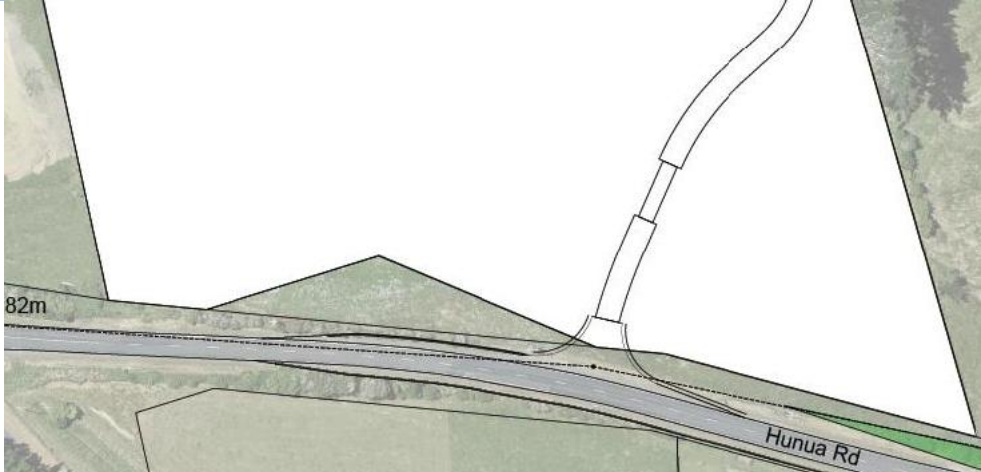


# Memorandum

<b>To:</b>	Karl Anderson   Senior Planner (Auckland Council)
<b>From:</b>	Matt Ford   Senior Development Planner (Auckland Transport)
<b>Date:</b>	20/01/2026
<b>Subject:</b>	BUN60440759 - 362 Jones Road, Hunua
<b>AUP Information</b> :	The proposed development is subject to the following AUP matters:  <b>Zone</b> Rural – Rural Production Zone
<b>Proposal:</b>	<p>The proposed development includes:</p> <ul style="list-style-type: none"><li>• Establishing a clean fill site operating for 10 years;</li><li>• Up to 790,000m<sup>3</sup> of fill volume is to be imported to the site</li><li>• Operation will be Monday to Friday 7am to 6pm, Saturday 7am to 1pm, and no operations on Sunday or public holidays;</li><li>• A new vehicle entrance established to Hunua Road;</li><li>• Localised shoulder widening at site entrance;</li><li>• Proposed road widening of Hunua Road and centreline adjustments;</li><li>• Vegetation removal and trimming;</li><li>• Average of 52 truck movements a day (26 movements in each direction).</li></ul> <p>Overall, the proposal required consideration as a <b>Discretionary</b> activity.</p>
<b>Proposed Site Layout:</b>	

**Note: This memorandum provides Auckland Transport's (AT) review of this application from a development planning perspective. The review relies on the technical expertise of AT consulting transport specialists PTM and other internal AT specialists. PTM remains AT's main technical expert on this review. This memorandum supersedes all previous memorandums provided by on this application as well as previous applications on this site.**

## 1. Qualifications

1. I am a Senior Development Planner - Network Operations Planning at Auckland Transport (AT). I have been in this role since 2023. I hold the qualification of Bachelor of Urban Planning (honours degree) and have 5 years of experience in planning and transport planning respectively.
2. I am a Graduate member of the New Zealand Planning Institute.
3. I have prepared expert evidence and technical assessments for resource consent applications, plan changes, and fast-track applications and have appeared as an expert witness before consent authorities.
4. As a Senior Development Planner, my role is to provide and facilitate specialist technical input into the review of development proposals for impacts on the transport network. Dependent on the development proposal, we as Development Planners provide our professional view as well as in part rely on internal or external technical expertise to help us in reviewing the extent of effects on the transport network. The expertise relied on has been specifically outlined below to demonstrate clearly what expert opinion has been adopted as part of this response.
5. I have relied on the following expertise in:
  - Road Safety Engineering from Paul Schischka from PTM Consultants. Paul Schischka is a Principal Transportation Engineer at PTM Consultants. Paul has 21 years of experience as a transportation engineer.
  - Pavements and Surfacing Engineering from Indra Gyawali (AT). Indra is a Principal Engineer in Design and Engineering team in Auckland Transport. Indra is a civil and transport engineer. Indra Has more than 35-years of civil and structural engineering experience from bridges, railway, roading and associated infrastructure on design, project management and construction.
  - Structural and Geotechnical Engineering from Narayana Srinivasan (AT). Narayana is a Principal Engineer in Design and Engineering team in Auckland Transport. Narayana is Subject Matter Expert for structural and geotechnical matters. Narayana has over 35 years of experience having work on several infrastructure projects internally and domestically.

## 2. Introduction

6. Thank you for the opportunity to provide feedback on this resource consent application. Auckland Transport's (AT) review, as the Road Controlling Authority, is based on the following AUP Reasons for Consent and asset owner matters;
  - Under E12.4.1 (A6) any earthworks greater than 2,500m<sup>2</sup> is a **Restricted Discretionary** activity.
  - Under E12.4.1 (A10) any earthworks greater than 2,500m<sup>3</sup> is a **Restricted Discretionary** activity.
  - Under Rule E27.4.1(A2), establishing a new access which is an accessory activity, which does not comply with the standards for access is a **Restricted Discretionary** Activity. The proposed vehicle crossing width being 12.73m wide and exceeds 6.0m and does not comply with Standard E27.6.4.3.2 (T156).
  - Under Rule H19.8.1(A66), a managed fill within the Rural Production zone requires resource consent as a **Discretionary** Activity.
7. As noted above, the proposal requires consideration as a **Discretionary** activity due to failure to comply with other provisions and standards under the Auckland Unitary Plan.
8. The proposal has also been assessed from an asset management perspective with AT being the Road Controlling Authority (RCA). The following roading assets are identified as being affected / proposed:
  - Potential deterioration of pavement conditions of Hunua Road;
  - Potential deterioration of Hunua Road cliff face; and
  - Road widening and centreline adjustments on sections of Hunua Road.
9. This application has been reviewed in line with the relevant matters of discretion, assessment criteria and Objectives and Policies associated with the applicable reasons for consent. Any additional matters not otherwise specified are for Auckland Council's review.
10. As part of AT's review of the Auckland Unitary Plan (AUP) and the Auckland Code of Practice for Land Development and Subdivision Chapter 3: Transport (ACoP:T) have been considered.
11. The following application documents were reviewed and compared against the guidelines:
  - AEE prepared by Hodgson Planning Consultants, dated 22 November 2024
    - Subsequent s92 response(s) dated 12 February 2025;
    - Subsequent s92 response(s) dated 24 February 2025;

- Subsequent s92 response(s) dated 28 March 2025;
- Transport Assessment prepared by Commute, dated 22 November 2024
  - Subsequent s92 response(s) dated 3 March 2025;
  - Subsequent s92 response(s) dated 28 March 2025;
  - Subsequent s92 response(s) dated 4 April 2025;
- Engineering Plans prepared by Fraser Thomas, dated 25 October 2024

12. In conducting the review, the following AT specialists were also consulted:

- Transport Design and Standards
- Road Safety Engineering
- Road Maintenance team
- Asset Maintenance team
- PTM Consultants.

### 3. Site Visit

13. A site visit was undertaken by AT on 1 September 2025 and 22 September 2025.

### 4. Background

14. A pre-application meeting was held on 20 September 2024. This meeting included discussion around mitigations for impaired sightlines on Hunua Road.

15. The Application was publicly notified by Auckland Council. As such, submissions received raised a number of issues that were not previously known to AT at the time prior to the submission period. The submissions shed light on crucial issues that AT used as additional matters to be worked through with the Applicant. This led to a Subsequent round of information requests. AT notes that there is information that is either not acceptable or unverified.

16. Various section 92 (s92) requests for further information were raised by AT in the review of this application. A summary of these s92 requests is provided in Appendix A.

17. Additional information requests were requested post the submission phase. These are also summarised in Appendix A.

18. A supporting memorandum on the assessed safety effects is provided by PTM Consultants attached as Appendix B.

### 5. Submissions

19. There were 522 submissions received on this proposal. Of the 522 submissions, AT notes that 485 of these were related to traffic-related concerns. As such, AT can confirm we have reviewed the traffic related submissions and considered them in our

assessment and recommendation to the Council. The submissions on the proposal raised the following categorised traffic related matters:

- **Road geometry and capacity:** Hunua Gorge, Hunua Road, and Jones Road are repeatedly described as narrow, winding, and unsuitable for high heavy vehicle volumes. Submitters report trucks crossing the centreline and insufficient passing space.
- **Safety risks:** School bus routes and pick-up/drop-off points along Hunua Road and Ponga Road create high exposure for children. Submitter mention that increased truck movements raise risks for cyclists, pedestrians, and tourist traffic (Hunua Falls access).
- **Network resilience:** Roads are prone to slips, flooding, and closures, which could force trucks onto unsuitable alternative routes (e.g., Ponga Road) and delay emergency services.
- **Condition and maintenance:** Existing pavement failures, potholes, and edge breakdown will accelerate under heavy truck loads, requiring constant rehabilitation.
- **Mitigation concerns:** Submitters doubt the effectiveness of proposed measures (e.g., radio communications for passing, vegetation trimming) and emphasize road widening and upgrades before operations start.
- **Traffic data reliability:** Some submissions challenge the Applicant's traffic analysis and request a recount and independent review.

## 6. Matters for Review

20. All proposals which will increase the existing number of heavy vehicles on any road through either construction or operation is sent to AT for review. ATs scope to then review the proposal is restricted to the reasons for consent. However, in this case, the overall consent status is for a Discretionary activity. As the proposed activity is classified as Discretionary under the Auckland Unitary Plan, the scope of assessment is not confined to specific matters of discretion. In accordance with section 104 of the Resource Management Act 1991, the assessment may consider any actual or potential effects on the environment, as well as relevant objectives, policies, and provisions of the Plan. This broader discretion enables a comprehensive evaluation of all environmental effects and policy alignment, rather than limiting consideration to predefined matters.
21. The existing road environment in relation to the site consists of Hunua Road, being a rural road. Under the Auckland Unitary Plan Geo maps, Hunua Road is not identified as an arterial road. Some sections of Hunua Road have sharp bends but is generally a windy road with a steep drop off one side into the gorge. Hunua Road is comprised of one vehicle lane in each direction and has a posted speed limit of 80 km/hr adjacent to the site access.

## 6.1. Road Safety

### Scarbro Trucks verse Scarbro Trucks and other heavy vehicles

22. The Applicant intends to use truck and trailers to transport and drop fill off to the site. Fill capacity for these trucks is approximately 10-18m<sup>3</sup> and measuring at up to 19m long. These are noted in the assessment as 'Scarbro trucks' as the Scarbro group is the Applicant.
23. Figure 1 below shows the areas along Hunua Road that are physically constrained and narrow around the bends. These are referred to by AT as Sections A, B, C and D.



Figure 1 constrained sections of Hunua Road

24. It has been demonstrated by the Applicant that two Scarbro trucks cannot pass each other simultaneously at Sections A–D (shown in Figure 1) of Hunua Road, thus the movement fails. It is observed in the plans provided by Commute titled '*vehicle tracking assessment 4A-4D Updated*' dated 8 December 2025. There is a less than 0.5m clearance distance between the two types of trucks to pass by each other. To be considered acceptable there needs to be at least a 0.5m clearance distance between the two trucks. The Applicant's plans do not disclose the clearance distances between opposing truck-and-trailer movements. Consequently, the risk profile for sideswipe/head-on conflict persists.
25. The Applicant states that while full truck and trailer vs truck and trailer movements cannot be accommodated simultaneously, it can be managed as all trucks to / from the site will be controlled by Scarbro (site operator), GPS monitored and be in constant communications. AT cannot accept these mitigation measures as fleet coordination (GPS/radio) is an operational mitigation and cannot substitute for geometric provision for mixed traffic. As non-Scarbro vehicles are not subject to fleet controls and residual conflict risk remains material. There will be many situations where a Scarbro truck and trailer will need to simultaneously pass another large heavy vehicle that is not operated by Scarbro. How the driver of another heavy vehicle reacts to a situation where a Scarbro truck and trailer is tracking over the centreline is outside of the Applicant's control.

26. The Applicant cannot rely on other heavy vehicle drivers coming in the other direction to notice that Scarbro truck and trailers are tracking across into their lane and take evasive action (either slowing, stopping, or moving their vehicle cross to the edge of the lane to make space for the truck). Many drivers are alert and will take evasive action to avoid an oncoming vehicle in their lane, but not all, and AT cannot rely on this for safety. In a scenario where a Scarbro truck and trailer needs to turn the corners while another heavy vehicle is also turning and there not being enough width in the road corridor for both vehicles to pass, it could result in head on collision and serious injury.
27. AT is not willing to accept the risks of this arrangement as there are too many variables outside of the Applicant's control that need to be relied on to make the proposed arrangement safe between Scarbro trucks and other heavy vehicles. As such, AT identifies this as a significant adverse safety effect. AT considers the proposed mitigations insufficient to manage identified risk. Further detailed analysis of this is provided in the PTM memorandum attached as Appendix B in paragraphs 11 – 26.

## Scarbro Trucks verses emergency vehicles

28. As raised in the submissions, there was concern about the increase in Scarbro trucks resulting in the prohibiting of emergency response vehicles from accessing the Hunua township and Camp Adair. It has been demonstrated that if road widening were to occur as per the plans provided by Commute titled '*vehicle tracking assessment 4A-4D Updated*' dated 8 December 2025, Scarbro trucks and emergency vehicles could pass each other simultaneously on Sections A–D (shown in Figure 1), however the Applicant has not disclosed what the clearance distance is between the two vehicles would be. AT cannot conclude these interactions are satisfactorily managed.

