.412	0.9	NA	0.9	7.2	0.07	0.04	59.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

▽ Site: P2930 [2017 PM Design]

Tweed Coast Road / Crescent Street Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Tweed Coast Road											
1	L2	3	0.0	0.382	5.6	LOS A	0.0	0.0	0.00	0.00	58.3
2	T1	723	4.0	0.382	0.1	LOS A	0.0	0.0	0.00	0.00	59.9
Approach		726	4.0	0.382	0.1	NA	0.0	0.0	0.00	0.00	59.9
North: Tweed Coast Road											
8	T1	804	24.0	0.419	0.7	LOS A	1.1	8.9	0.12	0.03	58.8
9	R2	39	4.0	0.419	12.3	LOS B	1.1	8.9	0.16	0.04	56.1
Approach		843	23.1	0.419	1.2	NA	1.1	8.9	0.12	0.03	58.6
West: Crescent Street											
10	L2	53	24.0	0.116	10.8	LOS B	0.4	3.3	0.67	0.86	48.1
12	R2	2	0.0	0.116	48.2	LOS E	0.4	3.3	0.67	0.86	48.7
Approach		55	23.1	0.116	12.3	LOS B	0.4	3.3	0.67	0.86	48.2
All Vehicles		1624	14.5	0.419	1.1	NA	1.1	8.9	0.09	0.05	58.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: P:\P2930 Tweed Sand Quarry TIA\Technical Work\Models\P2930.003 Tweed Coast Road_Crescent Street_Model.sip7

MOVEMENT SUMMARY

▽ Site: P2930 [2027 AM Base]

Tweed Coast Road / Crescent Street Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Tweed Coast Road											
1	L2	6	25.0	0.649	6.0	LOS A	0.0	0.0	0.00	0.00	56.9
2	T1	1234	3.0	0.649	0.2	LOS A	0.0	0.0	0.00	0.00	59.7
Approach		1240	3.1	0.649	0.2	NA	0.0	0.0	0.00	0.00	59.7
North: Tweed Coast Road											
8	T1	853	13.0	0.607	8.8	LOS A	11.3	87.1	0.65	0.08	51.3
9	R2	65	5.0	0.607	35.0	LOS E	11.3	87.1	1.00	0.13	46.0
Approach		918	12.4	0.607	10.7	NA	11.3	87.1	0.67	0.09	50.9
West: Crescent Street											
10	L2	91	20.0	0.612	41.6	LOS E	2.3	18.4	0.96	1.09	34.0
12	R2	1	0.0	0.612	263.1	LOS F	2.3	18.4	0.96	1.09	34.1
Approach		92	19.8	0.612	44.2	LOS E	2.3	18.4	0.96	1.09	34.0
All Vehicles		2249	7.6	0.649	6.2	NA	11.3	87.1	0.31	0.08	54.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: P:\P2930 Tweed Sand Quarry TIA\Technical Work\Models\P2930.003 Tweed Coast Road_Crescent Street_Model.sip7

MOVEMENT SUMMARY

▽ Site: P2930 [2027 AM Design]

Tweed Coast Road / Crescent Street Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Tweed Coast Road											
1	L2	6	25.0	0.649	6.0	LOS A	0.0	0.0	0.00	0.00	56.9
2	T1	1234	3.0	0.649	0.2	LOS A	0.0	0.0	0.00	0.00	59.7
Approach		1240	3.1	0.649	0.2	NA	0.0	0.0	0.00	0.00	59.7
North: Tweed Coast Road											
8	T1	853	13.0	0.655	10.3	LOS B	11.8	90.9	0.62	0.10	50.2
9	R2	79	5.0	0.655	35.9	LOS E	11.8	90.9	1.00	0.16	44.2
Approach		932	12.3	0.655	12.4	NA	11.8	90.9	0.65	0.11	49.6
West: Crescent Street											
10	L2	109	20.0	0.727	49.4	LOS E	3.0	24.5	0.97	1.16	31.8
12	R2	1	0.0	0.727	280.9	LOS F	3.0	24.5	0.97	1.16	31.9
Approach		111	19.8	0.727	51.6	LOS F	3.0	24.5	0.97	1.16	31.8
All Vehicles		2282	7.7	0.727	7.7	NA	11.8	90.9	0.31	0.10	53.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: P:\P2930 Tweed Sand Quarry TIA\Technical Work\Models\P2930.003 Tweed Coast Road_Crescent Street_Model.sip7

