

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER Shaw's Property Holdings Ltd, 928 Kaipaki Road, RD3, Cambridge
3495, Land Use Consent for a Discretionary Activity for the
establishment and operation of a mineral extraction activity (sand
quarry) under the Waipa District Plan

**STATEMENT OF EVIDENCE OF MARK JOHN APELDOORN ON BEHALF OF THE
SUBMITTERS: AMANDA AND KEITH WALKER**

(TRAFFIC)

23 NOVEMBER 2020

INTRODUCTION

Qualifications and experience

1. My full name is Mark John Apeldoorn. I have the title Practice Leader: Transport Advisory Private Sector at Stantec NZ Ltd with responsibilities generally across the New Zealand and Australian Regions. I have 29 years' experience as a practising traffic and transportation engineer.
2. I hold a Bachelor's degree with honours in Civil Engineering, a postgraduate Certificate of Proficiency in Transportation Planning and a postgraduate Diploma in Business Management, all from the University of Auckland. I am a Chartered Professional Engineer (CPEng) New Zealand and Australia, a Fellow of Engineers New Zealand (FEngNZ), an International Professional Engineer (IntPE), a Member of Engineers Australia (MEA) and a Registered Professional Engineer Queensland (RPEQ).
3. I have worked as a local authority engineer and currently as a traffic engineering consultant. As a consultant, I have been engaged by local authorities and private interests to advise on traffic and roading development issues covering safety, management and planning matters of many kinds.
4. I have also advised extensively on traffic and transportation matters involving plan changes, designations, and resource consents in the Waikato Region and elsewhere. By way of example, these have included a number of resource consent applications for sand and other mineral extraction activities in the Waipa and Waikato districts, acting for the applicant.
5. Stantec has been asked by Amanda and Keith Walker (the Walkers) to describe and assess the traffic safety considerations in relation to the location and form of the proposed access and its potential effects on the local road environment.
6. In preparing my evidence, I have reviewed and considered the relevant traffic and transport parts of the following documents:
 - (a) The Kaipaki Road Sand Quarry Application and AEE;
 - (b) Appendix E: Integrated Traffic Assessment to the AEE;
 - (c) The Walker's submission;

- (d) Council's section 42A officer's report including the Appendix 8 ITA Peer Review by Bloxam Burnett & Olliver;
- (e) The suggested Draft Conditions of Consent; and
- (f) The applicant's evidence in relation to Traffic matters, in particular the evidence of Mr Black.

7. I visited the site for the specific purpose of assessing the potential impact of the proposal on 13 October 2020.

Code of Conduct

8. I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court of New Zealand Practice Note 2014 and that I have complied with it when preparing my evidence. Other than when I state that I am relying on the advice of another person, this evidence is entirely within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Scope of Evidence

9. My evidence is focussed on the local road and site access safety environment. I address the following matters:
- (a) My own independent findings and advice to the Walkers;
 - (b) Waipa District Council objectives and policy;
 - (c) The Council officer's s42A report recommendations;
 - (d) Applicant's evidence; and
 - (e) The suggested draft conditions of consent.

INDEPENDENT ASSESSMENT

10. I prepared independent advice for the Walkers dated 28 October 2020 and based on a peer review of the applicants AEE report including the Appendix E: Integrated Traffic Assessment by Gray Matter. My assessment has been provided to the applicant and is attached as **Appendix A** to this evidence.
11. By way of a summary, I concluded as follows:
- (a) A painted right turn bay design solution is required at the site access;

- (b) With the introduction of a higher volume access to the environment, the local road speed limit should be reviewed to determine whether a reduction from 100km/hr is warranted, as has been the safety approach recently on other sections of Kaipaki Road;
- (c) Further detailed consideration should be given to how a painted right turn bay marking can integrate with and deliver a safely managed overtaking environment to the east (with the horizontal curve) and to the west (for the vertical curve);
- (d) Further detailed consideration as to the length and width of road shoulder areas in relation to acceleration and deceleration movements associated with the proposed access;
- (e) Provision for advance warning advisory signage;
- (f) Further recessing the quarry access gate into the site to avoid potential queue effects on Kaipaki Road;
- (g) Development of the design to demonstrate vehicle tracking is achievable from the proposed turning lane/shoulder provision areas;
- (h) Full separation of the residential access entry waiting area from the quarry access through movements; and
- (i) Establishment of a safe and perpendicular access at its intersection with Kaipaki Road.

12. My Figure 1 shows the location of the following key local road features:

- (a) The proposed site access;
- (b) The Walker's access gate located directly opposite the site access;
- (c) The vertical curve to the west of the proposed site access;
- (d) The horizontal curve on Kaipaki Road to the east of the site access;
- (e) The Walker's residence; and
- (f) In the blue dashed lines, only 700 – 750m of the necessary 900m minimum acceleration distance necessary to bring trucks up to an operating free flow speed on Kaipaki Road.



Figure 1: Key referenced traffic elements (Source: Google Earth)

13. The particular and further findings I have made are:
- (a) The quarry activity is expected to produce on average 318 equivalent car movements (ecms) per day (106 heavy commercial vehicle movements), significantly in excess of the desirable operating (31 - 100 ecms) range for a Diagram E treatment, hence the recommendation for a right turn bay;
 - (b) Sight distances are able to be safely achieved at the indicated site access location;
 - (c) Moving vehicle sight distance in relation to accelerating vehicles departing the site fully laden present with a new and increased safety risk. Departing laden vehicles are expected to require in the order of 900m to 1,200m to reach a free-flow operational speed along Kaipaki Road. This introduces increased uncertainty for following drivers in relation to overtaking decisions on the approach to the vertical curve to the west and the horizontal curve to the east of the site access, indicated in my **Figure 1** earlier. Uncertainty in decision making at higher vehicle speeds and involving high mass vehicles has a significantly increased potential for serious or fatal injury outcomes. Accordingly, design at the site access needs to safely mitigate the potential adverse effects due to the differential speeds of accelerating laden trucks and higher speed free-flowing vehicles both to the west at

the vertical curve and east at the horizontal curve on Kaipaki Road;
and

- (d) The left turn entering vehicle tracking path from Kaipaki Road directly conflicts with a waiting vehicle seeking access to the residential property, resulting in potential queuing effects back into the Kaipaki Road environment.

14. My assessment at **Appendix A** provides further evidential analysis to these conclusions.

WAIPA DISTRICT COUNCIL OBJECTIVES AND POLICY

15. The relevant traffic and transport objectives and policies are included in the s42A officer's report at paragraphs 10.22 to 10.29. Without re-traversing these, it is evident there are particular emphases on the following:

- (a) *"...attention to design, safety and amenity..."* ref: 16.3.2;
- (b) *"...safe and appropriate for all road users..."* ref: 16.3.2.1(b);
- (c) *"...contribute to a safe road environment..."* ref: 16.3.2.3;
- (d) *"...safe and appropriate locations for vehicle entrances..."* ref: 16.3.2.3(a);
- (e) *"...minimise conflict, maintain visibility, and provide for maintenance activities..."* ref: 16.3.2.3(b)
- (f) *"...avoid, remedy or mitigate the adverse effects of development or*
- (g) *subdivision on the operation and maintenance of the transport network..."* ref: 16.3.3.1;
- (h) *"...contribute to both the efficient functioning of the site and the adjacent transport network..."* ref: 16.3.4;
- (i) *"...maintain the safe and efficient functioning of adjoining roads and railways, vehicle entrances..."* ref: 16.3.4.1; and
- (j) *"...maintain the efficient functioning of adjoining roads..."* ref: 16.3.4.2.

16. The principal underlying themes emphasise road safety, efficiency, road operation and maintenance outcomes. The key mechanisms are described as being achieved through avoidance, remedy or mitigation.

17. Based on the assessments I set out at my **Appendix A**, the necessary outcomes do appear achievable in this general location, however the mitigation proposed in the application are assessed to fall short of the required level of design.