## Scarbro Trucks verses school buses

29. As observed and raised by the submissions, Hunua Road caters for school buses and coaches frequently. While the number of these is not clearly defined (due the vehicles being privately operated and outside of ATs ability to review) it is assumed that buses run during the AM and PM school commuter peaks being between 8:15 – 8:45am and 3:00–3:15 pm.
30. AT asked the Applicant to confirm that a school bus and Scarbro truck can pass each other at Sections A–D on Hunua Road. It appears that if road widening were to occur as per the plans provided by Commute titled '*vehicle tracking assessment 4A-4D Updated*' dated 8 December 2025, that buses and Scarbro trucks can pass each other, however the Applicant has not disclosed what the clearance distance is between the two vehicles would be. AT again cannot conclude these interactions are satisfactorily managed.

## Scarbro Trucks verses light vehicles

31. AT asked the Applicant to confirm that light vehicles and Scarbro truck can pass each other at Sections A–D on Hunua Road. It has been demonstrated that if road widening were to occur as per the plans provided by Commute titled '*vehicle tracking assessment 4A-4D Updated*' dated 8 December 2025, that light vehicles and Scarbro trucks could pass each other with at least 0.5m clearance between them however the Applicant has not disclosed what the clearance distance is between the two vehicles would be. Therefore, AT cannot conclude these interactions are satisfactorily managed.

## Safety risk for school children

32. Hunua Road caters for school bus stops (that are unmarked) for school children getting picked up and dropped off by the school buses. AT notes that rural bus stops are generally not sign-posted due to rural context and being subject to change depending on where school children live. However, the Hunua School Parent Teacher Association (PTA) submission identifies at least six known stops.

33. From the Hunua School PTA submissions the current stops are listed as:

- 1852 Hunua Road (opposite the site entrance)
- Hunua Road at Gillespie Road, Hunua
- Hunua Road at Middleton Road, Hunua
- 1712 Hunua Road, Hunua (top of the gorge hill)
- 896 Hunua Road (bottom of the gorge hill)
- Walkers Bush, Hunua Road, Papakura.

34. Submitters (both the PTA and others) were concerned that increased heavy truck movements on Hunua Road would heighten safety risks for school children, as the road already carries frequent heavy trucks<sup>1</sup> and lacks safe pedestrian infrastructure. Due to the absence of dedicated pedestrian infrastructure and 80km/h operating speeds of heavy vehicles, a child walking along Hunua Road from a bus stop to their house would have limited protection and minimal reaction time in the event of an unexpected conflict. AT agrees that this combination of factors substantially increases the likelihood and severity of harm in the event of an incident.

35. AT notes there are currently no plans to construct a footpath along Hunua Road, as this location does not align with AT's strategic priorities under Future Connect, given its low walking demand and limited strategic benefit. Pedestrians who choose to walk here should exercise caution and do so at their own discretion, as the route is shared with frequent heavy vehicle traffic and lacks dedicated pedestrian infrastructure. AT advises against children walking on the berms of Hunua Road for long distances for this reason.

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<sup>1</sup> AT traffic survey of Hunua Road dated May 2025 showed the daily total number of vehicles was 5,418 eastbound and 5,343 westbound. Total daily heavy vehicles were 239 eastbound and 252 westbound.

36. The Applicant has volunteered to provide signage at the known bus stops to bring attention to Scarbro truck drivers (and subsequently other vehicles too) the stop locations. This is an attempt to help reduce Scarbro travelling speeds and increase awareness during school commuter times where children will be walking to and from a bus stop. This could help increase the safety and awareness of children when waiting/disembarking on the side of Hunua Road and walking across the road. If consent is approved, the Applicant should be subject to driver-awareness measures such as signage and health and safety procedures via consent conditions.
37. However, even with the proposed mitigation measures, a residual pedestrian safety risk remains at the school bus stops. As outlined in paragraphs 27–40 of the PTM memorandum, Hunua Road has an established pattern of loss-of-control crashes, which typically involve vehicles leaving the carriageway and entering the roadside area. If such an event were to occur at a school bus stop while pedestrians are waiting, the high operating speeds on Hunua Road mean that a collision (whether involving a car or a truck) would likely result in fatal injury. Any activity that increases traffic volumes, including the proposed fill operation, proportionately increases the likelihood of such an event occurring. Further assessment on school bus stops is provided in paragraphs 48 – 56 in the PTM memorandum (Appendix B).

## Safety risk for active modes

38. Many submitters raised concerns about the increase in safety risk on general active mode users on Hunua Road. AT acknowledges that people (at their discretion) could walk or cycle on this road, but AT does not advise it. Hunua Road is a high-speed rural corridor with frequent heavy vehicle usage and no existing footpaths or dedicated cycling facilities. It is not identified within AT's strategic walking or cycling networks, and no upgrades are planned in the short to medium term. While informal walking or cycling may occur at people's discretion, these movements are outside the scope of AT's planned active mode network and do not constitute a safety deficiency under AT's standards. If the consent is to be approved, AT would not likely impose the provision of active mode upgrades on Hunua Road on the Applicant.

## Summary on overall safety risk

39. Overall, the proposed increase in Scarbro truck movements along Hunua Road will result in significant adverse safety effects that AT are not in a position to support. This is due to proposed road widening of Hunua Road not being able to accommodate the full truck and trailer vs truck and trailer movements. AT does not support granting consent for the proposal. In forming this view, AT gave regard to the relevant objectives and policies of Chapter E12 of the Auckland Unitary Plan, specifically Objective E12.2, which seeks to ensure land disturbance is undertaken in a manner that protects the safety of people and avoids, remedies, or mitigates adverse effects on the environment, and Policy E12.3(2)(a), which requires managing the extent of land disturbance to avoid, remedy, or mitigate adverse traffic effects. The proposal is not

fully aligned with these provisions as the increase in truck movements cannot be fully managed to maintain safety and operational efficiency of the transport network.

## 6.1 Hunua Road Cliff Face Stability

40. As a result of additional truck movements on Hunua Road, it was queried if the increase in trucks could have an adverse effect on the stability of the Hunua Road cliff face due to vibrations of truck and trailer movements. The following assessment was provided by AT's specialists, Narayana Srinivasan from Auckland Transport and Doug Lewis<sup>2</sup> from SMEC.
41. The information provided by the Applicant and data available to AT<sup>3</sup> indicate that the cliffs instability mainly occurs after high intensity or prolonged rain events rather than directly attributed to the vibration of trucks. This is common, as the ground is saturated increasing its weight and it will have reduced cohesion (holding it in place). Trees and shrubs may also have a negative contribution by roots moving creating preferential pathways for water to infiltrate rather than run off. Failure appears to occur along the soil/rock boundary. This is common across Auckland which has a shallow soil profile on steep slopes. Additional truck movements are unlikely to have a negative effect on the cliff stability as it is observed to more attributable to heavy rain events. However, the more trucks on the road the greater the risk of them being hit by falling rock that falls off the cliff.
42. Overall, AT's geotechnical specialist have noted that the carriageway along Hunua Road (from Winstone Quarry access to the site access) against the cliff is unlikely to be adversely affected by the additional truck movements from this proposal, albeit it will be subject to debris falling onto the road as a result of weather related slips which is an ongoing AT maintenance activity to treat. AT is exploring remedial solutions that may look to install rockfall netting, including rock bolts, either in sections or along the whole cliff to help hold any debris against the cliff face. The date for proposed works is yet to be determined at this time.

## 6.2 Sightlines

43. Sightlines refer to the distance a driver can see ahead along the roadway. When these are restricted by curves, vegetation, structures, or other obstructions, drivers have less time to perceive hazards, make decisions, and react appropriately. Limited sightlines around sharp corners, can be contributing factors to the increase in risk of crashes and near-misses.

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<sup>2</sup> Doug Lewis – SMEC, Geotechnics Manager, New Zealand

<sup>3</sup> Data on Hunua Road cliff face has been obtained from AT's own on-site investigations.

## Sightlines at the site access

44. Hunua Road has a posted speed limit of 80 km/h adjacent to the subject site access. Therefore, according to AustRoads, the required sightline distances are 182m to the west and 207m to the east. At the site access, the available Safe Intersection Sight Distance (SISD) to the west is currently 198m, which meets the required 182m sight distance. The available sight distance to the east is currently 180m and therefore falls 27m short of the 207m requirement.
45. The eastern sightlines are restricted by vegetation located within the road reserve. The Applicant has recommended they be responsible to trim this vegetation to improve the visibility from the site access. Upon trimming of the vegetation, the achieved sight distance of will be 206m where 207m is required. In a scenario where the consent is approved, AT could accept the achievable sightline distances. This is because AT can accept a  $\pm 2\text{m}$  shortfall considering the fluctuating operating speeds of 75–78 km/h, indicating a practical compliance.
46. If the consent is to be approved, AT recommends consent conditions requiring this vegetation to be removed in full rather than periodically trimmed, to maintain safe sightlines and reduce long term costs. The Applicant would need to remove this prior to the commencement of the activity.

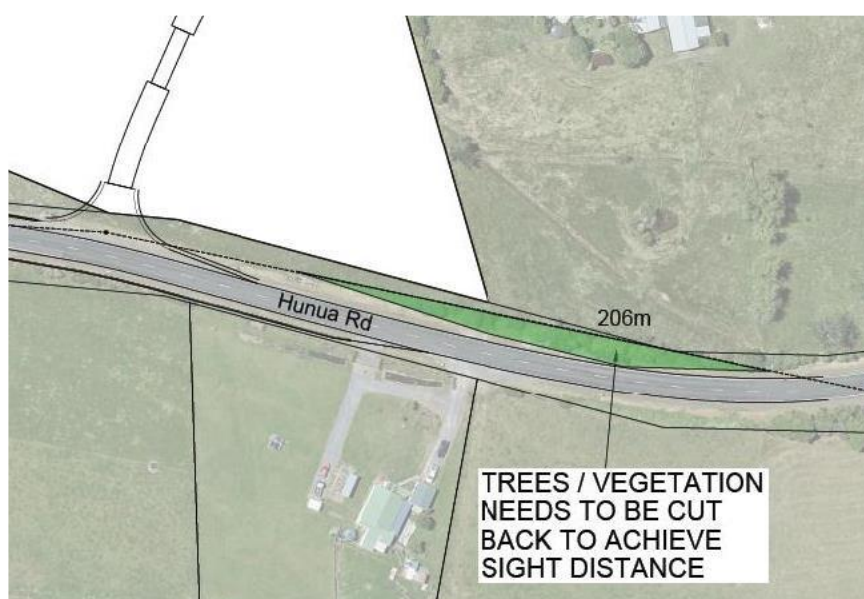


Figure 2 vegetation to be removed at site entrance

## Sightlines along Hunua Road

47. The Applicant undertook a wider assessment sightline assessment along Hunua Road. On the constrained sections of Hunua Road (Sections A - D), it was determined by the Applicant after investigation, that sightlines were partially blocked by vegetation along the road reserve. The Applicant has stated that they will take responsibility for improving the sightlines in Sections A–D by regularly trimming / maintaining the vegetation for the life of the consent.
48. While the Applicant has not clearly defined what the existing sightline distances are and what can be achieved post vegetation trimming, it is understood that this would be a net positive outcome. The extent of vegetation maintenance can be seen in Figure 3.
49. Vegetation trimming was considered best practicable rather than full removal because full removal could likely result in ground instability of the gorge and potentially resulting in land sliding into the stream. AT agreed with this assessment presented by the Applicant’s specialists. If the consent was sought to be approved, AT recommends consent conditions are provided by the Applicant to confirm the measured values, demonstrate that it meets AustRoads SSD/SISD requirements at the relevant sections, and adopt a maintenance approach that avoids slope instability would be required.
50. AT notes that while vegetation maintenance can be managed at a margin and is an attempt to mitigate adverse safety effects, it does not address the principal safety constraint of Hunua Road Sections A–D not being able to accommodate simultaneous truck and trailer movements as detailed in section 6.1 above.

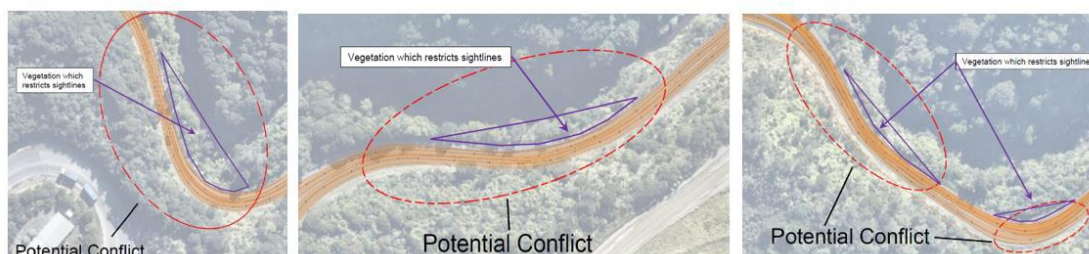


Figure 3 sections of vegetation removal needed on Hunua Road

## 6.3 Site Access

### Alternative Site Access Points

51. There was concern for Scarbro trucks using alternative roads to Hunua Road to access the site. In our view the site visit has confirmed that other roads such as Ponga Road and Jones Road are unsuitable for truck and trailers to use. This is due to their narrow width, poor pavement conditions and overall high safety risk to other road users. If the consent is sought to be approved, the Applicant should be subject to consent conditions to only allow truck trips to be made from Hunua Road only however, this does not resolve the primary road safety issues of Hunua Road as detailed in section 6.1 above.

## Proposed Site Access

52. The proposed vehicle crossing will be 12.73m wide at the property boundary. This does not comply with the requirements of the AUP where 6m wide is the maximum as per Standard E27.6.4.3.2 (T156). This is 6.73m wider than the permitted standard. However, the tracking plans demonstrate that trucks can adequately turn to and from the site in a safe and efficient manner. AT supports the intention to widen Hunua Road near the site access to allow for safer tracking of trucks and safer passing of vehicles to avoid queueing on Hunua Road. If the consent is sought to be approved, consent conditions should require this to be reviewed at the Engineering Approval stage to ensure this is correctly designed and implemented to AT's standards.

## 6.4 Crash and Tube Count Data

### Crash Data

53. The Applicant provided crash data for the five-year period 2020 - 2024 including all available records for 2025, for Hunua Road between Dominion Road and Ponga Road. As such, the search area covers 6.5km of rural road. Crash reports contained in CAS are provided by police. It should be noted that not all crashes which occur are reported to police, particularly less serious crashes, and it is likely that there are some crashes which have occurred in this part of Hunua Road which are not included in CAS. Figure 4 below shows the approximate location of the crashes on Hunua Road.