MOVEMENT SUMMARY

▽ Site: P2930 [2027 PM Base]

Tweed Coast Road / Crescent Street Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Tweed Coast Road											
1	L2	4	0.0	0.513	5.6	LOS A	0.0	0.0	0.00	0.00	58.2
2	T1	972	4.0	0.513	0.1	LOS A	0.0	0.0	0.00	0.00	59.8
Approach		976	4.0	0.513	0.1	NA	0.0	0.0	0.00	0.00	59.8
North: Tweed Coast Road											
8	T1	1081	24.0	0.579	1.8	LOS A	2.6	22.0	0.19	0.03	57.6
9	R2	41	4.0	0.579	22.3	LOS C	2.6	22.0	0.25	0.04	54.6
Approach		1122	23.3	0.579	2.6	NA	2.6	22.0	0.19	0.03	57.4
West: Crescent Street											
10	L2	53	24.0	0.307	18.9	LOS C	1.0	8.2	0.88	0.99	39.9
12	R2	3	0.0	0.307	178.7	LOS F	1.0	8.2	0.88	0.99	40.2
Approach		56	22.6	0.307	28.0	LOS D	1.0	8.2	0.88	0.99	39.9
All Vehicles		2154	14.5	0.579	2.1	NA	2.6	22.0	0.12	0.04	57.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: P:\P2930 Tweed Sand Quarry TIA\Technical Work\Models\P2930.003 Tweed Coast Road_Crescent Street_Model.sip7

MOVEMENT SUMMARY

▽ Site: P2930 [2027 PM Design]

Tweed Coast Road / Crescent Street Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Tweed Coast Road											
1	L2	4	0.0	0.513	5.6	LOS A	0.0	0.0	0.00	0.00	58.2
2	T1	972	4.0	0.513	0.1	LOS A	0.0	0.0	0.00	0.00	59.8
Approach		976	4.0	0.513	0.1	NA	0.0	0.0	0.00	0.00	59.8
North: Tweed Coast Road											
8	T1	1081	24.0	0.591	2.1	LOS A	3.1	25.9	0.22	0.04	57.2
9	R2	48	4.0	0.591	22.4	LOS C	3.1	25.9	0.29	0.05	54.2
Approach		1129	23.1	0.591	3.0	NA	3.1	25.9	0.22	0.04	57.0
West: Crescent Street											
10	L2	65	24.0	0.347	19.5	LOS C	1.2	9.7	0.88	1.00	40.3
12	R2	3	0.0	0.347	184.2	LOS F	1.2	9.7	0.88	1.00	40.6
Approach		68	22.9	0.347	27.1	LOS D	1.2	9.7	0.88	1.00	40.3
All Vehicles		2174	14.5	0.591	2.5	NA	3.1	25.9	0.14	0.05	57.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