S42A REPORT

18. The officer assesses the *Traffic and Road Safety Effects* at paragraphs 9.11 to 9.26 of the report. By way of a response to the application, some reliance is placed on the peer review report prepared by Bloxam Burnett & Olliver (BBO). I make some further recommendation in relation to the suggested draft conditions for traffic matters at paragraphs 9.19 and 9.20, as follows:

Concurrence

19. Overall, my assessments generally concur with the approach described, in particular the requirements for:
- (a) The painted right turn bay approach;
 - (b) A perpendicular access road;
 - (c) Recessing of the quarry access gate;
 - (d) Resolving the residential access conflict;
 - (e) Advanced truck crossing warning signs;
 - (f) Monitoring and reporting; and
 - (g) Independent Safety Audit

Matters Requiring Further Consideration

20. In my assessment, the form of mitigation described is incomplete and does not appear to adequately mitigate the potential adverse effects. The areas of concern I have are:
- (a) Access road passing bays between Kaipaki Road and the site gate;
 - (b) Road safety on Kaipaki Road both east and west of the site access due to the differential speed of accelerating laden truck; and
 - (c) Security of the Walker's access gate opposite the proposed site access on Kaipaki Road.
21. I briefly describe these unresolved matters in my following evidence.

Access Road Passing Bays

- (a) To ensure safe and uninterrupted movement of vehicles away from Kaipaki Road, between the road and the site access gate, I consider it necessary for the access to be formed to safely accommodate independent two-way movement of vehicles. The provision for two lanes of movement (one entry and one exit lane) is also expected to be necessary to safely provide for access to the site gate by operators, where early morning queuing occurs prior to the gate opening. In my assessment, passing bays may be an acceptable arrangement within the site, beyond the gate, if this is preferred by the applicant and can be safely demonstrated.
- (b) Accordingly, it is my assessment that a further condition is necessary to confirm a safe two-way access is established between Kaipaki Road and the site access gate. I have also concluded the draft condition 31.f) in relation to the size and spacing of any passing bays on the proposed access road remains necessary.

Heavy Vehicle Speed Differential in Kaipaki Road East and West of the Site Access¹

- (c) My **Figure 1** (paragraph 12) shows that accelerating laden trucks will require travel in excess of about 500m beyond the vertical curve to the west and the horizontal curve to the east in order to reach a free flow operating speed on Kaipaki Road. The heavy quarry vehicles will be moving at about 40 to 50km/h on the approaches to the sight restricted locations on Kaipaki Road. The speed differential from general traffic, which I have observed and measured to be in the order of 85 to 115km/h on approaches to the site access, combined with the accelerating profile of the quarry vehicles will create an environment of uncertainty and indecision for following motorists. An indecisive driver environment increases the potential for mistakes. In this high speed, and high mass vehicle environment, the potential for injury is increased.
- (d) No overtaking markings are currently in place in advance of the approach to the vertical curve west of the site access point. Only a

¹ Refer also paragraph 12 and 13.c) in this evidence.

white dashed centreline is in place in advance of the horizontal curve east of the site. I have concluded the potentially adversely impacted section of Kaipaki Road extends beyond the immediate site access point to include both of these visibility constrained locations. In my assessment, a comprehensive approach to advanced signage and road markings (both yellow and white) can establish an environment that will be adequately safe. The current point of access mitigation does not achieve an adequately safe local road environment on its own, in my view.

Walker's Access Continuity Opposite the Proposed Site Access

- (e) There is little reference to ensuring continuity of access for the existing gateway servicing the Walker property located directly opposite the proposed quarry access. This access is shown on the following photograph.



Figure 2: Walker site access viewed from the proposed quarry access.

- (f) A concern arises where widening to establish the proposed quarry access extends the carriageway north towards the Walker property. My following photograph shows the significant slope and the depth of the roadside drain in this location.



Figure 3: Roadside drain adjacent to the Walker property, the quarry access is shown on the right.

- (g) Widening the carriageway has the potential to significantly steepen the verge area presenting an increased loss of control risk outcome for motorists. My assessments at Appendix A have identified a recurrence of single vehicle loss of control crashes on the subject section of Kaipaki Road. A natural response to this risk may be to establish a roadside barrier, the effect of which may prevent access to the Walker gateway.
- (h) The evidence of Mr Black² shows all of the proposed widening occurring on the northern (Walker) side of the carriageway. The edge of the existing carriageway is therefore to extend a further 5.0m towards the Walker site boundary. The new edge of seal will be just 1.5m from the Walker site boundary, in effect, directly above the current invert of the drain position. An indicative boundary fence location can be seen within the boundary hedge on my **Figure 3**. Further unresolved consequences of this design approach include:
 - (i) The over-head power poles shown on my **Figure 3** are unable to be relocated while maintaining a minimum safe 2.0m clear zone from the carriageway edge;

² Black evi, Attachment 1: Proposed Right-Turn Bay Concept

- (ii) A metered water supply connection is shown on the Council GIS map system servicing the Walker property (**Figure 4**) and will need to be crossed and secured;

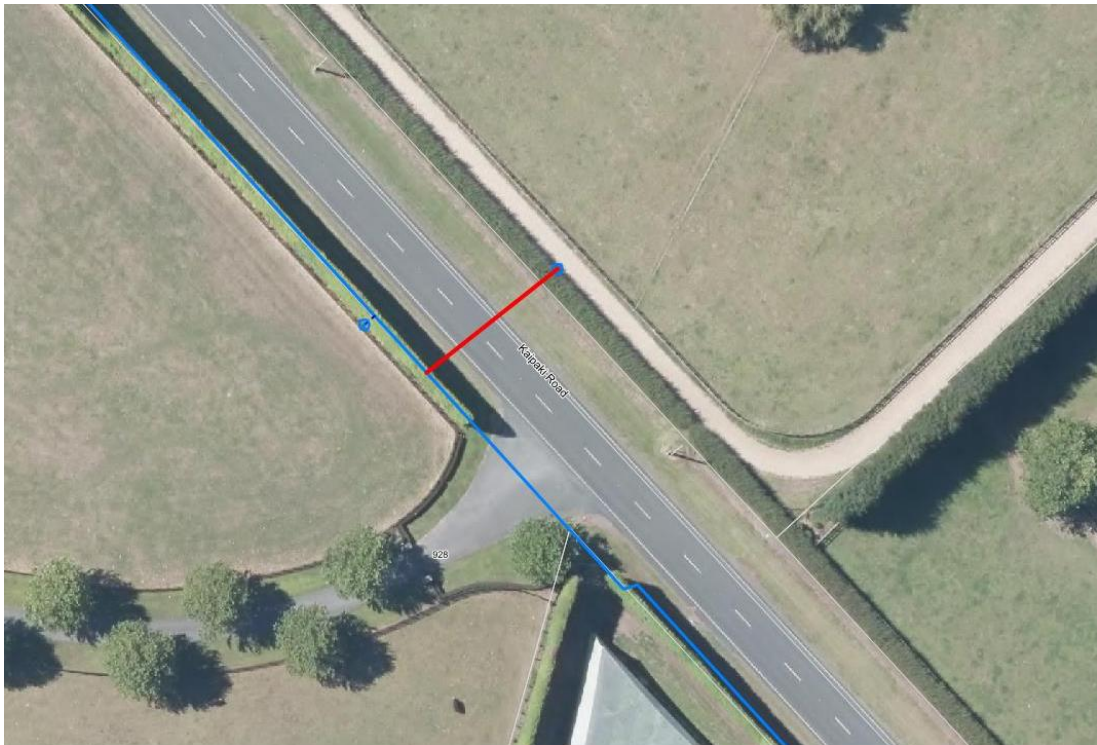


Figure 4: Waipa District Council Water Supply Service (Source: Waipa District Council Utilities GIS Maps Service)

- (iii) Underground utility services are currently unknown as to how these may impact on the proposed design;
- (iv) Continuity of the roadside drainage and its capacity is unknown;
- (v) It's unclear how the Walker's hedge will be able to be maintained if a narrow open drain is to remain between the widened carriageway and the fence;
- (vi) There will be an inadequate width of berm remaining for a vehicle (4.5 to 5.5m long) or a horse (in the order of 2 – 2.5m in length) to be positioned between the gate and the edge of the road shoulder, a dimension in the order of 1.5m; and
- (vii) The new edge of carriageway will be very close to the horse training track which is immediately behind the Walker's hedge, as is shown on my **Figure 5**.