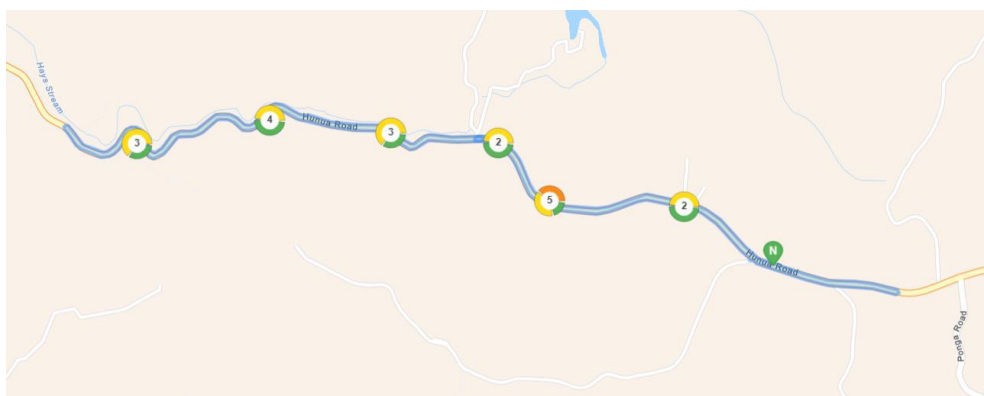


Figure 4 crash data locations

54. The recorded crash history for Hunua Road shows a total of 39 reported crashes, comprising 20 non-injury, 14 minor-injury, and five serious-injury incidents. The majority of these (26 crashes) were loss-of-control events, often involving vehicles departing their lane and striking roadside objects. A smaller number (four crashes) were head-on collisions, generally associated with a vehicle crossing the centre line following a loss of control. The PTM memorandum notes that increases in traffic volumes (particularly involving heavy vehicles) can heighten both the likelihood and the severity of such

crashes, as the probability of an oncoming vehicle being present during a loss-of-control manoeuvre increases.

55. Crash records involving trucks include five incidents, two of which were serious-injury head-on collisions west of the Winstone Quarry entrance, both caused by cars crossing the centre line. Although this pattern is considered not directly attributable to the proposal given existing truck volumes in that section between the quarry entrance and the site entrance (being the section most relevant to the proposal), there remains a persistent loss-of-control crash pattern, and heavy vehicles are not insignificant contributors to overall network risk.
56. The remaining 13 crashes are varied in type and location and do not form a clear pattern, but collectively they highlight the vulnerability of the corridor to a broad range of driver errors and operational conditions.
57. AT maintains the view that Hunua Road is a high-risk environment, and any proposal that introduces further vehicle movements (particularly heavy vehicles) necessarily introduces additional crash risk onto an already constrained and safety-challenged section of the transport network. While there are mitigation measures proposed by the Applicant, these do not eliminate the underlying safety issues already evident along this corridor. Paragraphs 30 – 40 of the PTM memorandum (Appendix B) provides further supporting analysis of the crash data.

## Tube Count Data

58. For reference we have elaborated on the tube count data which explains the issues with the traffic survey data below. Tube counts classify vehicles based on the number / arrangement of axles into 14 classes based on an NZTA system from 2011. Appendix C of this memo is the Traffic Monitoring for State Highways guidelines. Appendix A of this guidance document shows the classes. For a further detailed assessment of the tube count data, please refer to Paragraphs 41 – 44 of the PTM memorandum (Appendix B).
59. The Applicant's traffic survey results are significantly outside AT's expectations for this site. AT has previously encountered inaccurate tube count data due to equipment faults or external factors such as nearby roadworks, making such data unrepresentative of typical conditions. AT cannot accept data that deviates substantially from expectations without a clear explanation. Despite requests for clarification, the Applicant has not provided sufficient information to confirm accuracy.
60. Analysis of the tube count data indicates anomalies. Nearly all "heavy vehicles" were classified as Class 4, with a pronounced imbalance in eastbound versus westbound movements (28:72), while Classes 5–13 were evenly split. This is unusual given the absence of activities south/east of the count site that would attract such volumes of Class 4 vehicles. Tube counts classify vehicles into 14 classes under NZTA's 2011 system; heavy vehicles are Classes 4–13. Over seven days, 12,666 vehicles were recorded, with 25.4% classified as heavy. Of these, 2,541 were Class 4, compared to

only 682 across Classes 5–13. Total directional volumes were 6,185 eastbound and 6,481 westbound—a difference of less than 5%.

61. AT has internal traffic data for Hunua Road from May 2025 that we have compared to the Applicant's. For reference, AT has included the traffic count to this report as Appendix D. The count was taken a short distance east of where the applicant did their survey, but we would expect traffic patterns to be very similar in both places. The tube counters that obtain the data sort vehicles based on axle spacing. Under the NZTA system, some larger SUVs and vans (like a Ford Ranger or Toyota HiAce) can be counted as "Class 4 heavy vehicles" even though they're not trucks. This can make the "heavy vehicle" numbers look higher or skew the proportions if many of these vehicles are present. After reviewing the data, AT notes the following:

- Heavy vehicles were only 4.6% of all traffic, compared with 25.4% in the applicant's survey. This is a very large difference.
- Total daily traffic was roughly the same in each direction, about 5,400 vehicles eastbound and 5,300 westbound. Heavy vehicles were also evenly split in both directions. This matches what the applicant found regarding the balance of traffic flows.
- Most heavy vehicles were Class 4, which in this count made up 65% of eastbound heavy vehicles and 50% of westbound heavy vehicles. However, the direction split for Class 4 vehicles doesn't match the applicant's survey. AT's data shows a 55:45 east/west split, while the applicant reported 28:72.

62. AT suspects a fault in the survey equipment, potentially misclassifying westbound light vehicles as Class 4, inflating heavy vehicle counts. Without verification, AT considers the data inconclusive and cannot accept it. If consent is sought to be approved, AT recommends a peer review of the dataset as a consent condition.

## 6.5 Damage to Roads

### Hunua Road Pavement deterioration

63. The average trucks over the 10-year period are approximately 26 trucks per day or 2-3 trucks per hour. This further equates to 52 truck movements per day (in and out) or an average of 4-6 truck movements per hour). This is calculated using the assumptions as detailed in Section 4.1 of the Traffic Report. During the peak seasonal periods, the peak daily movements will be up 192 truck trips / movements per day or up to 96 truckloads a day. This threshold would equate to 20 trucks an hour (40 truck movements an hour). The Applicant notes that this flexibility will not occur for the full 6-7 months per year (typical earthworks season) just short periods within the 6-7 months as demand requires.

64. While the trip generation standards under AUP Chapter E27.6.1 may not be triggered, this does not preclude adverse effects, particularly cumulative pavement wear resulting from heavy axle loads. As noted in section 6.5.2 of this memorandum, AT has significant

concerns regarding the reliability of the Applicant's tube count survey data. The reported figures appear to overstate the number of heavy vehicles currently using Hunua Road, which raises questions about the accuracy of the classification methodology and equipment calibration. Accepting these inflated counts would artificially increase the baseline traffic volumes, thereby reducing the apparent incremental effect of the proposed truck movements. This approach effectively delays the trigger for pavement upgrades or maintenance obligations, allowing the Applicant to operate a higher number of trucks without implementing necessary mitigation measures. AT does not consider this an appropriate basis for assessing pavement deterioration risk and does not support any conclusions or conditions derived from this data until its accuracy is suitably verified.

65. Secondary to this is the Applicant's reliance on Hunua Road being marked as a strategic freight route. Since the proposal was lodged, AT's Future Connect planning tool was updated on the 17 December 2025, with significant changes to the Freight and General Traffic networks to better align with emerging growth areas and evolving corridor usage patterns. As part of these updates, AT notes that Hunua Road is no longer identified as a strategic freight route. This change has important implications for the proposal. Previously, the Applicant had relied on Hunua Road's inclusion in the freight network as an indication that AT intended to maintain or upgrade the corridor to accommodate freight movements. That assumption is no longer valid. The removal of Hunua Road from the strategic freight network signals that AT does not prioritise this corridor for freight investment or upgrades beyond standard maintenance. While Future Connect does not carry statutory weight and is primarily a planning tool rather than a legal instrument, it reflects AT's strategic intent and investment priorities. Consequently, any pavement strengthening or safety improvements required to support the proposed truck movements must be addressed entirely through consent conditions (if the consent is approved) and should not be assumed to occur as part of AT's future strategic programme.
66. If the consent is sought to be approved, AT recommends that consent conditions are imposed for the Applicant to have a suitably qualified person to peer review the data and provide conclusions on its suitability. If the results determine that there has been overstatement of volumes than a Pavement Impact Assessment should be carried out by the Applicant by way of condition to highlight if their proposal will deteriorate the pavement quality of Hunua Road.

## Pavement deterioration outside the site access

67. Frequent braking by heavy trucks on a specific section of road can significantly damage the pavement due to the high dynamic loads applied during deceleration. When trucks brake, their weight shifts forward, concentrating immense pressure on the front axles and tires. This creates localized stress that exceeds the pavement's design limits, especially if the surface or subgrade is already weakened. Additionally, braking generates shear forces that can cause micro-cracking and displacement of asphalt layers. Over time, these repeated stresses lead to rutting, cracking, and surface

deformation, accelerating pavement deterioration far beyond normal wear. If the consent is approved, the Applicant should be required through consent conditions to monitor and maintain a targeted section of Hunua Road and the vehicle crossing where frequent truck braking will occur. Any mitigation must be performance-based and verified via a monitoring regime agreed at Engineering Approval.

## 6.6 Truck and Trailer Backloading

68. Backloading refers to the practice of using a truck's return journey to carry goods or materials instead of traveling empty. For example, a truck delivers aggregate to a construction site. Instead of returning empty, it picks up hardfill (excavated material) from the site and transports it to a fill facility.
69. The assertion that "local factors" supporting the proposal includes transport efficiencies from backloading empty trucks and trailers with hardfill materials is not supported in this context. It is understood that Winstone Quarry is not presently configured to enable backloading operations, particularly for truck-and-trailer movements from the east, due to the design and layout of their site entrance. The current access arrangement does not accommodate efficient or safe movements for these vehicle types approaching from the eastern direction, which significantly limits the feasibility of two-way loading. In the absence of an operational pathway to implement backloading, the stated efficiency gain is speculative and cannot be relied upon as a material benefit. Until feasibility of this can be demonstrated, this factor should not be given weight in the assessment of positive transport effects. Any claimed transport efficiency should be demonstrated through tracking plans and management measures, rather than assumptions that are not reflective of current operations.

## 7. Conclusion

70. AT's position is based on its responsibilities as the Road Controlling Authority and asset owner, with a focus on maintaining the safety and operational efficiency of the transport network.
71. AT has undertaken a comprehensive review of the proposed clean fill operation at 362 Jones Road, Hunua, with particular regard to its potential effects on the transport network. While the Applicant has proposed mitigation measures, AT's assessment identifies that the proposal will result in significant adverse safety effects, primarily due to Hunua Road's inability to safely accommodate simultaneous truck-and-trailer movements without acceptable clearance. This concern is compounded by existing crash patterns and constrained geometry along Sections A–D.
72. For clarity, AT's position is based on quantified operating clearances ( $\geq 0.50$  m), measured SSD/SISD values by section, and validated heavy vehicle volumes. Where these cannot be achieved or verified particularly for simultaneous truck and trailer movements at Sections A–D, operational controls (fleet coordination) do not remedy

geometric deficiencies in a mixed-traffic environment. Accordingly, residual safety effects remain significant. All conditional items (access sightlines, local widening, vegetation maintenance, pavement monitoring, and signage) are recommended, but they do not address the non-conditional geometric constraints of Hunua Road.

73. Furthermore, AT notes that Hunua Road is no longer identified as a strategic freight route in Future Connect. While Future Connect is a planning tool without statutory weight, its update signals AT's intent and priorities meaning Hunua Road will not be upgraded for freight purposes. Any pavement strengthening or safety improvements required to support the proposed truck movements must therefore be addressed entirely by the Applicant.
74. Although improvements such as road widening, vegetation trimming, and signage will reduce risks for interactions between Scarbro trucks and school buses, emergency vehicles, and light vehicles, these measures do not fully address the safety risks associated with opposing truck and trailer movements. Accordingly, AT **does not support** the proposal in its current form. Council may consider limited risk-reduction (sightlines, pavement performance-based monitoring) however, these do not resolve the fundamental safety constraints.

## 8. Glossary of standard terminology for footnoting

**Future Connect:** is an aspirational planning tool. It is AT's network plan that identifies the Strategic Modal Networks (cycle, PT, walking, freight and general traffic) and the region's most critical challenges. It does not, however, propose any solutions (new projects) to these challenges and has no statutory weight. This is the role of the Regional Land Transport Plan (RLTP). The RLTP considers Future Connect outputs (among others), to help prioritise investments that are delivered through other AT programmes and projects, which will give effect to Future Connect.

**AustRoads:** is the association of the Australian and New Zealand transport agencies which provide practical advice on the design, management and operation of road transport networks.

**Safe Intersection Sight Distance (SISD):** is the minimum sight distance which should be provided on the major road at any intersection.

**Stopping Sight Distance (SSD):** is the minimum distance a driver needs to see ahead on the road to safely stop before hitting an object. It accounts for perception-reaction time and braking distance

**CAS:** refers to the Crash Analysis System (CAS) managed by Waka Kotahi (the NZ Transport Agency), a comprehensive database containing records of all traffic crashes reported to the NZ Police on New Zealand public roads, used for road safety analysis, policy, and infrastructure planning to improve safety.

# Appendix A – AT Further RFI's

## Initial request for information dated 17 December 2025

- Clarification on seasonal truck trip period and worst-case scenario details
- Worst-case truck trip generation outside seasonal period
- Design requirements for shoulder widening using Austroads standards
- Mitigation of safety risks from truck movements on Hanua Road bends
- Requirement for Pavement Impact Assessment due to heavy vehicle volumes

## Second request for information 17 February 2025

The applicant responded to AT's queries on the 12 February 2025. Based on these responses, AT issued a second s92 request on 17 February 2025. A summary of this request includes:

- Confirming the type of landscaping the needed to occur to trim back vegetation and improve sightlines.
- Further discussion on the requirement for Pavement Impact Assessment due to heavy vehicle volumes.