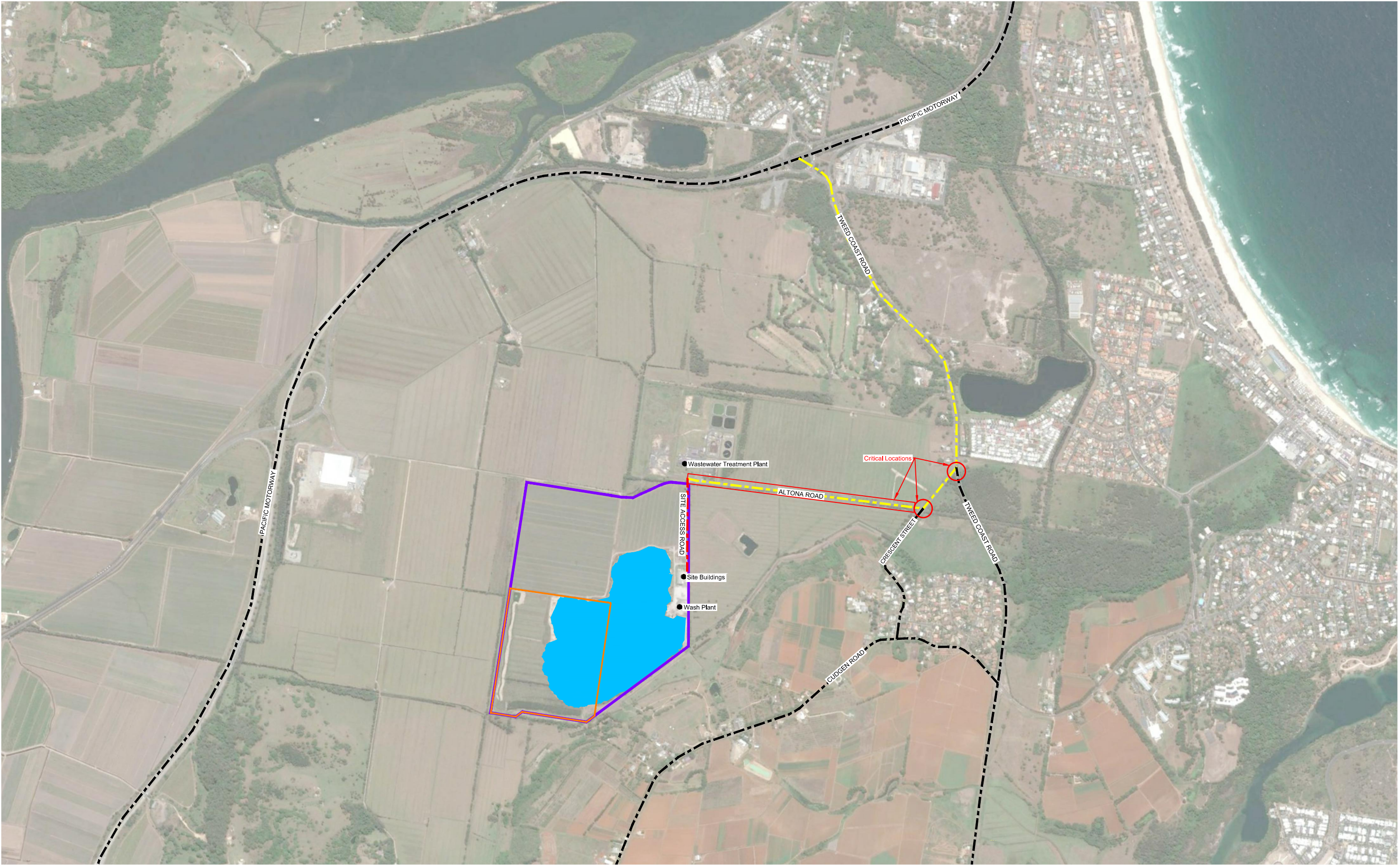
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Project: P:\P2930 Tweed Sand Quarry TIA\Technical Work\Models\P2930.003 Tweed Coast Road_Crescent Street_Model.sip7

Attachment 3 – HCM Driver Code of Conduct, and TSQ primary haul route



ORIENTATION

SCALE 1:16 000

200 400 600 800 metres

ROBINA

PO Box 4115 Robina QLD4230
Email robina@access.gs

07 5578 9944
www.access.gs

LEGEND

- Site Boundary
- Current Dredge Lake
- Phase 4 Development Area
- Local Road Network
- Primary Houte Route
- Site Access Road (part of primary haul route)
- Critical Locations

SOURCES

Image: Google Earth Pro 2016, Image dated 25/9/2016.