Figure 5: Walker horse training track located immediately inside the boundary fence

- (i) While it is a relatively simple process to demonstrate an ability to design a solution overlaid on an aerial photo, it is evident that a number of matters remain unresolved, some of which may prevent the layout from being delivered in the way indicated in the evidence of Mr Black. If this is the case, the potential effects that may be associated with an alternate configuration have not been assessed.
- (j) Fundamentally, continued safe access needs to be retained and assured to at least an equivalent standard of accessibility, unless otherwise agreed, in respect of the existing gate to the Walker property.

APPLICANT'S EVIDENCE

- 22.** I have read and considered the evidence of Mr Black. I set out and describe in my preceding evidence, the matters of difference. I also set out as follows some further points of inconsistency between Mr Black's evidence and the s42A draft conditions:

- (a) His para 25 seeks consent for peaks of 132HCV/day, whereas draft condition 29 describes 133HCV/day;
- (b) His para 26 describes mitigation of the access queuing effects by setting the gate back 300m. I concur with this setback mitigation will be adequately achieved. The s42A draft condition 31.c) currently specifies 100m. In my assessment, Mr Black's recommended 300m set back will mitigate the potential adverse effects due to queuing;
- (c) Mr Black's para 27 recommends a right turn bay and an upgraded vehicle crossing to allow for two-way vehicle movements. I concur with these recommendations as they relate to the immediate site access and crossing locations. In my assessments, a more comprehensive advanced signage and markings access response is necessary to adequately mitigate the adverse effects of differential truck speeds and the constrained visibility environments both east and west of the access. It is also my assessment that a two-way access is necessary between the Kaipaki Road carriageway and the site access gate;
- (d) At his para's 44 to 48, Mr Black considers and determines active advanced warning signs are not required and that if required, standard reflective signs should be sufficient. In my assessment the approach road environments exhibit some constrained forward visibility and the local road operating environment will change materially with frequent and slow moving/accelerating heavy commercial vehicle effects extending some way beyond the site access point. The local road safety environment, including that extended area beyond the immediate point of access would benefit materially from appropriate advanced warning signage in my opinion;
- (e) Mr Black assesses the relative merits of auxiliary lanes at his paragraphs 73 and 74. I concur, with adoption of the right turn bay access treatment as is now proposed, auxiliary lanes are not necessary;
- (f) At his paragraphs 75 to 77, Mr Black considers the matter of yellow no overtaking lines. It is evident in the adopted painted right turn bay design for the access, that painted yellow no overtaking lines are a

required and integrated part of the design. I concur with Mr Black as to the further generalised application of no-overtaking lines, however it remains my assessment that a wider and integrated design approach is necessary which should include an integrated markings design outcome with the yellow no overtaking lines in advance of the vertical curve west of the site access. Further, consideration is necessary to ensure safe integration with the horizontal curve east of the site access, which may be achieved through consideration of continuous reflectorised white pavement markings and advanced warning signage;

- (g) In his paragraphs 78 to 82, Mr Black considers the potential interaction associated with the residential property access off the quarry access road. It is suggested that an increase in the separation of the access point, to 30m, will address the potential for adverse queue effects on Kaipaki Road. I accept this will substantially address the potential risk effects on Kaipaki Road, however I would note that the potential risk of a rear end collision for vehicles waiting to access the residential driveway could be avoided by creating a safely separated waiting area between the entry and egress quarry traffic lanes;
- (h) In relation to the matter of parking restrictions, I concur, with the enhanced site access Mr Black now proposes, including the right turn bay approach, setting back the gates 300m and sealing the full length between Kaipaki Road and the gates, the potential parking effects are appropriately mitigated;
- (i) At his paragraph 85, Mr Black concurs with the potential road safety benefit and that an appropriate speed limit for the subject section of road is 80km/h. He also describes the Council process necessary for this. I acknowledge his finding that a speed limit cannot be established as a condition of consent, however it is my recommendation the applicant be required by condition to explore the potential, given the nature of the change introduced by the proposed quarry, with Council, to establish a reduced speed limit, and if determined appropriate, be required to implement it.

23. Further to these matters, and as I have described earlier, Mr Black does not appear to address retention and safe continuation of accessibility in respect of the existing Walker access gate located directly opposite the proposed quarry access. In my assessments, I have concluded this is a necessary assurance in that it remains substantially unclear whether this can reasonably be achieved based on the northern side widening approach proposed in the diagram at Attachment 1 of Mr Black's evidence.

DRAFT CONDITIONS

24. Suggested draft consent conditions have been set out at Appendix 6 of the s42A report. I set out amendments to these conditions that would address the matters I have described earlier. Changes are either underlined or ~~strike-through~~.

Suggested Condition 29: Trip Generation

The maximum number of heavy vehicle movements generated by the activity shall not exceed:

- a) Daily maximum of ~~133~~132 HCV movements/day; and
- b) Daily average of 106 HCV movements/day (calculated over a one-month period).

Advice Note: *For the purposes of compliance with this condition truck entering and exiting the site will generate two movements.*

Suggested Condition 31: Entrance and Access Improvements

The consent holder shall submit engineering plans detailing the vehicle crossing and proposed haul road to the Council's Team Leader Development Engineering for approval in a technical certification capacity in advance of any construction works being undertaken. The design should be in general accordance with NZTA Manual of Traffic Signs and Markings, "Rural Right Turn Bay" Figure 3.25 and include:

- a) *Heavy vehicle tracking for the design vehicle;*
- b) *Details for the location and size of the splitter island;*
- c) *Location of the proposed access gate and the extent of two-lane two-way sealed access being no less than ~~400m~~300m from the road reserve boundary;*
- d) *Details of access to the residential dwelling including an entry waiting zone that is separated from the quarry access movement lanes;*

- e) *Details of the proposed sealed access road 6m wide or 3m wide with passing bays at maximum 100m spacings;*
- f) *Size and spacing of any passing bays on the proposed access road;*
- g) *A realigned access road which is at 90 degrees from Kaipaki Road; and*
- h) *Provision of electronic warning signs installed either side of the intersection with flashing yellow lights and an LED message “Caution Trucks Turning” when a truck is detected entering or exiting the site. The detection system shall be designed to be fit for purpose to detect trucks entering the right turn bay, slowing to turn left into the site access, and exiting from the site access.*
- i) *Continued provision of at least an equivalent standard of accessibility, unless otherwise agreed with the land owner, for the existing gate to the property directly opposite the proposed quarry site entrance.*
- j) *Details showing how road markings and advanced warning signage through the vertical curve located about 300m to the west and the horizontal curve about 300m to the east of the site access positively contribute to minimising the potential for overtaking movements in these areas.*
- k) *Evidence of assessment and engagement with Council, and inclusion if enabled, of a reduced speed limit on Kaipaki Road that encompasses the site access area;*

CONCLUSION

25. On the basis of my assessments I concluded:

- (a) Safe site access is not able to be established on Kaipaki Road without provision to mitigation the potential adverse effects arising from the interaction between laden trucks departing the site, free-flowing traffic and the vertical and horizontal curves immediately adjacent to the access environment;
- (b) It is not clear that continued and equivalent accessibility is able to be maintained for the existing access gate to the Walker property directly opposite the proposed site access; and
- (c) An inadequately safe arrangement remains in respect of access to the residential property from the quarry access road.

26. Overall, I consider the access is able to be made safe for quarry movements to and from the site, with inclusion of the recommendations I have made. The ability to assure safe and convenient accessibility in respect of the Walker's gate opposite the proposed quarry access (for either small vehicles and/or horses) based on the full northern side widening approach for the right turn bay that is proposed, remains an unresolved issue in my assessment.



Mark Apeldoorn

23 November 2020

Appendix A: Independent Assessment

28 October 2020

A & K Walker
Kaipaki Road
Kaipaki
Cambridge 3495

STANTEC REF: 310204352

Dear Amanda and Keith

Proposed Sand Quarry – 928 Kaipaki Road, Leamington, Transportation Peer Review

1. Introduction

Stantec has been asked by A & K Walker of 889 Kaipaki Road to provide traffic and safety advice in relation to a notified application for a sand quarry at 928 Kaipaki Road, Leamington.

The Walker property is noted as Property 7 on Figure 1 below, which is reproduced from the Applicant's Assessment of Environmental Effects (AEE). The proposed quarry occupies approximately 49.83 hectares (ha) and is outlined in red on Figure 1.