## Post submission information request 1

Council requested AT to provide a combined final request for information. AT provided this on the 29 August 2025 in order to give the applicant another opportunity to provide the information required. This list of information requested is summarised below:

- Quantification of truck routes and volumes beyond Hunua Road
- Assessment of emergency and regular vehicle passing at Hunua Road pinch points
- School bus frequency and passing ability with trucks on Hunua Road
- Safety assessment of school bus stop locations and truck interactions
- Traffic management and alternative routes during Hunua Road closures
- Impact of truck queuing or parking on Hunua Road sightlines and safety
- Sightline limitations due to vegetation and cliff faces along Hunua Road
- Updated truck tracking diagrams using actual carriageway and full truck-trailer length
- Assessment of rock instability risks from truck vibrations near cliff faces
- Clarification on traffic survey data period and inclusion of Saturday operations
- Seasonal peak truck movements and compliance with heavy vehicle thresholds
- Proposed pavement maintenance and damage remediation methods
- Updated crash data (2020–2025) and breakdown of truck-involved incidents

The applicant responded to this final request on the 26 November 2025, which is discussed in the body of the memorandum.

# Appendix A – AT Further RFI's

## Post submission information request 2

The Applicant had offered to investigate road widening on Hunua Road. AT sought to clarify the details of the road widening to determine its possibility and confirmation it will allow for two Scrabo trucks to pass each other. As part of this response the Applicant has confirmed that the widening is **NOT** accommodating the full truck and trailer vs truck and trailer.

AT provided this on the 15 December 2025 in order to give the applicant another opportunity to provide the information required. This list of information requested is summarised below:

- Road closures and traffic management during road widening works
- Feasibility of cutting in the rock face for road widening works
- Truck tracking over road seal and close to road safety barriers
- Upgrading the safety barriers

The Applicant responded to this final request on the 13 January 2026, which is discussed in the of the body of the memorandum.

# Memorandum

To: Matt Ford | Senior Development Planner | Network Operations Planning | Development Planning South

From: Paul Schischka | Consultant Transportation Engineer | PTM Consultants

Date: 16 January 2026

Subject: BUN60440759 - 362 Jones Road, Hunua

Revision: 1

## Background and Description of Proposal

1. Auckland Council have received a resource consent application for a new fill site proposed to be located at 362 Jones Road, Hunua. Auckland Council have requested advice from Auckland Transport on this application in relation to the potential traffic related effects on the public road network. PTM Consultants is assisting Auckland Transport to prepare this advice by providing specialist road safety and traffic engineering services.
2. The site location is shown in Figure 1.

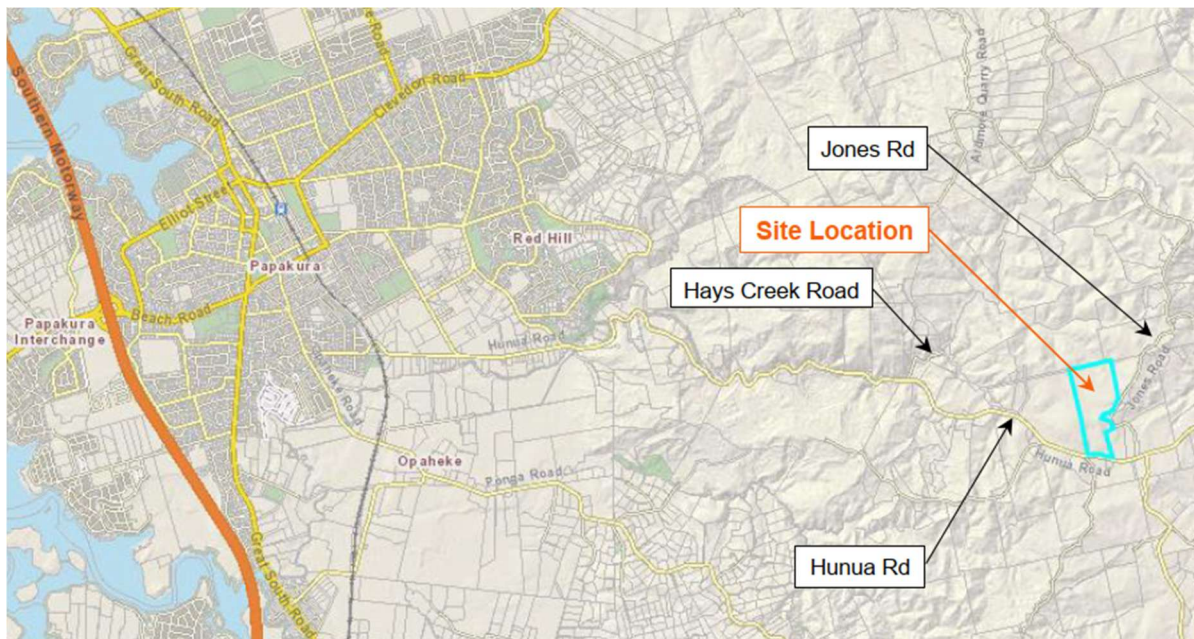


Figure 1: Site location: 362 Jones Road, Hunua. Source: Traffic Assessment Report prepared by Commute Transportation Consultants dated November 2024.

3. According to the Assessment of Environmental Effects (AEE) prepared Hodgson Planning Consultants dated November 2024 the site consists of two fill areas with a combined volume of 790,000m<sup>3</sup> of fill. The duration of the consent sought is 10 years.
4. The site is located on north-western corner of the intersection of Jones Road and Hunua Road. The proposed access is directly off Hunua Road. It is understood that truck access will be solely via Hunua Road to the west of the site and that no truck traffic will travel east of the site on Hunua Road or along Jones Road.

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5. The Traffic Assessment Report (TAR) provided with the AEE and prepared by Commute Transportation Consultants (Commute) dated November 2024 states that a maximum of 192 truck movements per day on weekdays will be generated by the site, and that *“trucks will vary in size from smaller single unit trucks (6-8m<sup>3</sup> capacity) through to larger articulated trucks and truck and trailers (10-18m<sup>3</sup>)”*.
6. The average number of truck movements per day will be 52. Daily truck traffic will be higher during the earthworks season (summer months) and is dependent on customer demand.
7. There are four distinct sections of Hunua Road to the west of the site entrance;
  - a. Between the site entrance and the intersection with Hays Creek Road Hunua Road passes through farmland. While the road cross-section in this part of Hunua Road does not have shoulders, the road alignment has less curves and higher curve radii than the section in the gorge immediately to the west. This section is approximately 2.3 km long.
  - b. To the west of Hays Creek Road Hunua Road enters a gorge. This section is characterized by a higher number of curves and lower curve radii. The carriageway is located between a cliff face on the south side and a fall into the Hays Stream on the north side. This section extends to the entrance to the Winstone Quarry (Hunua Quarry) and is approximately 2.1 km long.
  - c. Between the Winstone Quarry entrance and the intersection with Dominion Road Hunua Road. The Hays Stream is still to the north of the road, but for most of this section the stream is located much further away from the edge of the carriageway, and vehicles which leave the road are at much less risk of falling into the stream. The topography of the adjacent land is still relatively steep and there are still a high number of curves in the road, however this part of Hunua Road is frequently traversed by quarry traffic and the road has been modified to ensure it is suitable for heavy trucks. This section is approximately 2.0 km long.
  - d. West of the Dominion Road intersection Hunua Road enters an urban industrial area. The carriageway in this section has a mostly straight alignment, kerb and channel, wider traffic lanes, and a flush median separating east and westbound traffic. This section is very suitable for heavy truck traffic and is section approximately 2.3 km long.
8. I consider that the section of Hunua Road between the Hays Creek Road and the Winstone Quarry entrance to be the section where potential traffic safety related effects are most likely to occur as a result of increased heavy vehicle traffic from the proposal. This memorandum will focus mostly on this section of Hunua Road.
9. The topics covered in the memorandum have been requested by Auckland Transport.
10. The author of this memorandum drove Hunua Road between the site entrance and its western end on 22 September 2025.

## Inter-visibility Between Drivers Travelling in Opposite Directions Along Hunua Road

11. The applicant's traffic specialist has prepared vehicle tracking drawings showing the swept path for truck and trailer units passing through the section of Hunua Road located in the gorge between the Winstone Quarry entrance and the intersection with Hays Creek Road. This is the largest vehicle type which will be used to access the proposed fill site.

## Memorandum

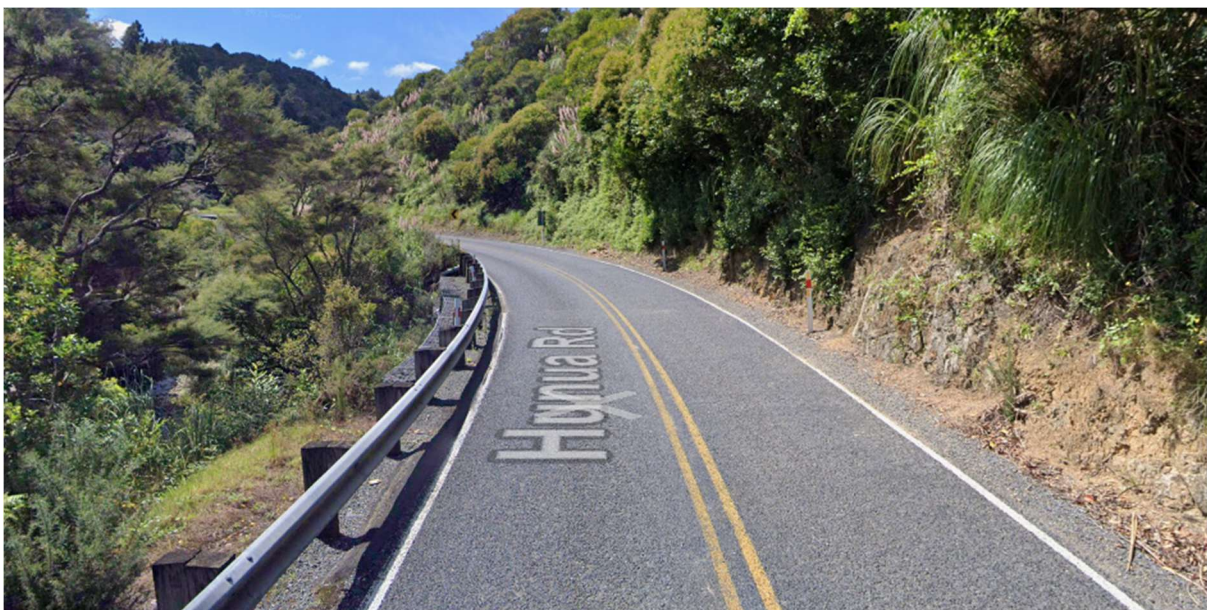
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12. There are several low radius horizontal curves in the road in this section and the tracking drawings show that the truck and trailer vehicles will need to pass over the centre line into the opposing traffic lane on some of the curves. This presents an increased risk of a head-on crash between vehicles travelling in opposite directions on these curves.
13. To address this potential traffic safety effect the applicant is has proposed to modify their proposal to include to widening of the carriageway in several locations in this section of Hunua Road.
14. I have reviewed the proposed widening, along with updated tracking drawings prepared by the applicant's traffic specialist. I consider that carriageway widening would be an adequate mitigation measure if appropriate widening were proposed, but I consider that widening proposed may not be sufficient. In particular I consider that, in order to stay within their lane the left side wheels of truck and trailer vehicles heading towards the fill site would need to track within 0.5m of some existing road safety barriers.
15. There are variety of types of road safety barrier in this section of Hunua Road. AT's engineering standards require that new road safety barriers in Auckland need to be of a type approved by NZTA. Approved types are listed in the appendices to NZTA's M23 Road safety barrier systems specification. Barrier systems are rated by their test level, which is the level of containment they are designed and tested to provide for different vehicle types, impact speeds, and angles.
16. The barrier types present in Hunua Road are not types which are designed to contain a truck and trailer unit sized vehicle. In some locations the road surface is not even and continuous all the way to the face of the barrier, which results in a potential situation where the wheels of a truck tracking close to the barrier face could become trapped between the barrier.
17. Tracking close to the barrier face presents a traffic safety risk to the drivers of the truck and trailer units visiting the fill site. If the driver misjudges the clearance between their vehicle and the barrier and collides with it, it may give way and, in a worst case scenario the vehicle could fall into the gorge.
18. It is likely that to minimise this risk truck drivers will position their vehicles further away from the barrier than indicated on the tracking drawings. However, this does mean more risk of a head-on crash with a vehicle travelling in the opposite direction.
19. Photos 1, 2, 3, and 4 below show the road safety barriers along with the corresponding vehicle tracking drawings prepared by Commute.

# Memorandum



*Photo 1: Road safety barrier next to gorge on Hunua Road. Corresponding Commute tracking drawing number 4B.*



*Photo 2 Road safety barrier next to gorge on Hunua Road. Corresponding Commute tracking drawing number 4C.*

# Memorandum



*Photo 3: Road safety barrier next to gorge on Hunua Road. Corresponding Commute tracking drawing number 4D.*



*Photo 4: Road safety barrier opposite the gorge on Hunua Road. Corresponding Commute tracking drawing number 4D.*

20. This matter has been put to the applicant who has responded with comments from their traffic specialist, Commute, stating that the widening shown on the tracking drawings is for a truck and trailer passing another truck and trailer (rather than truck and trailer vs van / ambulance which is the widening proposed by the applicant).

# Memorandum

21. The because the applicant is only proposing widening sufficient to allow a truck and trailer to safely pass a van / ambulance this means that truck and trailers will not be able to stay on the left side of the traffic lane though out this section of Hunua Road.
22. When truck and trailer crosses the centre line the driver of a vehicle travelling in the opposite direction may need to take evasive action to avoid a collision by positioning there vehicle toward the left edge of their lane.
23. This requires the driver of the other vehicle to see the approaching truck and trailer before the vehicles meet. In order to ensure that there is sufficient inter-visibility between drivers travelling in opposite directions the applicant is proposing to trim vegetation on the inside of four curves on the gorge side of Hunua Road. The locations of the vegetation to be trimmed are shown in Figure 2 below.