PROJECT

TWEED SAND
QUARRY -
EXTRACTION LIMIT
INCREASE EA

CLIENT

HANSON
CONSTRUCTION
MATERIALS

DRAWING

ROAD NETWORK, PRIMARY
HAUL ROUTE & CRITICAL
LOCATIONS

SCALE	DATE	DRAWN	CHECKED	PROJECT	DRAWING	REVISION
1:16 000@A3	25/08/2017	AJS	GRC	11792	11792_DA_P4_003	

**+GILBERT
SUTHERLAND**

Tweed Sand Driver's Code

Hanson Construction Materials Pty Ltd operates a sand quarry at Altona Road, Cudgen. The quarry is located close to residential areas and supplies sand to the Brisbane and Gold Coast areas.

All trucks must observe a 40km/h speed limit along Altona Rd. No trucks are allowed to travel South up Crescent St. Courteous driving, and limiting the use of exhaust brakes will assist in maintaining a good relationship with the local community.

All heavy vehicle drivers are required to be responsible and professional, and drive in accordance with this Driver's Code.

Hanson will enforce this code and follow up on any complaints. Breaches or blatant disregard to the code may lead to prohibition from entry to the quarry site.

Hanson Driver's Code is required to be understood and completed by all drivers. The signed confirmation will be held at the quarry.

Tweed Sand Requirements:

- All drivers must obey all signs, directions and instructions, & give way to all quarry vehicles.
- No soil, dirt or other materials are permitted to be brought onto the site without the Manager's prior approval. All trucks must be free of any build-up of soil or dirt before entering the site.
- Upon entry to the site communicate with the weighbridge operator and loader driver on **UHF channel 19** before entering the stockpile area.
- Maximum speed limits:

Altona Road	40km/hr
Quarry Site	40km/hr
- Steel capped boots and high visibility vest/clothing must be worn at all times inside the quarry boundaries. Hard hats must be worn if exiting the truck cab in the stockpile area.
- You must remain in the cab while loading, unless instructed by the loader driver.
- All quarry mobile equipment have right of way at all times.
- **No children are permitted on site**, this includes in truck cabs. Trucks carrying children will be turned around and not loaded.
- All loads are to be tarped prior to leaving the quarry. The tarp must cover the whole body, without air gaps.

Please detach and retain at plant



Hanson Construction Materials Pty Ltd

Tweed Sand Driver's Code

Confirmation of Understanding of the Code

I, (print) _____
have read/had the Driver's Code explained to me and understand the requirements of the code. I confirm I will comply with the requirements of the Driver's Code.

Signed: _____

Date: _____

Endorsed By: _____
(Hanson Representative)

- All drivers are to ensure their load is legal, secure and side bars, draw bar and tailgate are clear of material.
- No truck will be permitted to leave the site if it is over the legal GVM for that vehicle.
- All litter must be placed in the bins provided on site, including cigarette butts.
- All drivers are required to drive in a safe and courteous manner.
- All vehicles entering the site must be fully roadworthy and maintained. Hanson may inspect any vehicle, or request maintenance records for any vehicle. Hanson reserves the right to prohibit any vehicle from the site if we believe it may not be roadworthy or safe to operate.
- No maintenance or repairs to be performed on trucks within the quarry without the Quarry Manager's approval.
- Hanson has a Drug and Alcohol Policy which includes random testing.
- Any accidents, incidents, complaints, hazards, spillages or near misses must be reported to the Quarry Manager immediately. This includes on the haul routes outside of the site (public roads).
- All Trucks must STOP at the corner of Altona Rd and Crescent St after exiting the quarry, & obey traffic rules at all times.
- The quarry operating hours for sales are 6.30am to 4.30pm Monday to Friday, and 6.30am to 12.00am Saturday.



Hanson Construction Materials Pty Ltd

Tweed Sand



Driver's Code