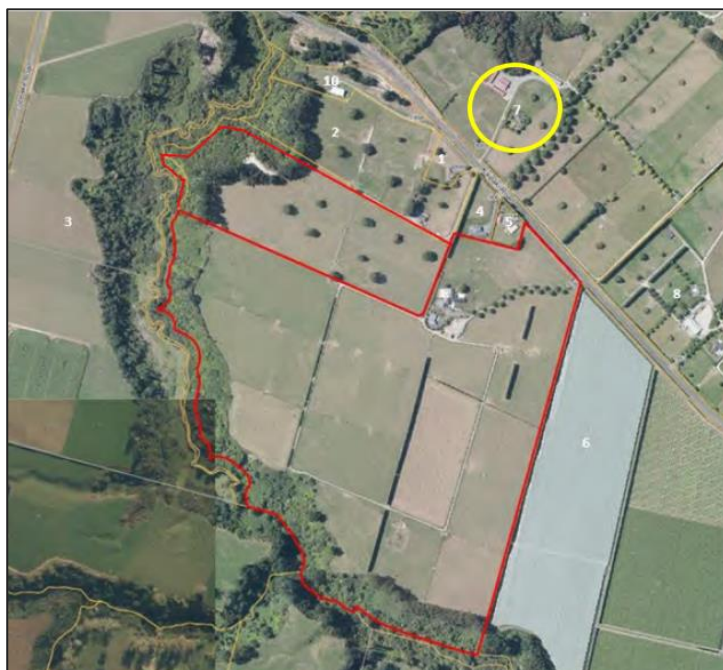


Figure 1 – Site Location and Walker Property (Sourced from Mitchell Daysh AEE, annotation added)

This assessment is based on the publicly available documents that accompanied the application, and a site visit undertaken by Stantec on Tuesday 13 October, 2020.

2. Review of Integrated Transportation Assessment (ITA)

2.1 Overview

The transport effects of the proposal were assessed by Gray Matter Ltd and summarised in a report titled "Proposed Sand Quarry, 928 Kaipaki Road Cambridge, Integrated Transport Assessment, Shaws Property Holdings Ltd" (Issue 3, 21 April 2020).

The existing transport environment and current traffic volumes are accurately described in Sections 2.1 to 2.3 of the ITA. Kaipaki Road is classified by the Waipa District Council Operative District Plan (the ODP) as a Minor Arterial road along the frontage of the site. It changes to Collector Road status at Mellow Road, approximately 3.5km west of the proposed site access.

Kaipaki Road carries a daily volume of approximately 3,200 vehicles per day (vpd) and has a posted speed limit of 100km/h (signed with a speed derestriction sign). This reduces to 80km/h to the west of the site, near Kaipaki School, about 2.5km west of the site.

A cap on daily maximum and daily average Heavy Commercial Vehicle (HCV) movements of 106 average and 133 maximum is proposed in the application.

Stantec has made an assessment of some of the particular aspects traffic and transport of the proposal. Some key findings and conclusions determined from that assessment are summarised as follows.

2.2 Form of Access Treatment

The proposed access treatment for the sand quarry is a 'Diagram E' layout, as shown indicatively below as Figure 2.

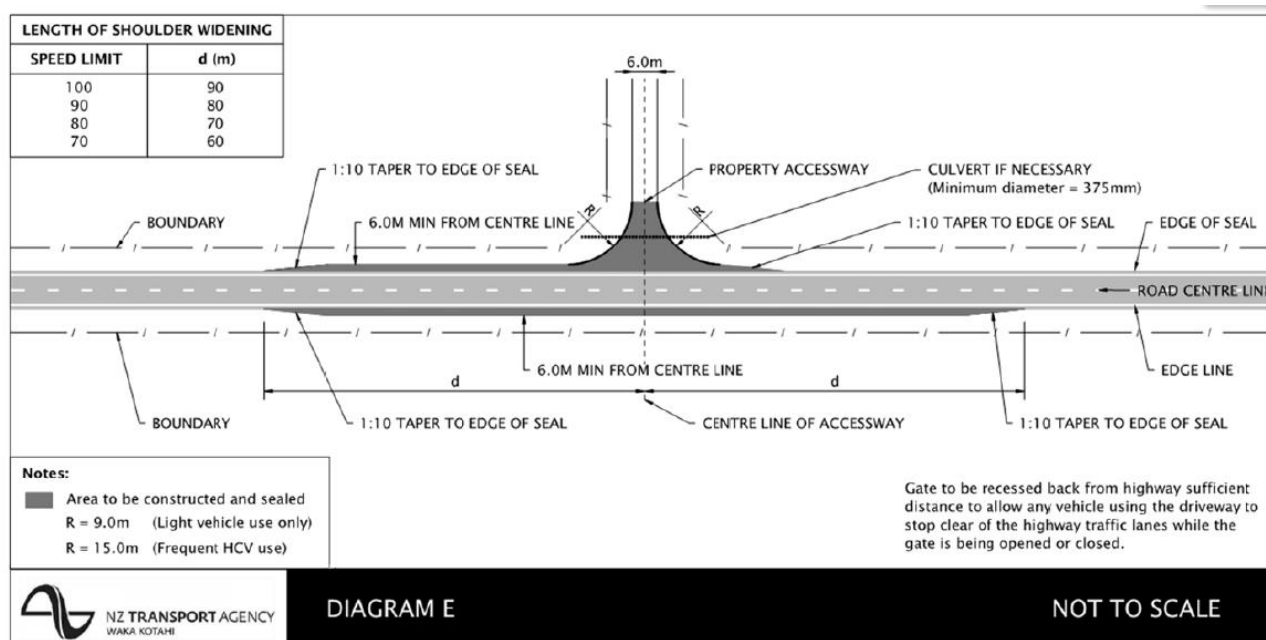


Figure 2 – Diagram E Intersection Treatment

The Waka Kotahi NZ Transport Agency (Waka Kotahi) Planning and Policy Manual describes at Appendix 5B, that a Diagram E access standard is a suitable treatment on accessways operating in the range 31 to 100 equivalent car

movements (ecm) per day. For such accessway demands, the arrangement is applicable on state highway roads in all traffic volume circumstances.

The Appendix 1 Glossary to the Planning Policy Manual defines ecm/day as:

Equivalent car movements per day (ecm/d): Equivalent car movement per day (averaged over a year) is defined as follows:

- 1 car to and from the property = 2 equivalent car movements
- 1 truck to and from property = 6 equivalent car movements
- 1 truck and trailer to and from property = 10 equivalent car movements

A single residential dwelling is deemed to generate 9 equivalent car movements per day (ecm/d). An indication of typical traffic generation levels for a variety of different activities is provided in Appendix 5B.

A simple calculation based on the proposed 106 HCV movements per day average cap indicates an expected 318 equivalent car movements per day. Based on the Planning Policy guidelines, the Diagram E treatment is most suited to accessway demands in the order of up to 100 ecms, a level about one third that anticipated by the proposal.

For accessways where higher utilisation is anticipated, the Planning Policy Manual recommends a more specific assessment. In the circumstances related to the demands expected of the access, it is recommended a more specific access arrangement involving:

- A painted right turn bay with storage and deceleration dimensions appropriate to the vehicle type, speed and access demands,
- Left turn deceleration facility similarly appropriate to the vehicle type and speed environment, and
- Acceleration shoulder areas are had regard for.

2.3 Sight Distance

Views looking right (south east) and left (north west) from the property access are shown as Figure 3 and Figure 4 below.



Figure 3 – Sight Distance looking right (to south east)



Figure 4 – Sight Distance looking left (to north west)

The ITA states that the available sight distance from the property access to the right (to the south-east) is 640m, limited by a horizontal curve in Kaipaki Road. As shown on Figure 5 below, this curve is approximately 400m from the property entrance. Stantec's site visit indicates that the available sight distance is approximately 420m.



Figure 5 – 420m Sight Distance Measurement to Right

As illustrated below on Figure 6, sight distance of 640m would require visibility through private properties on the opposite side of the road. The reference to 640m in the ITA may be a typographical error.



Figure 6 – 640m Sight Distance Measurement to Right

To the north-west (looking left from the property access) the ITA states that 400m is available to the crest curve. Stantec's sight visit suggests vehicles become visible over the crest curve approximately 360m from the access.

The Waikato Regional Infrastructure Technical Specifications (RITS) require 250m sight distance, which is satisfied in both directions.