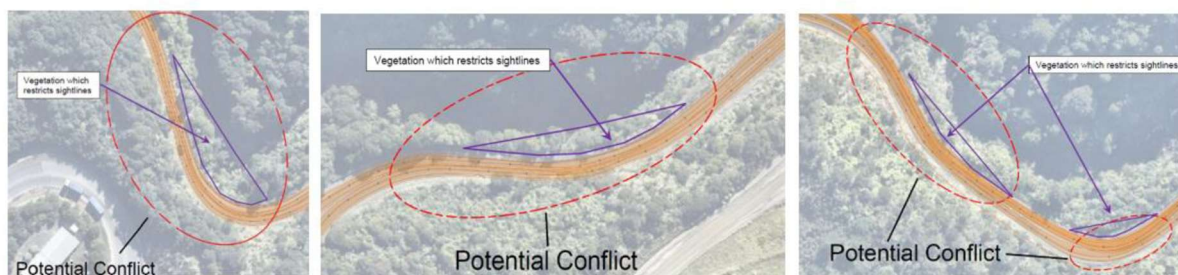


Figure 2: Locations where vegetation will be trimmed and maintained to maintain inter-visibility between drivers travelling in opposite directions.

24. Ongoing maintenance of the vegetation will be required to ensure that it does not grow back to interfere with visibility and my understanding is that the applicant is willing to agree to a condition to do this every six months.
25. While this vegetation removal allows drivers approaching a truck and trailer which has crossed the centre line near a curve sufficient time to take evasive action before a collision occurs this relies on the driver to pay sufficient attention to notice that they need to take this action. While most drivers will be focused on the driving task and will do this, not all will and a proportion of drivers will not take action to position their vehicles towards the left edge of their lane to provide space for the approaching truck to pass. There is still a potential risk of a head-on crash.
26. In summary, while I consider that the carriageway widening and vegetation trimming and maintenance proposed by the applicant are useful mitigation measures, and will reduce the risk of a head-on crash between a truck travelling to or from the fill site and another vehicle, it does not eliminate the risk and in my opinion the residual traffic safety effect of a potential head-on crash is still at the level which is unacceptable.

## Recorded Crash History on Hunua Road

27. The Traffic Assessment Report provided with the AEE prepared by Commute dated November 2024 contained an assessment of the recorded crash history data in the NZTA Crash Analysis System (CAS) crash database on Hunua Road between Jones Road and Dominion Road intersections for the period 2019 to 2023, as well as all available records for 2024 at the time the report was prepared.
28. During processing of the application the applicant was also asked to provide additional assessment of the recorded crashes, including crashes recorded from 2020 to 2024 as well as crashes uploaded for 2025, which they provided.

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29. Crash reports contained in CAS are provided by police. It should be noted that not all crashes which occur are reported to police, particularly less serious crashes, and it is likely that there are some crashes which have occurred in this part of Hunua Road which are not included in CAS.
30. I have also accessed CAS directly when preparing this memorandum.
31. The s92 response from Commute noted that there were a total of 39 crashes (20 non-injury, 14 minor-injury, five serious-injury) reported crashes.
32. The majority (26/39) were loss of control crashes. 12 of these were non-injury crashes, 11 were minor-injury crashes, and three were serious-injury crashes.
33. Of these four were head-on crashes, with the remainder typically being run-off-road type crashes where an out of control vehicle left the traffic lanes and collided with an object in the roadside area.
34. Increasing the amount of traffic on Hunua Road means that if a driver loses control of their vehicle it is more likely that another vehicle will be coming in the other direction at the same time, and a head-on crash is more likely to occur. If the oncoming vehicle is a truck then the likelihood of the crash resulting in serious injury to the occupants of the other vehicle is elevated.
35. Any proposal which increases the number of vehicles using Hunua Road will therefore increase the crash risk, especially if the additional vehicles are trucks, unless off-setting measures to help reduce the rate of loss of control crashes are implemented at the same time. I note that the applicant is proposing improvements such as road widening in the gorge, vegetation trimming, and road narrows warning signage. I consider that these improvements will help reduce loss of control crashes for all vehicle types, and mitigate the increased risk of an out of control vehicle colliding with a truck travelling to or from the proposed fill site.
36. Of the 39 crashes, five involved trucks, one on which was a minor-injury crash near the Dominion Road intersection involving a truck which stopped suddenly, two of which were serious-injury crashes on the same curve located between Dominion Road and the Winstone Quarry entrance which involved a car crossing the centre line and colliding with an oncoming truck, and a non-injury loss of control crash involving a truck but no other vehicles near the same curve, and a serious-injury loss of control crash on a curve involving an overturned truck but no other vehicles.
37. I consider that the two serious-injury head-on crashes on the same curve which occurred between the Winston Quarry entrance and Dominion Road to indicate a pattern in this location, however I note that in both cases it was the car rather than the truck which crossed the centre line, and that the number of trucks using Hunua Road west of the quarry entrance is already very high, and that relative to existing the proposal will only increase truck traffic in this section a little.
38. For this reason I consider that the recorded crashes west of the Winston Quarry entrance to be not relevant to the proposal.
39. There was only one recorded crash involving a truck between the Winston Quarry entrance and the site entrance. The recorded crash history for this part of Hunua Road shows that heavy vehicles are not disproportionately represented in the existing loss of control crash pattern.
40. I do not consider that the 13 recorded crashes which did not involve loss of control can be considered to be part of a pre-existing crash pattern which the proposal could potentially

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aggravate. These crashes are of a variety of types, are in different locations, and none involved death or serious injury.

## Applicant's Traffic Survey Data

41. The applicant has supplied a 7-day traffic survey on Hunua Road . This survey was undertaken between 18 March 2024 and 24 March 2024 east of the intersection with Gillispie Road. It is a tube count survey where a set of pneumatic tubes are laid across the traffic lanes and attached to a device that can measure and record the number of vehicles crossing the tubes, the speed of these vehicles, and classify the vehicles based on the number of axles and spacing between the axles. The classification is based on the 2011 NZTA Vehicle Classification Scheme. A chart showing the vehicle classes is appended as Appendix A.
42. The data survey data indicated that 25.4% of vehicles using the road were heavy commercial vehicles (HCV). Heavy vehicles are classes 4-13 for purposes of calculating the HCV percentage. The applicant presented this information as evidence that the road was already carrying a high proportion of heavy vehicles.
43. Based on my experience with traffic survey data for other sites I consider that 25.4 HCV% is unexpectedly high. There are no industrial sites or land uses like quarries or fill sites east of the position where the traffic survey was undertaken, and the HCV percentage would not typically be this high for roads mostly used for farm access.
44. The traffic survey results were provided in the form of a highly detailed spreadsheet using a standardised format for this type of survey. I reviewed the spreadsheet data and noted the following;
  - a. The class total table in the survey results spreadsheet shows that (over 7-days) there were 12,666 vehicles with 25.4% HCV.
  - b. However, of the HCV 2541 were class 4, the smallest size vehicle which can be considered heavy. Classes 5 to 13 were only 682 vehicles total.
  - c. Looking at the direction of travel there were 723 class 4 vehicles eastbound and 1818 class for vehicles westbound.
  - d. For classes 4 to 13 there were 341 in each of the east and westbound directions.
  - e. The eastbound/westbound direction split for classes 4 would be around 28:72 while for classes 5 to 13 it was exactly 50:50. I consider that the difference in direction split for just one class of vehicle to be anomalous. I have not encountered a situation before where there was such a clear difference in the direction split for just one class of vehicle. Normally where there is a big difference in the split between the direction of travel there is an obvious reason for the difference and it covers all classes equally.
  - f. The total for all classes was 6,185 eastbound and 6,481 westbound. So, while there are more westbound vehicles overall the difference between the split in directions is under 5%.
45. Auckland Transport has supplied me with traffic survey data for Hunua Road which was collected as part of their own traffic monitoring programme. This survey was undertaken in May 2025 between the intersection with Ponga Road and the intersection with Heald Road. This is to the east of the site and the position where the applicant undertook their survey, but I would not expect the type or number of vehicles using this part of Hunua Road to be significantly different to the part near the site. I reviewed the spreadsheet data and noted the following;

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- a. The May 2025 traffic survey results show that 4.6% of vehicles were heavy vehicles. This compares to a 25.4% HCV% from the applicant's traffic survey.
  - b. The daily total number of vehicles was 5,418 eastbound and 5,343 westbound. Total daily heavy vehicles were 239 eastbound and 252 westbound. This is in line with the applicant's traffic survey which showed nearly even numbers of eastbound and westbound vehicles when looking at all vehicle classes or all heavy vehicle classes.
  - c. Class 4 vehicles made up a high proportion of heavy vehicles, and comprised 65% (155/239) of eastbound and 50% (127/252) of westbound vehicles.
  - d. The eastbound/westbound split for class 4 vehicles was 55:45 This differs from the applicant's survey which showed a 28:72 eastbound/westbound split for class 4 vehicles.
46. Tube count survey's classify vehicles by the number axles and the spacing between axles. Under the 2011 NZTA classification scheme two axle vehicles with an axle spacing of between 1.75m and 3.2m are classified as Class 2 vehicles while two axle vehicles with an axle spacing of 3.2m or more are classified as Class 4 vehicles. This means that some SUV vehicles (for example Ford Ranger) and Vans (for example Toyota HiAce) with axle spacing of 3.2m or more may be classified as Class 4 vehicles and grouped with much larger two axle trucks.
47. I recommend that an additional traffic survey is undertaken to confirm if the March 2024 traffic survey was accurate.

## School Bus Stops

48. The Hunua School Parent Teacher Association (PTA) submission identified that there are currently school bus stops in the following locations on Hunua Road west of the site;
- 1852 Hunua Road (opposite the site entrance)
  - Hunua Road at Gillespie Road, Hunua
  - Hunua Road at Middleton Road, Hunua
  - 1712 Hunua Road, Hunua (top of the gorge hill)
  - 896 Hunua Road (bottom of the gorge hill)
  - Walkers Bush, Hunua Road, Papakura.
49. As is typical for rural school bus stops, these stops are not signposted nor do they have any formal bus infrastructure like a shelter or hardstand for waiting passengers. With the exception of the Walkers Bush stop, they are not connected to the footpath network. School bus stop locations can vary from year to year based on the location of the houses of children living or near the school bus route.
50. The Walkers Bush site is located on Hunua Road mid-way between the intersections with Boundary Road and Dominion Road. This location is urban and has footpath, kerb and channel on both sides. This location presents no more of a safety risk than a standard urban public bus stop and I consider that the increase in truck traffic passing this stop associated with the proposal will have a negligible impact on traffic and pedestrian safety near the stop.
51. The other five stops are located in rural locations without footpath kerb or channel. Two are located near intersections and the others at vehicle crossings. At each there are

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there are either shoulder areas, vehicle crossings, or relatively flat berm areas which a waiting child could stand on outside of the traffic lane.

52. This type of arrangement is typical for school bus stops in rural locations. The stops on Hunua Road should not be considered unusual. Crashes involving pedestrians near school bus stop are not common, but occasionally occur and drivers are required to slow to 20 km/h when meeting or overtaking a stopped school bus by Section 5.6 of the Land Transport Rule: Road User 2004 to help reduce the risk of a crash involving a pedestrian near a school bus.
53. As mitigation against a potential crash involving a vehicle travelling to or from the site the applicant has proposed that W16-6.1 “school bus stop route” signs be installed to warn drivers of the potential presence of children using the school bus stops.
54. Auckland Transport has recommended that the applicant also be required to provide additional signage at the stops themselves as additional mitigation.
55. My understanding is that drivers accessing the site will be employed by the consent holder. I recommend that as further mitigation the a condition of consent be set which requires the consent holder to inform new drivers of the location of the school bus stops near the site and to exercise additional caution as part of their health and safety procedures, with a refresher at the start of each school year to account for any changes in stop locations.
56. Even with these mitigation measures there is still some residual pedestrian safety risk associated with the school bus stops. As described in the section of this memorandum covering the recorded crash history on Hunua Road there is a pre-existing pattern of loss of control crashes on Hunua Road. This crash type will typically involve a vehicle leaving the carriageway and entering the roadside area. Should this happen at a school bus stop and coincide with a period while people are waiting for a bus then, given the vehicle operating speeds on Hunua Road, a pedestrian stuck by a vehicle, whether it is a car or a truck, is highly likely to be killed by the impact. Any activity which increases the volume of traffic, like the proposed fill site, increases the risk of a crash at the school bus stops proportionate to the increase in traffic over existing.