The available distances also exceed the Austroads requirements for Safe Intersection Sight Distance (SISD) for sign posted speed environment. SISD is the distance that traffic on the major road (Kaipaki Road) needs to observe and react to a vehicle that moves into a collision situation from a side road (the proposed quarry), before reaching the collision point.

2.4 Traffic Generation

The overall traffic generation assessment (ITA Appendix 4) appears reasonable, taking into account the assumed volume of material to be extracted (up to 5,000m² per week) and the applicant's proposed cap on daily heavy vehicle movements to a maximum of 133 HCV/day and an average of 106 HCV/day.

The peak hour of activity has been assumed to account for 10% of the daily total. Given the proposed hours of operation are 7:00am to 5:30pm (10.5 hours), this assumes that activity is constant throughout the day. Should there be peaks within the day the peak hour turning movements could be somewhat higher than the 14 vph forecast.

The assessment places some weight in a particular distribution outcome, which in practice may well not occur. It is assessed that the distribution of traffic movements will be heavily influenced by the nature, location and scale of supply contracts that the quarry secures in the future. For that reason, testing all demand coming from both directions (at different times) is an appropriate scenario to consider in designing the access. An assessment on this basis is expected to result in a different determination with respect to access management.

2.5 Right and Left Turn Treatment Warrants

Austroads Part 4 (Intersections and Crossings – General) provides guidance as to when auxiliary right and left turn treatments are required. This guide is referred to in the ITA. The warrants are based on expected peak hour volumes on the major road (Kaipaki Road) and the turning volumes into the minor road (the quarry access).

Hourly traffic data for Kaipaki Road is not presented in the ITA. It can be broadly assumed for the purpose of an approximate calculation that peak hour volumes make up around 10 to 12% of the daily total. This gives Kaipaki Road an existing peak hour volume of say 320 vehicles per hour (vph), at 2019. Applying growth of 2% per annum to the year 2030, gives a volume of 390 vph toward the latter stages of the quarry life. The Austroads warrant assessments for this level of major road volume are shown as Figure 7.

In the absence of any hourly directional data it has been assumed that 55% of traffic travels towards State Highway 3 (SH3) in the morning and 45% travels towards Cambridge, with the opposite occurring in the afternoon. The basic right turn (BAR) and basic left turn (BAL) treatments referred to on the graph are effectively the 'Diagram E' shoulder widening treatments proposed in the AEE and shown earlier as Figure 2.

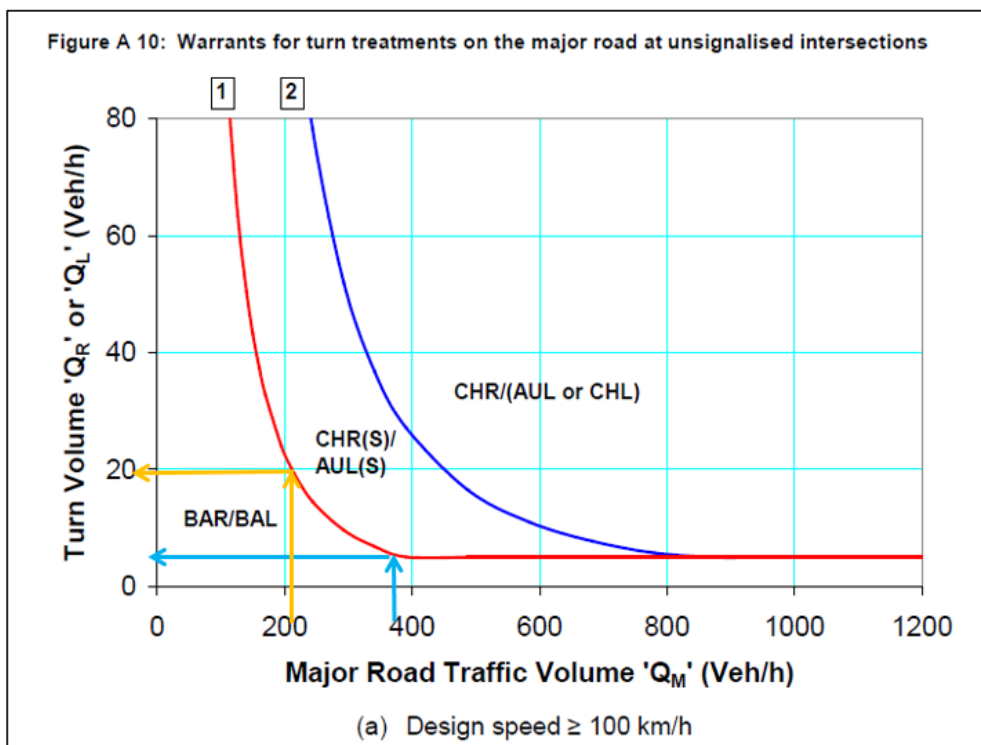


Figure 7– Austroads Warrant Assessment

The left turn assessment (the orange arrows) considers only the north-westbound volume. These arrows show that something more than a basic left turn treatment (BAL) would be warranted if there were more than 20 vph turning left.

The ITA predicts up to 14 vph when the quarry is extracting 5,000m³ per week. Half of these movements would be inbound. Even if all the demand came from the south-east (Cambridge) side, an auxiliary left turn lane would only be justified if the peak hour generation was 40 vph, 2-3 times higher than the ITA predicts.

The Diagram E treatment provides 90m of shoulder widening (to a minimum of 6m from the centreline) to assist left turning vehicles. This is expected to provide adequate width for following vehicles to pass trucks that are slowing to turn.

The right turn assessment (shown with the blue arrows) considers the two-way volume on Kaipaki Road. These arrows show that with any more than 5 vph turning right into the quarry, a standard higher than a BAR treatment, such as a right turn bay, would be warranted.

This threshold is different to what is cited in the AEE (8 vph). The basis of that calculation is not presented in detail however the difference is likely to have arise because of different assumptions regarding the existing and future volume on Kaipaki Road.

The ITA predicts up to 14 vph when the quarry is extracting 5,000m³ per week. Half of these movements would be inbound. Should the majority of that demand come from the north-west (Ohaupo) side for a given period, a right turn bay is likely to be warranted.

On this basis, and on the basis of other safety related observations at the site, it is recommended that:

- The need for a right turn bay be reviewed on the basis of actual hourly count data by direction, and an appropriate allowance for future growth over the life of the quarry.
- The corresponding Diagram E shoulder widening arrangements for the left turn deceleration facility are assessed to be broadly appropriate, however further consideration may wish to be given to lengthening this shoulder area to accommodate the full deceleration requirement for heavy vehicles clear of the through traffic lane, avoiding delay and disruption to following traffic.

2.6 Arrival Queuing at the Site Entry Gates

The ITA refers to the quarry gate being set back 24m into the property to enable one truck to queue, should it arrive when the gate is closed. The nature of sand quarries is such that trucks can and do frequently accumulate at the property before opening in the morning, to fill and begin serving their destination sites as early as possible.

There are limited opportunities on Kaipaki Road and in the broader area for trucks to wait safely clear of the road. It would be an unsafe outcome where trucks accumulated on the roadside shoulder areas during these periods.

It is therefore recommended that the gate be recessed significantly further into the property (at least 80m and desirably in the order of 120m) to provide adequate storage length on site for trucks that arrive early, to eliminate the potential for queueing on Kaipaki Road. At an 80m provision of separation, spaces is only likely to be available to accommodate 3 waiting vehicles safely clear of the Kaipaki Road environment. It may well be appropriate to establish a monitoring condition addressing this matter such that if any established threshold is exceeded provision is made for it to be remedied.

2.7 Integration with Residential Access

As shown on Figure 8 below, the existing residential property 928 Kaipaki Road will share the new quarry entrance. The residential gate is proposed to be recessed into the property to ensure that a vehicle can wait in front of it and be clear of the quarry access road.



Figure 8– Proposed Access Layout (Sourced from ITA Appendix 3, yellow annotations added)

The access design does not appear to have considered what would happen if a car (shown indicatively in yellow) has to give way to an exiting truck, or arrives when one or more trucks are queued to leave. In either instance, the car would need to wait and the swept paths above indicate that entering trucks would then be impeded, potentially being positioned within the Kaipaki Road carriageway.