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**Disclaimer / Important note:**

*The views and comments expressed by PTM Consultants within this memorandum are made without prejudice, on the applicant's proposal. Specialists have not conducted a specific review for design and standards compliance. We reserve the right to add to our comments in the future should there be any further changes or information presented. This memorandum has been compiled for the use of Auckland Transport and Auckland Council only and is not to be amended, used, forwarded or circulated without the written permission of PTM Consultants. It is an express condition of the supply of this information that the recipient is responsible for verifying its content, correctness, and completeness. PTM Consultants accepts no liability or responsibility for any error, loss or damage suffered by the recipient arising out of, or in connection with, the use or misuse of this information.*

# Memorandum

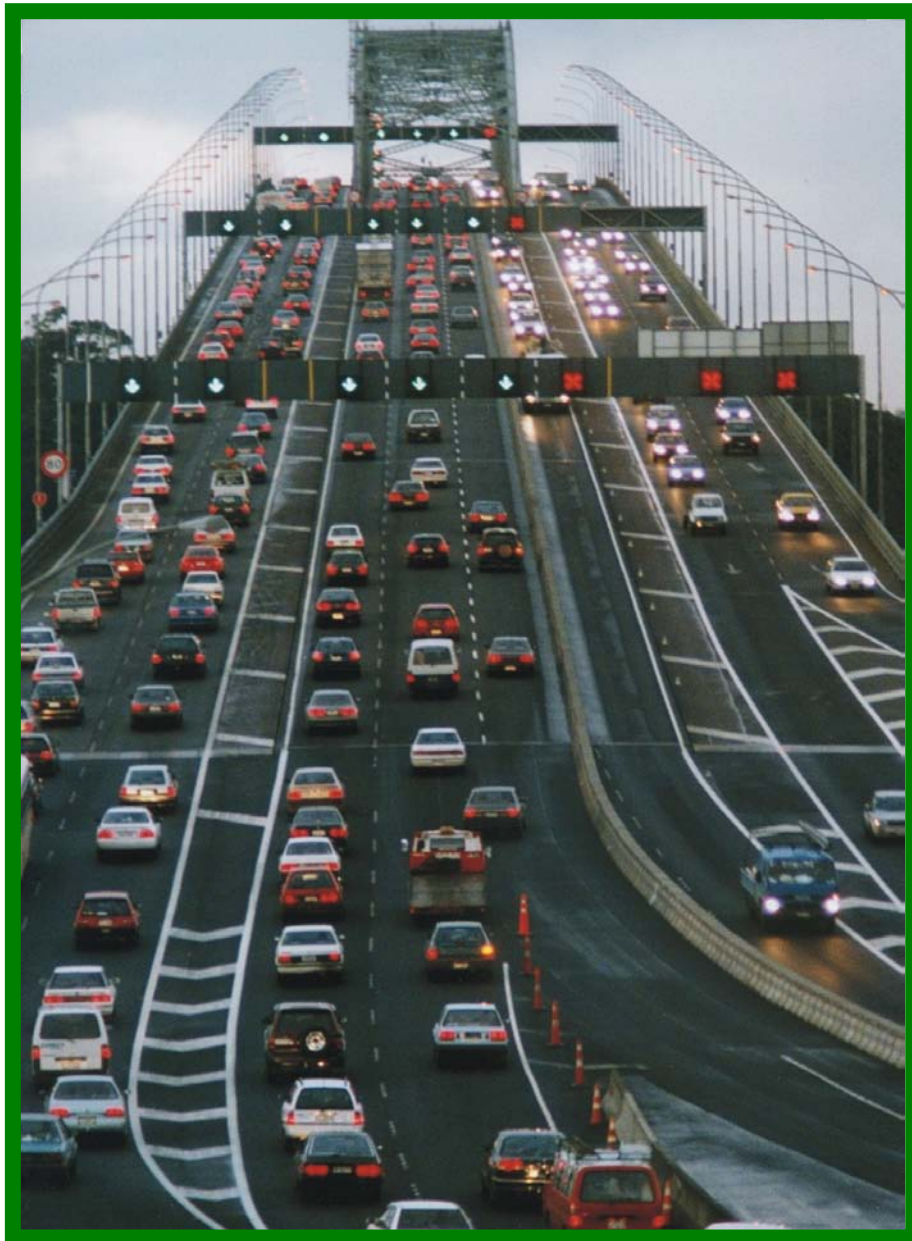
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## ***Appendix A: 2011 NZTA Traffic Classification Scheme***

## Vehicle Classification Scheme (NZTA 2011)

NZTA Axle Class	Vehicle Types in Class	Axles	Groups	Criteria	Maximum axle spacing < 10m			Length Range (WIM data)	NZTA EEM Class	Light or Heavy	NZTA Length Class	Austroads 1994 Class
					AS1-2	AS2-3	AS3-4					
1	oo (very short 2 ax veh = motorbike)	2	1	2 ax, AS 1 criterion	>=0.5, <1.75	-	-	>1.5 - 2.5	(PC)	Light	VS	1
2	o-o (short 2 axle vehicle = car)	2	2	2 ax, AS 1 criterion	>=1.75, < 3.2	-	-	2.5-5.5 (4-6)	PC & LCV	Light	S	1
3	o-o-o (car towing 1 axle trailer)	3	3	3 ax, AS 1,2 criteria	>2.1, < 3.2	>2.1	-	7 -11	PC & LCV	Light	M	2
	o-o-oo (car towing tandem trailer)	4	3	4 ax, AS 1,3 criteria	>2.1, < 3.2	>2.1	<=1.0	8 -13			M	2
	o-o-o-o (car towing car)	4	4	4 ax, AS 1,2,3 criteria	>2.1, < 3.2	>2.1	>2.1	10 -15			M	2
4	o----o (truck or bus)	2	2	2ax AS 1 criterion	>=3.2m	-	-	5 - 12	Bus & MCV		M	3
	o-o-o-o (truck towing light trailer)	3	3	3 ax, AS 1,2 criteria	>=3.2m	>2.1, <=6.8	-	8 -16			L	6
	o-o-oo (truck tow light 2 ax trailer)	4	3	4 ax, AS 1,3 criteria	>=3.2m	>2.1	<=1.0	9 -17			L	7
5	o-oo (truck or bus/coach)	3	2	3 axles, 2 groups	>=3.2m	<=2.1	-	7 -12	Bus & HCV1	Heavy	M	4
	o-oo (tractor without semi-trailer)	3	2	3 axles, 2 groups	>2.1, < 3.2	<=2.1	-	6 -8			M	4
	oo-o (twin steer truck)	3	2	3 axles, 2 groups	<=2.1	-	-	7 -12			M	4
	o-o-----o (artic e.g. bread truck)	3	3	3 ax, AS 1,2 criteria	>=3.2m	>6.8	-	11 -17			L	6
	o-oo--o (truck tow light 1 ax trailer)	4	3	4 ax, AS 1,2,3 criteria	>=3.2m	<=2.1	>2.1	10 -17			L	7
	oo-o--o (twin steer tow 1 ax trailer)	4	3	4 ax, AS 1,3 criteria	<=2.1	-	>2.1	10 -17			L	7
6	oo-oo (heavy truck)	4	2		<=2.1	-	>1.0, <=2.1	7 - 13	HCV1	Heavy	M	5
	o-ooo (heavy truck)	4	2	4,5 axles, 2 groups	>2.1	<=2.1	>1.0, <=2.1	7 -11			M	5
	oo-ooo (heavy truck)	5	2		-	-	-	8 -13			M	5
7	o-o-oo (artic A112)	4	3	4 ax, AS 1,2,3 criteria	>2.1	>2.1	>1.0, <=2.1	12 -18	HCV1	Heavy	L	7
	o-oo-o (artic A121)	4	3	4 ax, AS 1,2,3 criteria	>2.1, <3.2	<=2.1	>2.1	12 -18			L	7
	o-o-o-o (truck tow heavy trailer)	4	4	4 axles, 4 groups	>=3.2	>2.1	> 2.1	13 -17			VL	7
8	o-oo-oo (truck tow light trailer)	5	3		-	-	-	10-18	HCV2	Heavy	VL	8
	o-oo-oo (artic)	5	3	5 axles	-	-	-	12-17			L	8
	o-o-----ooo (artic)	5	3		-	-	-	12 -17			L	8
	o-oo-o-o (T+T)	5	4	3,4,5 groups	-	-	-	13 -18			VL	8
	o-o-o-o-o (mobile crane)	5	5		-	-	-	10 -13			L	8
9	o-oo-ooo (artic)	6	3		-	-	>2.2, <12.0	13 -18	HCV2	Heavy	L	9
	oo-oo-oo (artic)	6	3		-	-	-	13 -18			L	9
	o-ooo-ooo (artic)	7	3	6-8 axles	-	-	-	> 16			L	9
	o-oo-oooo (artic)	7	3	3 groups	-	-	-	> 17			L	9
	oo-oo-ooo (artic)	7	3		-	-	-	-			L	9
	oo-oo-oooo (artic)	8	3		-	-	-	-			L	9
	o-ooo-oooo (artic)	8	3		-	-	-	-			L	9
10	o-oo-o-oo (T+T)	6	4		-	-	-	-	HCV2	Heavy	VL	10
	oo-o-o-oo (T+T)	6	4		-	-	-	-			VL	10
	oo-oo-o-o (T+T)	6	4	6 axles	-	-	-	-			VL	10
	o-oo-o-o-o (T+T)	6	5	4,5 groups	-	-	-	-			VL	11
	o-o-oo-o-o (A train)	6	5		-	-	-	-			VL	11
	o-oo-o-o-o (A train)	6	5		-	-	-	-			VL	11
11	o-oo-oo-oo (T+T)	7	4		>2.2m	-	-	-	HCV2	Heavy	VL	10
	o-oo-oo-oo (B train)	7	4	7 axles, not twin steer	>2.2m	-	-	-			VL	10
	o-oo-oo-o-o (A train)	7	5	(AS 1 criterion)	>2.2m	-	-	-			VL	11
12	oo-oo-o-oo (T+T)	7	4		<=2.2m	-	-	-	HCV2	Heavy	VL	10
	oo-o-oo-oo (T+T)	7	4		<=2.2m	-	-	-			VL	10
	oo-oo-oo-oo (T+T)	8	4		<=2.2m	-	-	-			VL	10
	oo-oo-oo-ooo (T+T)	9	4	7-11 axles	<=2.2m	-	-	-			VL	10
	oo-oo-oooo-oo (T+T)	9	4	twin steer	<=2.2m	-	-	-			VL	10
	oo-oo-oooo-ooo (T+T)	10	4	(AS 1 criterion)	<=2.2m	-	-	-			VL	10
	oo-oo-oooo-oooo (T+T)	10	4		<=2.2m	-	-	-			VL	10
	various (twin steer A train)	7-11	5		<=2.2m	-	-	-			VL	11
13	o-oo-ooo-oo (B train)	8	4		>2.2m	-	-	-	HCV2	Heavy	VL	10
	o-oo-ooo-ooo (B train)	8	4		>2.2m	-	-	-			VL	10
	o-oo-oooo-ooo (B train)	9	4		>2.2m	-	-	-			VL	10
	o-oo-oooo-oooo (B train)	10	4	8-11 axles	>2.2m	-	-	-			VL	10
	o-oo-ooo-o-o (A train)	8	5	not twin steer	>2.2m	-	-	-			VL	11
	o-oo-ooo-o-o (A train)	8	5	(AS 1 criterion)	>2.2m	-	-	-			VL	11
o-oo-ooo-o-oo (A train)	8	5		>2.2m	-	-	-	VL	11			
14		any	-	Everything else	-	-	-					

NZTA Length Class: VS= 0.5-2.0m S=2.0-5.5m M=5.5-11m L=11-17m VL>17m  
 Axles: Number of axles  
 Groups: Number of axle groups ( an axle group is where axles are less then 2.1m apart.  
 AS1-2: Distance between first and second axle  
 AS2-3: Distance between second third axle  
 AS3-4: Distance between third and fourth axle



**Traffic Monitoring for  
State Highways**



# TRAFFIC MONITORING FOR STATE HIGHWAYS

Manual Number: SM 052

Effective from: May 2004

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**TRAFFIC MONITORING FOR  
STATE HIGHWAYS**

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**State Highway Management Division**

**Date of issue: May 2004**

## **Manual Management Plan for Traffic Monitoring for State Highways**

**Manual Owner:** Chris Parkman (Asset Management Information Manager)

**Sponsor Endorsement:** Dave Bates (National Operations Manager)

### **1. Purpose**

This is the Manual Management Plan for the above SHMD Manual.

*[In accordance with Transits ISO 9001 Quality System, Manual Owners are expected to complete this form for all manuals]*

### **2. Document Information**

Manual Name	Traffic Monitoring for State Highways Manual
Manual No.	SM 052
Regional Champion	Regional Asset Manager
Review Team Members	Dave Bates Mark Owen Dave Robertson Roger McLeay

### **3. Amendment and Review Strategy**

All Corrective Action/Improvement Requests (CAIRs) suggesting changes will be acknowledged by manual owners.

	Comments	Frequency
Amendments (of a region nature)	To be forwarded to Manual Owner	Annually
Review (major changes)	Reviewed in March	Annually

## Foreword

Transit New Zealand is committed to planning, developing and maintaining the state highway system in a way that contributes to an integrated, safe, responsive and sustainable land transport system for New Zealand.

To achieve this mission, Transit must have reliable information about the road users in terms of traffic volumes, vehicle mix and traffic loading.

This manual describes the current methodology for traffic monitoring, the technology involved, conventions, survey guidelines, calculations and an overview of the software system. It also describes the current strategy for what data will be collected, where and how often. The expectation is that this strategy will be updated: as data is collected and analysed, as the strategic direction is developed and, as other related systems such as weight enforcement.

As with all information systems, there is scope for improvement, but the implementation of the Traffic Monitoring System, and supporting contracts, has resulted in Transit realising the goal of a consistent supported traffic collection and storage system.

The future in traffic monitoring holds challenges in: technology, congestion, data management systems and fundamental philosophies e.g. classifications, Weigh in Motion. The Traffic Monitoring System provides an excellent base on which all traffic data from around New Zealand could be held.

Rick van Barneveld  
Chief Executive (Acting)

## **Document Status**

This document has the status of a guideline (G) as defined in Transit New Zealand's *Standards and Guidelines Manual*.

The objectives of the manual are to set out Transit New Zealand's policies and procedures for traffic monitoring for the state highway network in a manner that meets Transit New Zealand's goals.

The content is based on Transit New Zealand's current practices and those developed in the past from experience in traffic monitoring.

While all care has been taken in compiling this document, the Transit New Zealand Authority accepts no responsibility for failure in any way related to the application of this guide or any reference documents noted in it. There is a need to apply judgement to each particular set of circumstances.

## Amendment Procedures

The next amendment will be issued to manual holders in the form of a reissue, if necessary.

Amendments will be distributed to all organisations and individuals on the list of registered manual holders. If you wish to check that you are on this list, or change the number of copies that are sent to your organisation, please contact:

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### Record of Manual Amendments

No.	Pages Amended	Description	Effective Date	Updated by
1	v, vi, vii, and viii	Amendment procedure update	2/7/2004	N Beckett
2	i, vi and A.1	The contact phone number and vehicle classification scheme update	1/11/2011	G Wen

# AMENDMENT LIST REGISTRATION FORM

*[Note: this form must be returned to ensure receipt of amendments]*

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## **Glossary of Terms**

**3G** Third Generation

**AADT** Annual Average Daily Traffic (vehicles/day)

**ATMS** Advanced Traffic Management System

**CVIU** Commercial Vehicle Investigation Unit

**ESA** Equivalent Standard Axles

**GPS** Global Position Systems

**LRMS** Location Referencing Management System

**RAMM** Road Assessment and Maintenance Management

**TMS** Traffic Monitoring System (the software database)

**VKT** Vehicle Kilometres Travelled (sum of the products of AADT and Link Length)

**WiM** Weigh in Motion

**RUC** Road User Charges

# TRAFFIC MONITORING FOR STATE HIGHWAYS

A robust Traffic Monitoring Method is an essential part of any transportation management system. It primarily relies on accurate data collection procedures and an efficient means of storing that data for subsequent retrieval and analysis. Transit New Zealand has been developing its Traffic Monitoring Method over the past 10 years and this document provides an overview, including details of the objectives, principles, procedures and applications.

## 1. INTRODUCTION

The following document describes Transit New Zealand's Traffic Monitoring Method, detailing the objectives, principles, procedures and applications of the strategy, and stems from an aggregation of initiatives originally recommended by Transit's Traffic Monitoring Group in 1993. These and other initiatives now implemented include:

- A means of representing the entire state highway roadway system in terms of nodes and links
- An appropriate vehicle classification scheme for the vehicle fleet using the state highway system
- The Traffic Monitoring System (TMS) software facility
- Contracts for regional traffic data collection

These are explained in greater detail in subsequent sections of this document. Additionally it should be noted that this is a 'living' document and will continue to be developed as a result of information and experience gained from the use and ongoing progressive development of the system, along with other advances gleaned from research being carried out by Transit and the transport industry in general.

## **2. BACKGROUND**

Transit New Zealand was created by the Transit New Zealand Act 1989, which came into effect on 1 October 1989. In the forty years prior to that date, control of New Zealand's roads progressed through the Main Highways Board, the National Roads Board and the Ministry of Transport. Through these various bodies, Transit New Zealand inherited the Traffic Monitoring infrastructure and systems, which exist today.

In 1989 the Vogel Computer Centre supplied the computing resources required to manage the entire system as part of the Ministry of Works and Development. When the Vogel Computer Centre was privatised in 1993, it became necessary to investigate alternative resources to handle Transit's computing requirements.

Transit's Computer Services Division was commissioned to carry out investigations of what was required in terms of computing resources and report on the options available. Stage 1 of the investigations involved carrying out a comprehensive User Requirement Survey and the findings of this survey were disseminated in 1994. Based upon those findings, it was estimated that a prototype computer system that would encompass what the majority of what users thought was needed would cost in the order of two million dollars. Additionally the survey highlighted the issue that the data collection infrastructure then in place was not capable of delivering all that was actually needed.

Subsequently it was recognised that a formal long-term strategy plan for Traffic Monitoring was required to be established before committing to expensive inappropriate computer systems. Accordingly, in 1996, a project was commissioned to address the development of a robust mechanism to achieve this.

The first phase of the project involved the investigation of the feasibility of the node/link network concept for the state highway road system. The outcome of the investigations from this first stage was that the node/link methodology was adopted, and contracts to install loop count stations were awarded in 1998/1999. In this regard, the first contract dealt with the Napier, Wanganui and Wellington regions, followed by a contract for the entire South Island and finally one for the Auckland and Hamilton regions.

A subsequent phase for the project investigated a convenient method for categorising vehicles based on the composition of the New Zealand vehicle fleet and from this the Transit New Zealand Vehicle Classification Scheme 1999, was developed and is currently in use. A copy of this scheme is shown in Appendix A.

The next important phase involved the development of a comprehensive computer system for managing all the traffic count data from the various data collection sites. This system was implemented in 2000.

### **3. OBJECTIVES**

A reliable estimate of state highway road usage is vital to the routine management and future planning of the highway infrastructure and other transport systems associated with it.

A system that delivers this information effectively and efficiently will ensure that appropriate decisions concerning the road network are made in accordance with the best business practices. This is in line with Transit's overall mission "To plan, develop and maintain the state highway system in a way that contributes to an integrated, safe, responsive and sustainable land transport system for New Zealand".

## **4. BASIC COMPONENTS OF THE METHODOLOGY**

Transit's Traffic Monitoring Method essentially comprises the following key elements:

- A node/link network
- Traffic sampling method (Managed Regionally by Regional contracts)
- Continuous Telemetry monitoring system (Managed Nationally by contract)
- Traffic Monitoring System (TMS) Database to share and manage traffic data.

All these are described in greater detail in the following sections of this document.

### **4.1 Node/Link Network**

The core component of the Traffic Monitoring Method is the node/link network model. In general terms, this network provides a convenient means of representing the entire state highway roadway system in a discrete manner, such that an appropriate traffic monitoring regime can be easily applied and managed. Each link in the network is defined as having reasonably consistent traffic volumes and composition (vehicle mix) travelling along its length. Additionally, in association with each link are two nodes, which define the start and end of the link.

In the development of the network model, certain rules were devised for the location of nodes and they can be listed as follows:

- based on the change in estimated AADT values in the RAMM database, that is where:
  - the AADT changed by more than 10% and 3,000 vpd, or
  - the AADT changed by more than 15% and 1,500 vpd, or
  - the AADT changed by greater than 25% and 750 vpd, or
  - the AADT changed by greater than 40% and 350 vpd
- based on the locations of Reference Stations along the state highways, although nodes were not assigned to every Reference Station
- based on urban and rural transition boundaries (as identified by 50km/hr and 70km/hr speed restrictions) except in situations where the resultant link was less than 1km in length
- based on the locations of interchanges or intersections on motorway routes and roads with divided carriageways in 100km/hr zones
- based on start and end points of all State highways and State highway junctions.

Additionally, and except for a small number of low volume roads in the South Island, the maximum link length was set at 50km.

Further refinement of the model was achieved through consultation with the Transit regional offices and resulted in the adjustment of node locations such that they coincided with actual points of traffic inflow/outflow, generally at intersections with major arterial roads or other state highways.

A description of the current node/link network can be obtained from the TMS (see Section 6.3).

In 2000 there were approximately 800 links defined in the network model. In 2001 a further 300 links were added to include data obtained from the Advanced Traffic Management System (ATMS) being progressively installed along the Motorway network in Auckland.

In 2002 recognition was also made of the fact that the RAMM database considers divided carriageway sections of road as having separate links for each direction of travel. Therefore directional links were inserted into TMS for these divided carriageway sections to facilitate the smooth export of traffic data from TMS into RAMM.

In terms of data collection, one traffic count station is assigned to each link. The exact location of the count station along the link is fixed and should not be changed except for reasons of safety, data reliability or changes made to the node/link network. Link volumes on some high capacity motorways are calculated rather than directly surveyed and is achieved by measuring on or off-ramp traffic and incrementally adding or subtracting volumes to the known or calculated volumes on the immediately adjacent links.

In other places where there are short lengths of divided carriageway, “Virtual” sites have been created based on adjoining count station sites in order to provide a count value for these links. This also applies across Regional boundaries where a node point is required at the boundary. One count station applies to both links on each side of the boundary, so a “Virtual” site (Based on the actual count station) is created to ensure both links have their own unique count station.

#### **4.2 Traffic Sampling Strategy**

The statistical processes required for determining an appropriate and robust sampling method for traffic monitoring are complex given the large number of variables involved. It was decided that a ratio of continuous to non-continuous sites of 1:10 would be adequate to provide the level of accuracy required, at least until a full statistical audit can be carried out.

The data gathered at these continuous sites are used to factor the counts obtained at non-continuous sites so that seasonal variations in traffic volumes can be accounted for. Central to this rationale is the relationship of traffic flow patterns between the continuous and non-continuous sites.

The frequency of monitoring non-continuous sites is primarily determined as follows:

<b>Volume</b>	<b>AADT</b>	<b>Minimum number of 7 day periods per year</b>
Low	<1,000	Two
Medium	1,000 to 10,000	Four
High	10,000 >	At least Four

The fundamental objective of the traffic sampling method is to improve and optimise the sampling regime based upon a detailed statistical analysis of the data collected from all sites over a three year period.

#### **4.2.1 Telemetry Monitoring System**

The term “telemetry” denotes the 70 (approximate) continuous traffic monitoring stations located around the country, of which 4 are WiM sites, from which data is remotely downloaded via modem on a routine basis. These telemetry stations operate continuously throughout the year and provide a good indication of the variations in traffic volumes over the months of a year. The variations in traffic volume at these telemetry sites are used to adjust traffic counts from sites that are monitored less frequently.

Currently all telemetry sites are managed centrally by a National Telemetry Network Management Contract administered by Transit’s National Office.

There are essentially two types of telemetry stations:

- Count/classification stations
- Weigh in Motion (WiM) stations

At telemetry count/classification stations a rough breakdown of traffic mix is recorded based upon approximate vehicle lengths. These are then separated into four categories, 0.5 to 5.5m, 5.5 to 11.0m, 11.0 to 17.0m and 17.0 to 35.0m. Typically, the heavy vehicle proportion is calculated as being the sum of vehicles in the greater than 11.0m categories plus half of the vehicles in the 5.5 to 11.0m category.

At the WiM (or Weigh-In-Motion) stations the approximate axle loads of individual vehicles can be recorded.

Data is downloaded and checked on a regular basis. In the event of a fault being detected, the National Telemetry Network Management Contractor is required to carry out the necessary repairs to malfunctioning equipment. In order to maintain the integrity of the overall monitoring system and ensure usefulness of the data collected at these continuous sites, the maximum length of downtime for a telemetry station should be no more than 7 days (or 2% of a year).

Listings of count/classification telemetry stations and WiM stations are provided in Appendices B and C respectively.

#### **4.2.2 Regional Traffic Monitoring Contracts**

All of the traffic monitoring at non-continuous count stations is managed by the Transit Regional Offices. In this respect, a standard pro-forma contract has been developed to ensure that the contracts are consistent throughout the country.

The contracts specify that traffic data is to be collected on lane-by-lane basis, at 15 minute intervals for a continuous 7 day period up to four times a year. The types of data collected are vehicle counts and vehicle classifications. Transit’s vehicle classification scheme based on vehicle length was developed in 1999 to reflect the composition of the New Zealand vehicle fleet.

Contracts are designed such that the contractor is responsible for ensuring the integrity of the data recorded. The Transit Regional offices are required to audit this data and carry out random field checks to ensure the contractor meets Transit’s requirements and the data collected is valid.

### 4.3 TMS (Traffic Monitoring System)

The heart of the Traffic Monitoring Method is the TMS software database. This is an internet-based Oracle database system, which stores all traffic data routinely collected on the entire state highway network. Access to the system is restricted by Transit and can only be accessed by users with a valid username and password.

The system has been specifically designed so that data can be readily loaded into the system and then be extracted from the system in summarised format by any authorised person via a computer equipped with an internet connection. A description of how to use the system is continually being updated as new advancements to the software are developed. The most recent version of the TMS User Guide is available from the TMS internet site: <http://tms.transit.govt.nz>. It is expected that all authorised users should be thoroughly familiar with the contents of this guide.

Data is uploaded into the system by the regional traffic monitoring contractor /consultant via a secure internet connection. It is the responsibility of the respective traffic monitoring consultants to ensure the integrity and reliability of the data before the uploading process. The software system is capable of performing a number of basic validation checks on the information uploaded and warns consultants of data anomalies subsequent to the uploading process.

Under certain circumstances and when errors are detected, the system will reject particular datasets. When data is rejected in this manner, both the consultant and the TMS regional administrator are notified and it is then the responsibility of the consultant to recheck the data and provide a reasonable explanation to the administrator as to why the data has failed the system checks. If the Regional TMS Administrator is satisfied with the contractors explanation the loadset can be accepted by the Regional TMS Administrator. However, if a satisfactory explanation is unable to be provided, the data for that particular count is to be rejected and a new count survey for the site is required under the terms of the traffic monitoring contract. A flowchart illustrating the process is provided in Appendix D.

The software system is capable of manipulating the raw data to calculate summarised data such as, AADTs, vehicle composition and ESAs for each count site. These summaries are then readily available to end users through the TMS internet site. Calculated and summary data can also be transferred to other transportation systems such as the RAMM system and for this reason, consistency in terms of location referencing of count sites, nodes and links is a fundamental requirement of the system.

## 5. IDENTIFICATION OF COUNT STATIONS

A special system for identifying count stations has been developed for use with TMS. Each count station is required to have at least the following details:

- route position number
- unique site reference number
- Transit region
- description of the site
- status of the site (active or obsolete or virtual)
- site type (continuous or non-continuous)
- lane information (for each lane)
- related control site (where applicable).
- whether or not the count data is exported to RAMM
- if “Virtual” details of where the count data is obtained

Additional site or locality information can also be supplied if necessary. All information stored against a particular site enables it to be readily and efficiently identified and located within the state highway network.

### 5.1 Site Numbering

As noted earlier, each count station is required to have a unique site reference number assigned to it. In TMS, this takes the form of an eight character alphanumeric identifier in the format "sssdnnnn" where:

- sss is a three character code that identifies the state highway on which the count station is located
- d is a direction code, a number between 0 and 6, defined as follows:
  - 0 = both directions
  - 1 = increasing direction
  - 2 = decreasing direction
  - 3 = increasing on ramp
  - 4 = decreasing off ramp
  - 5 = decreasing on ramp
  - 6 = increasing off ramp
- nnnn is a four digit code which provides the approximate running distance to the count site and is determined by adding the previous reference station number and the displacement in kilometres from the reference station.

By way of example, the site "00220937" represents the count site on State Highway 2, measuring volumes in the decreasing direction, at a location approximately 937 kilometres from the start of State Highway 2.

## **6. TRAFFIC MONITORING TECHNOLOGY**

The various technological components within the system can be broadly separated into three categories as follows:

### **6.1 Data Communications**

This refers to the method of extracting the data that has been recorded by the roadside equipment. Data extraction can be carried on site (via laptop computer and data cables) or remotely by using a modem and telecommunications.

### **6.2 Data Logging Equipment**

The data logging equipment is an electronic device or computer which collects, processes and stores the data recorded from the vehicle sensors/detectors.

### **6.3 Vehicle sensors/detectors**

Sensors/detectors are the devices, which are connected to the data logging equipment in order to detect the presence of a vehicle or axle and thereby obtain a count of the number of vehicles passing the data collection point. They can be separated into two distinct categories:

- Vehicle Presence
  - Video imaging
  - Infra red
  - Radar
  - Laser
  - Inductive Loop
  
- Axle
  - Pneumatic tube
  - Treadle
  - Piezoelectric cables
  - Laser
  - Fibre optic
  - Capacitance strip
  
- There are also special types of axle detectors, which are capable of measuring axle loads while vehicles are in motion. These include bending plate detectors and load cell detectors.