It is recommended that further consideration be given to this scenario and design of the access to provide for avoidance of any such potential outcome. A potential solution is to realign the residential access to meet the quarry access further into the property and/or further providing for a short widened area for the residential access vehicle clear of both the entry and egress quarry vehicle tracking paths.

It is of further note that the tracking path for the left turn entry heavy vehicle is shown being bade from the high speed traffic lane on Kaipaki Road rather than from the shoulder Diagram E position. This is assessed as a high risk safety outcome and is not recommended. Positioning the turning vehicle onto the widened shoulder area that a Diagram E deceleration shoulder would create is assessed recommended. It is evident by way of observation of Figure 8, that the vehicle would not be able to physically achieve the left turn into the site access. The tracking path necessary would encroach across the corner boundary position in the order of 3 to 5m on the left hand side of the vehicle.

Overall, it is evident that the acute angle of the access is overly restrictive on the access making it impractical as shown. From a physical maintenance perspective, the acute turning angle will result in excessive drag of the rear axels across the pavement leading to excessive wear on both the access pavement and the vehicle. It is recommended that a length of accessway perpendicular to the Kaipaki Road carriageway be established to accommodate the whole of at least a single HCV, and that the internal form of the quarry accessway be established beyond that position to avoid these wear and adverse maintenance outcomes.

On the basis of this assessment, the access design shown is assessed as impractical, unsafe and a high maintenance arrangement. It is recommended the access be redesigned to safely provide for turning from the improved Kaipaki Road environment.

3. Review of Council Notification Report

The Council's Notification Report accepts that Kaipaki Road can accommodate the expected increase of 76 vpd (including 68 heavy vpd). Overall, it is accepted that the generalised form of Kaipaki Road is able to accommodate the forecast demands.

The Council report also notes that the location and design of the access will be critical for safety and goes on to state that a Diagram E treatment may not be ideal on a straight road where speeds are relatively high. The Applicant has responded to this in the AEE by stating that a right turn treatment is not warranted unless right turn entry volumes are 8 vph or more. The Council observations align with the assessments made above. Overall, there is very little scope for variability in the forecast demand and distribution outcomes in the applicant's assessment. A very small change in the distributive outcome is likely to trigger an alternate access solution, as has been described in the assessments above.

The Council officer's report also notes concern about the proposed angle of the access and it is suggested that this be corrected. Again, this observation is supported by the findings described in this assessment.

On the basis of these matters it would appear the Council assessment would be warranted in concluding the proposal could not be supported without further substantive remedy.

4. Road Safety History

The ITA sets out that 34 crashes have been reported on the full 13km length of Kaipaki Road in the last five years. No particular road safety issues were noted in the applicant's assessment report, in the vicinity of the property entrance.

The ITA also noted that the NZ Transport Agency's Safer Journeys Risk Assessment Tool indicates that the Safe and Appropriate Speed for the full length of Kaipaki Road is 80km/h. Waipa DC moved to adopt this speed on some parts of Kaipaki Road but our site observations indicate it has maintained an open road speed limit of up to 100km/h from Kaipaki School (2.5km west of the site access) through to the Cambridge Road intersection (about 3.9km east of the site).

A detailed review of the crash reports for the 3km section closest to the property showed:

- One rear-end crash involving an eastbound driver affected by dazzling sun.
- One single vehicle loss of control crash in the gully to the west of the property.
- Five other single vehicle loss of control crashes caused by driver distraction, impairment or excessive speed.
- One driver failing to give way turning right out of a driveway.
- One driver failing to notice vehicles slowing or stopping in front of them to turn into Thirlwall Lane.

Four of these crashes had a common theme of drivers losing control (or having difficulty regaining control) at the edge of seal. This lends some weight to Council's concern that the sealed width provided by a Diagram E treatment (6m from the centreline) may not provide sufficient seal width in this context.

The incidence of single vehicle loss of control outcomes also points to a range of other potential contributing factors that may warrant further consideration. In particular driver inattention such as occurs through mind-wandering and travelling speeds too high for the environment leading to unrecoverable outcomes. Again, these indicators suggest some further consideration is warranted in terms of both the design formation as well as advanced warning in respect of the proposed quarry access.

5. Speed and Overtaking Risk

To the north-west of the site, Kaipaki Road drops through a gully. There are 75km/h curve advisory speed warning signs facing both directions of travel, and warning signs about the steep gradient. Kaipaki Road has yellow no-overtaking lines marked for approximately 1km (including the advanced warning markings) through this area, between the Speake Road intersection and the top of the crest curve around 400m west of the site.

Some speed measurements were taken during the site visit. These revealed:

- Minimum, maximum and 85th percentile speeds of 76km/h, 116km/h and 95km/h for traffic travelling towards Ohaupo.
- Trucks travelling towards Ohaupo had an 85th percentile speed of 89km/h
- Minimum, maximum and 85th percentile speeds of 82km/h, 92km/h and 87km/h for traffic travelling towards Cambridge.
- No trucks were recorded travelling towards Cambridge during the measured period.

Driver speed behaviour along the site frontage was observed to be variable. It was evident that the straight section of road the quarry access is to be formed on is currently used as an overtaking opportunity by drivers travelling in both directions. For those travelling towards Cambridge it is the first opportunity to overtake coming out of the gully and out of the area when overtaking is not permitted. For those travelling towards Ohaupo, it is an opportunity to overtake slower vehicles before entering the gully.

This is a potential risk to consider in relation to the design of the quarry access. It means that some vehicles may be coming through at high speeds, and not anticipating slowing or stopped trucks. It also indicates that drivers may attempt to overtake trucks that have departed the site, entered the traffic stream and which are in the process of getting up to road speed.

Austroroads Guide to Road Design: Part 3, Geometric Design, Table 5.8 provides some indication of the necessary sight distances to enable safe overtaking and completion of the overtaking manoeuvre. Indicatively, these are in the order of about 900m to 1,200m (the sum of establishment and continuation sight distances). Indicatively, the subject length of visible straight adjacent to the site access is in the order of 650m, indicating the environment is heavily towards the minimum end of the spectrum within which a safe overtaking manoeuvre can be made. This is of course based on an assumption that the full length of the straight, from the top of vertical curve to the gully area west of the site to the horizontal curve east of the site access is necessary to complete the manoeuvre, without any additional sight distance margin.

With the proposed access being positioned generally near the centre point of the overtaking length of straight, vehicles are likely to be at a higher speed than the mean operating speed of the corridor and therefore present with an increased safety risk/severity outcome.

It is recommended that consideration be given in the development of an appropriate access solution, to prevention of overtaking manoeuvres entirely along the subject section of road, inclusive of the vertical and horizontal curved alignments east and west of the site access. In this regard it is observed that management of the operating speed environment to reduced levels through this area, recognising the proposed introduction of a greater frequency of higher mass vehicles, is likely to lead to a materially better road safety outcome, both in terms of personal injury and collective risk considerations.

6. Heavy Vehicle Acceleration and Deceleration

Trucks leaving the property access will take time to accelerate to their typical road speed. Their acceleration rate depends on factors including their loaded weight, the size and power of the vehicle and the extent to which the driver uses that power. A range of rates has been tested based on a recent Austroads Research Report¹.

Figure 9 presents an estimated range of speeds for trucks on Kaipaki Road as they travel away from the proposed quarry access. The analysis applies to trucks travelling either direction.

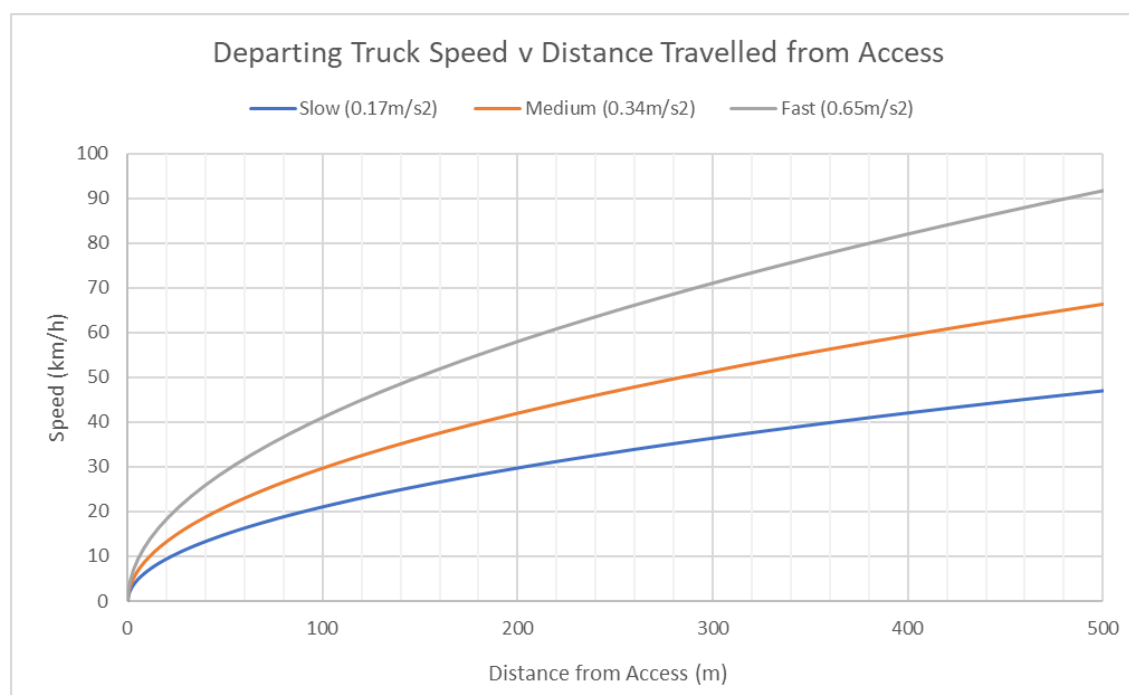


Figure 9— Expected Truck Speeds

After travelling approximately 100m from the site, trucks are expected to be travelling at speeds of 20-40km/h. By 200m, this increases to 30-60km/h and by 400m the range is 40-85km/h. For context, these 100m increments are shown on Figure 10 below, radiating outwards from the property access.

¹ Improving the Reliability of Heavy Vehicle Parameters to Support More Accurate Traffic Modelling in Australia and New Zealand. Austroads Research Report AP-R609-19

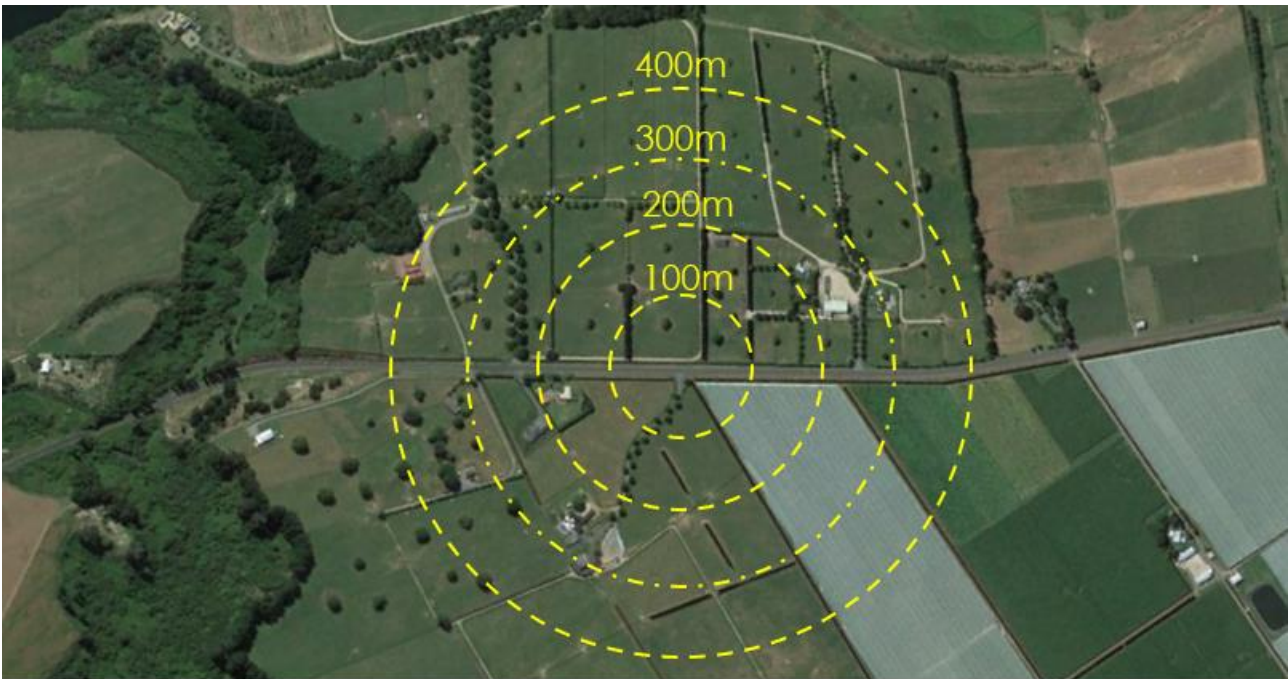


Figure 10– Indicative Distances from Property Access

It is reasonable to expect that with trucks moving at noticeably less than the posted speed limited on Kaipaki Road, faster moving vehicles that enter the straight behind them may be tempted to overtake. The quarry access joins the straight approximately 350-400m from the vertical and horizontal curves at either end.

Overtaking sight distance (OSD) is the distance that a driver needs to safely overtake a slower moving vehicle without interfering with the speed of an oncoming vehicle. It depends on factors including the size and speed of both vehicles, driver reaction time and the acceleration of the following vehicle. A car travelling at 80km/h needs approximately 520m of OSD to overtake a car travelling 60km/h.

The observable and visible length of straight is approximately 650m long and is therefore adequate to permit overtaking in some circumstances at present, noting that New Zealand law requires drivers to have at least 100m of forward sight distance at the time they complete their manoeuvre.

A car travelling at 80km/h overtaking a truck travelling at 30km/h requires approximately 430m of OSD. If the car is travelling at 100km/h the distance increases to 570m. Because the truck is joining Kaipaki Road midway along the straight there is insufficient distance in either direction to permit safe overtaking.

For this reason, consideration should be given to a markings treatment that prohibits overtaking from the end of the existing no overtaking lines at the top of the hill to approximately 420m south-east of the property access, beyond the horizontal curve.

Deceleration lengths have also been estimated based on deceleration rates specified in Austroads (AP-R609-19) These are:

- To slow from 100km/h to 10km/h (estimated left turn entry speed) 175m to 192m

- To slow from 80km/h to stopped (a right turn that needs to give way) 111m to 123m

The Diagram E treatment provides 90m of widening to assist turning traffic and allow vehicles following left turning vehicles to overtake, and vehicles following right turning vehicles to undertake. The above analysis indicates that trucks will begin to decelerate slightly before the widening and any following traffic would be slightly delayed as a result.

Whilst the delay effects of that are unlikely to be significant, given the expected volumes, a more specific access arrangement comprising a right turn painted median, overtaking restrictions, advanced warning signage and adequate left turn shoulder facilities are recommended to reduce the likelihood of risk taking behaviour associated with slow vehicles.

7. Conclusions and Recommendations

Overall, the ITA has been assessed as reasonably describing the existing environment and the proposed activity. Sight distance to the south east appears to be overstated however this does not affect compliance with relevant standards.

We concur with the conclusion of the ITA and the Council that the critical issue in ensuring that transportation effects are managed to an acceptable level is the location and design of the proposed access on Kaipaki Road.

The proposed limit on the number of heavy vehicle movements per day (maximum and average) is a key tool proposed in the application in terms of managing effects to the level assessed in the ITA. In practice however, differing trip distributions; peak period demand fluctuations; the comparatively high equivalent vehicle movement (ecm) demands and also the marginal differences between forecast movement distributions and the warrant thresholds are cumulatively expected to result in the safe functioning of a Diagram E approach being well exceeded.

There are several opportunities that should be explored to improve safety outcomes. These are:

- Engage with Council on the appetite to review the speed limit on Kaipaki Road from 100km/h to 80km/h in line with the recommendations of the NZ Transport Agency's Safer Journeys Risk Assessment Tool (referred to in the ITA);
- Review the right turn treatment warrant in terms of a practical and safe outcomes assessment to take account of existing hourly directional volumes on Kaipaki Road and a reasonable allowance for future growth over the life of the quarry;
- Independent of the above, consider an integrated markings treatment on Kaipaki Road that includes a right turn bay and extended no overtaking lines markings corresponding with the vertical curve to the west and the horizontal curve to the east of the site access;
- Re-evaluate the adequacy of the length and width of the left turn shoulder provision for deceleration and consider the extent that this is to impact following through traffic movements;
- Make a specific assessment of the provision for right and left turn out acceleration shoulder areas, particularly in light of the speed differential of vehicles and the potential risk arising from overtaking;
- Have regard for advanced warning advisory provisions in terms of the proposed access location;
- Recess the quarry gate further into the property to eliminate the risk of trucks waiting on Kaipaki Road prior to opening;
- Redesign the turning tracking provisions to represent these from the design solution turning lane provisions;
- Make a fully separated waiting provision for the residential access, clear from the quarry access, including consideration of a how a vehicle can enter and/or safely wait when trucks are exiting or queued to exit.

8. Applicant's Further Response of 27 October 2020

Since issue of our independent assessment dated the 27th October we have received further information from the applicant. We consider this further as follows:

The applicant has advised the following further traffic mitigations:

- *The proposal to limit duration on any landuse consent granted to 15 years (aligned with the Waikato Regional Council (WRC) consents recently granted – also copied for your information);*
- *Minor changes to the Site Management Plan condition to align with WRC consents*
- *Minimum setback requirements;*
- *New commitments to:*
 - *Extend sealed access road to 300m;*
 - *Install, maintain and use a wheel wash for exiting vehicles;*
 - *Setback the site access gate approximately 300 m from Kaipaki road;*
 - *Construct a 2m high bund alongside and to the west of the site access road;*
 - *Not use motor scrapers;*
 - *Not undertake any mechanical sand processing activities;*
 - *Not use reversing beepers.*
 - *Construct all bunding no less than 2.0m high and to plant them with indigenous species.*
 - *Place an advisory "no engine breaking" sign to the east of the site (subject to Council approval).*
- *A minor adjustment in daily maximum of HCV movements/day from 133 to 132.*
- *An updated site plan.*

Some of these matters deal with issues that appear to have been separately discussed between yourselves and the applicant. Notwithstanding this, we would see no traffic or transport reason as to why these would not be accepted.

The applicant does not appear to have engaged with mitigation relating to the potential adverse safety effects off-site, other than to suggest that the design solution will be subject to Council approval and a safety audit. It is our assessment however that the form of mitigation should be established prior to these steps so that there can be some confidence it is both achievable as well as capable of achieving an appropriately safe outcome.

The applicant's reference to not supporting the implementation of yellow no overtaking lines is not entirely accepted. It is recognised that there is criteria to be established in relation to their application. These are set out in the Waka Kotahi NZ Transport Agency Manual of Traffic Signs and Markings, Part 2 Markings document, which can be found here: <https://www.nzta.govt.nz/resources/motsam/part-2/>

It is recommended that the extent of no overtaking lines established on the approach to the vertical curve west of the site be confirmed and where appropriate extended. It is also recommended that the road safety record be reviewed to establish whether there are reasonable discretionary grounds, as are provided for within the MOTSAM Manual, for these to be established where the identified risk is established. In relation to the discretionary provisions afforded to Council, and in light of the Government Policy Statement directions with respect to the Vision Zero on road safety, it is assessed that consideration would be warranted in respect of the operating environment post operation of the access and the potential for road safety outcomes to adversely contribute to the GPS directions for road safety.

Further, we remain of the view that the matters which are still unaddressed by the response, as are set out above and summarised at Section 7, continue to warrant further consideration and assessment.

Our overall assessment is that the general location of the proposed access is the most desirable location and that it can be designed in a way that would achieve an acceptable local road safety outcome. It is concluded however that a safe operating environment outcome is not achieved through the proposed Diagram E approach.

We trust the above assessment provides the information required to assist the client in their current process. We would be pleased to discuss any of the above and provide further support as required.

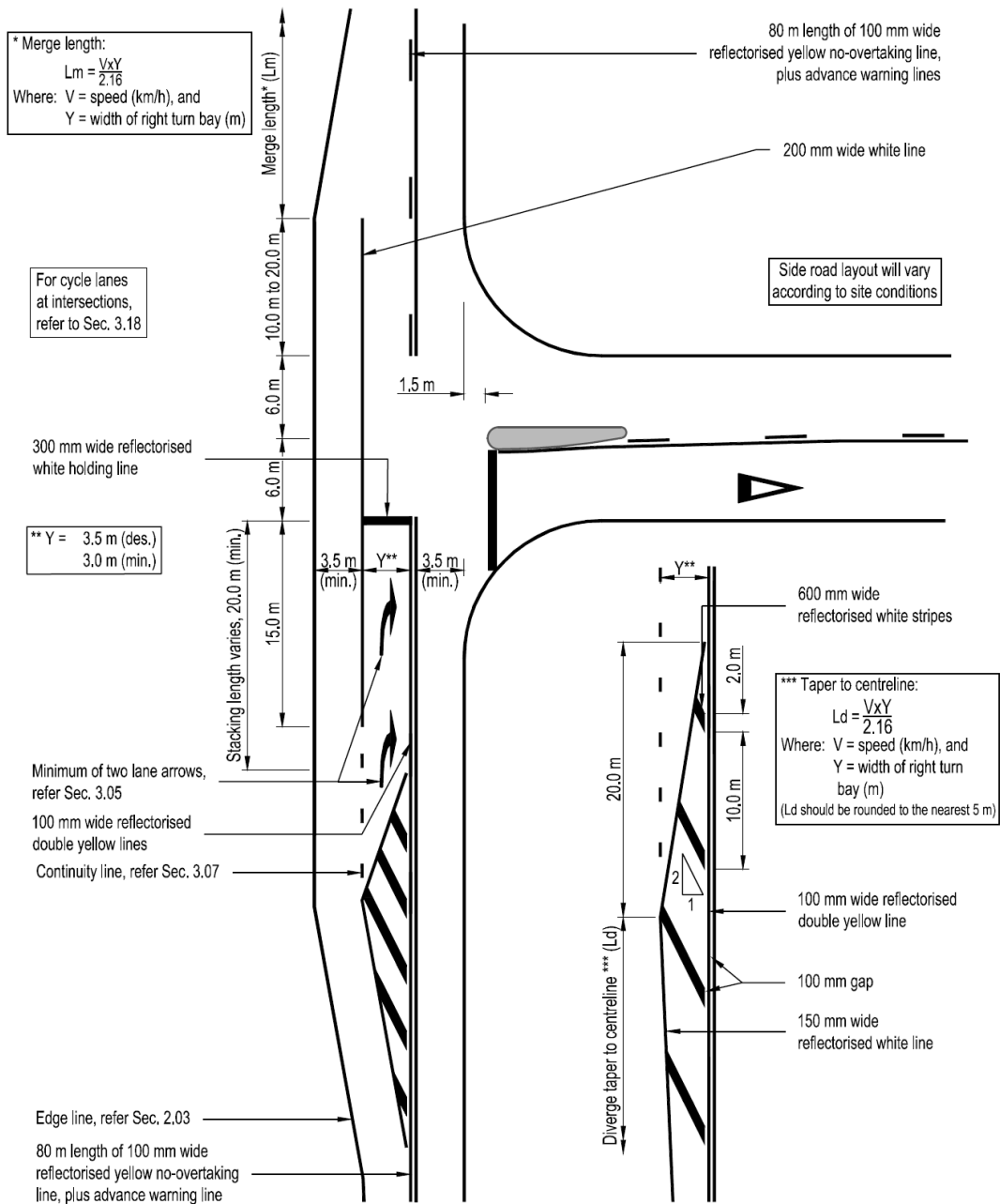
Yours sincerely

A handwritten signature in blue ink, appearing to read 'Mark Apeldoorn', with a stylized flourish at the end.

Mark Apeldoorn
Practice Leader - Transportation Advisory Private Sector

Cc: Mrs J Forret, Partner, Harkness Henry Joan.Forret@harkness.co.nz

Appendix B: NZTA MOTSAM Figure 3.25, Markings for Right Turn Bays in Rural Areas.



**MARKINGS FOR RIGHT TURN
 BAYS IN RURAL AREAS**

FIGURE 3.25

Blank Backing Sheet