All these detectors can be used in various combinations or configurations depending on the type of roadside equipment they are connected to and the type of information required.

Some examples of the types of detectors used in New Zealand include:

- Video imaging as used on the Auckland and Wellington ATMS
- Infra red technology as used on the Auckland Harbour Bridge telemetry site
- Radar technology as used on the ACC/Police Speed trailer
- Inductive loops as used for traffic signals and many of Transit's count sites
- Pneumatic tubes of the kind commonly used throughout New Zealand by all Road Controlling Authorities
- Piezoelectric cables as used on fixed speed camera sites and the Pukerua Bay telemetry site
- Bending plate/load cell detectors as used at the WiM sites and CVIU enforcement stations

The most common of these in terms of Transit's traffic monitoring system are the pneumatic tube, piezoelectric cable, inductive loop and bending plate detectors. The following sections detail the way each of these work.

### **6.3.1 *Pneumatic Tube***

This technology relies on a flexible tube being laid across a roadway and attached to data logging equipment on the side of the road. The impact of a wheel on the flexible tube generates a pressure pulse, which is detected by an air switch and recorded in the memory bank within the data logging equipment. Extraneous pulses or bounces are filtered out by electronics or software within the data logging equipment itself.

In its simplest configuration, with one tube laid across a roadway, axle counts can be collected. Axle counts are simple to obtain and only require one tube per lane. However it requires the application of an "axle factor" to convert axle counts into vehicle counts. For example, if all vehicles were "2-axled" then the axle factor would be 2, such that the total number of vehicles passing the count site would be the total axle count divided by 2. Where there are many multi-axled vehicles passing the site, the axle factor would accordingly be higher. Derivation of an appropriate axle factor is paramount to the accuracy of the vehicle count at a particular site.

Please note: Transit New Zealand 's contract specifications do not permit the use of single tube axle detectors in the normal traffic counting programme. Two-tube classifiers are to be used at all count sample sites where traffic volumes are being surveyed in order to obtain vehicle counts, classes, direction of travel, intervals and speed data.. The additional cost of laying two tubes across the traffic lanes compared to one is minimal since the greatest cost is getting the equipment to and from the site. The greater accuracy and level of information collected with two-tube classifiers is far greater than any time saved on site by using a single tube axle detector and calculating an axle factor to get vehicle counts.

With the use of only one length of tube, the lane in which the vehicle is travelling or the direction of travel cannot be determined. In order to obtain that level of information, two tubes are required. If the equipment is placed at the side of the road, directional traffic data can be collected from a maximum of two lanes. If the equipment is placed in the middle of a road, such as on a raised median, then data from up to four lanes can be recorded.

The diagram illustrating possible tube layout configurations is shown in Appendix E.

The biggest advantage of pneumatic tube detectors is their relatively low cost, and the fact that the tubes can be re-used for several surveys as they are only temporarily nailed to the road surface each time.

The disadvantages of pneumatic tube detectors are that the tubes, while re-usable, eventually do wear out. Additionally, the tubes are prone to vandalism and detachment from the road surface or data logging equipment especially in urban areas. For this reason, Transit New Zealand has a policy of installing loop traffic detectors in urban areas and where vandalism has been a problem. Loop detectors also provide greater safety for the field staff collecting traffic data as they are only required to go onto the traffic lanes for one count every three years when they do a classified count at the site.

### **6.3.2 *Piezoelectric Cable***

These detectors can be configured in the same manner as the pneumatic tube detectors and can be used on multiple lanes. The number of lanes that can be counted is dependant on what can be handled by the equipment. The equipment is placed on the side of the road.

This technology relies on the impact of a wheel on the cable creating a small change in cross-sectional shape of the crystals embedded within the cable. This in turn generates a small voltage, which can easily be measured and used to determine the passage of vehicles.

The disadvantages of piezoelectric cables are primarily their high cost. They are also difficult to maintain, especially when installed in flexible, chip-seal pavement environments. Additionally they are very sensitive and even small vibrations can generate electronic signals, which can be falsely interpreted as wheel activations.

### **6.3.3 *Inductive Loop***

This technology requires the use of an inductive loop, either installed permanently within the road pavement or temporarily affixed on the surface of the road, to detect the passage of vehicles travelling along the road. An inductive loop is essentially a wire wrapped round in a continuous loop in the centre of the traffic lane to form an inductor. The inductance of this loop depends upon the loop area and the number of turns of the wire. A small electrical current is passed through the loop at a specified frequency in order to produce an electronic field. When a vehicle passes over the loop the inductance changes and an electronic signal is generated which can be measured, registering a 'count' in the roadside data logging equipment.

As noted earlier, the loops can be installed permanently within the road pavement or temporarily on the road surface, although the latter method can be difficult, as it requires the use of sticky bituminous tape.

Permanent loops have an estimated lifespan of at least 10 years and can be set up at a particular location to record data continuously (as for telemetry sites) or connected to data logging equipment to collect data when required. However it should be noted that the adoption of this technology requires substantial forward planning as the costs associated with installation and maintenance are relatively high.

Inductance loops can be configured, depending on the data logging equipment used, to collect vehicle counts only or a combination of counts and classification (either length or speed). For the latter, two loops per lane would be required. Possible configurations for inductance loops are shown in Appendix E.

#### **6.3.4 Bending Plate**

Bending plate technology incorporates a steel or rubber plate with strain gauges (or sensors) attached to its underside. As the axle of a vehicle passes over the plate, the strain gauges generate an electronic signal proportional to the plate deflection to the roadside data logging equipment. The magnitude of the signal is then used to determine the applied load.

Bending plate technology in conjunction with inductive loop technology can be used to determine the presence and speed of a vehicle, the axle spacing and the axle load applied. This is the basic principle governing Transit's Weigh-in-Motion sites.

## **7. MONITORING HIERARCHY AND CONVENTIONS**

Historically, Transit New Zealand have measured the total vehicle counts on all sites; at some of these sites the vehicles will be classified; and at some of these sites weigh-in-motion data will be collected. Hence, there is a hierarchy of traffic data collection.

For each monitoring site, data is generally collected on a lane-by-lane basis at 15 minute intervals.

Additionally, it is vital that the equipment clocks are synchronised and maintained to within five seconds of the Industrial Research Limited's Talking clock, accessible on 0900 45678 so that consistency is maintained across all sites.

### **7.1 Vehicle Counts**

This is simply the total number of vehicles recorded over each lane at a particular location within a specified period of time.

Individual surveys should be carried out over a period of 7 contiguous days, taking care to avoid daylight saving start/end times and public holiday periods. In some instances however, collecting data during public holiday periods may be useful, especially in respect of summer and winter vacationing locales, and it is left to the discretion of individual Transit regional offices as to whether counts in these areas are warranted.

If a number of 7-day counts are required for a particular site then the data collection should be spread evenly throughout the year. For example, if four 7-day counts are required during the year then each count should be carried out at three monthly intervals.

Inductive loop technology is used on highways where traffic volumes are in excess of 4000 vehicles/day so that the hazards of placing pneumatic tubes in areas of high traffic flow are avoided in the interests of safety.

As noted earlier vehicle counts are carried out on a continual basis throughout the year at Transit's telemetry sites. These counts are obtained on a directional basis and are separated into Transit's four standard length classes.

### **7.2 Vehicle Classifications**

Supplementing the basic vehicle counts are counts in which the vehicle flow travelling past the monitoring location is disaggregated into 14 separate classifications based on a combination of the number of axles and spacing. Transit developed a standard Vehicle Classification Scheme in 1999 and as noted earlier, a copy of this scheme is provided in Appendix A.

The rules regarding frequency of count and days where counts are to be avoided are the same as for the standard vehicle counts outlined in the previous sub-section.

It is expected that a classified count is to be undertaken at every rural and non-motorway monitoring site at least once every 3 years.

### **7.3 Weigh In Motion**

As noted earlier, there are 4 WiM monitoring sites located throughout the country in current operation. At each WiM site, the weight of every passing vehicle is determined dynamically, that is while they are in motion. If this weight exceeds 3.5 tonnes, which is a convenient means of defining a “heavy vehicle”, then various details pertaining to this vehicle are stored in the memory banks of the roadside data logging equipment. These details include:

- The date and time that the vehicle passed the site
- Which lane the vehicle was travelling in
- The overall length of the vehicle (measured by loops)
- Speed of the vehicle
- Spacing between each axle
- Weight associated with each axle.

From the last two items, the overall wheelbase (sum of axle spacings) and the gross weight (sum of axle weights) are also calculated and stored within the data logging equipment. In addition to all the details noted above, the WiM site also performs the same function as the conventional telemetry classifier by recording traffic counts in the standard four Transit length bins described in Section 4.2.1 of this Guide.

## **8. TYPICAL SURVEY SPECIFICATION**

This section is included to assist the count contractor with carrying out traffic counts at the non-continuous monitoring site locations. The success of the entire Traffic Monitoring System relies entirely on the quality of the data obtained and all efforts must be directed towards ensuring that data collection procedures and equipment are of the best possible standards.

### **8.1 Site Selection Criteria**

The choice of site is extremely important to the quality of the count data obtained. In this regard, sites must be located a reasonable distance away from intersections and other turning traffic. It is desirable to have at least 20 metres of straight road on either side of the survey site. If tubes are used, they should be secured perpendicular to the lane.

Factors such as: lane discipline within the survey area, areas where overtaking is prevalent, and areas where acceleration or deceleration is common, should be taken into account when choosing a suitable survey site. Additionally, on-street parking can pose a problem when the wheel of a vehicle is parked directly over a tube thereby inhibiting the operation of the counting equipment. Furthermore, the noise generated from the wheels of vehicles travelling over the tubes can create an unacceptable nuisance in residential areas. Multiple tubes can compound the problem. Vandalism and interference with counting equipment also is a potential problem at urban sites. Careful consideration is required in these circumstances. These are among the reasons Transit New Zealand prefers all regular urban count sites to be set up with permanent traffic detection loops.

### **8.2 General Guidelines for Tube Surveys**

Tube survey equipment should be limited to obtaining data for one or two lanes. If a solid raised median is available to accommodate the data logger then basic axle counts from up to four lanes can be collected with relative ease.

Two types of information can be collected depending upon the tube configuration and type of equipment used at the monitoring site. This data can be either axle counts or classified counts (based on vehicle length and speed). Classified counts require the use of two tubes. In high traffic volume situations, where coincident traffic in each direction may confuse the data logger, one recorder for each direction may be required.

In both types of survey, a visual assessment over a period of at least 15 minutes, must be carried out and documented in order to confirm the integrity of the collected data. The visual survey would also be used to determine the axle factor for the site if necessary.

The correct operation of tube equipment is generally described in the specific equipment operation manuals. It is important that the field operators in charge of placing the equipment on the site are fully conversant with the details provided in the equipment manuals.

Additional important points to note with regard to the placement of data counting equipment are as follows:

- For vehicle classifications it is necessary for both tubes to be of the same length and stretched to the same tension
- Tubes should be checked thoroughly on a regular basis as they have a tendency to deteriorate over time. Air escaping from punctures in tubes and water getting into tubes can cause serious recording errors
- It is good practice to blow compressed air through the tubes regularly to check they have no moisture in them and they are not punctured.
- Vandalism is a constant issue, especially in areas of relatively high pedestrian activity. Avoidance of these areas where possible and frequent inspection of the equipment are measures which can be employed to minimise the problems associated with vandalism
- Data logging equipment should be securely chained to fixed roadside objects such as power poles, signs, fence posts, trees or housed in purpose built cabinets
- Tubes must be securely affixed to the road surface in such a way as to prevent the tube from bouncing, which can send false signals to the data logger

Adherence to the points noted above will assist in ensuring the success of the data collection process.

### **8.3 Safety Issues**

As with all matters relating to working on the road, extreme caution is required to be exercised to ensure that the laying and retrieval of equipment is carried out in the safest manner possible, with respect to both the contractor and other road users.

Transit New Zealand has developed a Code of Practice for Temporary Traffic Management to assist people working in the road environment in carrying out their necessary tasks safely and efficiently. Additionally the Road Controlling Authorities in various regions have their own specific requirements in regard to working on the roads. Both the Code of Practice and the relevant Road Controlling Authority must be consulted prior to undertaking any surveys and guidelines adhered to when setting out or removing equipment.

If a tube is required to traverse a footpath, then appropriate safety precautions should be observed for pedestrians. Tubes should be covered by a plate, or at the very least, sprayed with a bright coloured paint so that they are visible in poor light conditions. In this respect, placing the equipment near a street light can be advantageous.

When fastening tubes to the surface of the carriageway special care needs to be taken to ensure nails or spikes do not come loose and create a hazard likely to puncture the tyres of vehicles passing over the tubes.

## **9. DATA CALCULATION**

Once the data is collected from a particular site it can be used to calculate a variety of outputs, such as AADT, VKT or ESA. As referred to in the preceding section, calculations are reliant on an accurate representation of the base data.

The TMS database software has been specially developed to carry out all the necessary calculations on the collected data as noted earlier in Section 4.3. The software continues to be developed as requirements of users change over time and as technological advances necessitate. The particular outputs from the TMS are discussed in a later chapter.

### **9.1 Data Accuracy**

Accuracy can be described in two basic terms, confidence limits (or levels) and target (or desired) range. Confidence limits relate to the degree of certainty, such that a confidence limit of 95% indicates an assurance “95% of the time”. The 95% limits or thresholds originate from the properties of the normal distribution where the true mean lies within two standard deviations of the sample mean.

Therefore, an accuracy specification of  $95\% \pm 10\%$  indicates that 95% of the time the measured value, for example AADT, will lie within 10% of the true value.

Variables affecting accuracy include the type of equipment used and the type of survey conducted, the duration of the survey and the frequency of the survey. Acceptable recording errors are within plus or minus 5%.

More statistical analysis work is to be conducted at the conclusion of the current three year contract cycle.

### **9.2 Calculated Values**

#### **9.2.1 *Average Annual Daily Traffic (AADT)***

The most common computation carried out on the collected data is to calculate the AADT for a particular survey site. At a continuous site, this is simply the sum of the daily totals divided by the number of days. The level of accuracy is dependent on the number of days for which a complete 24 hour count is available, ideally every day of a given year. The ratio of the flow measured on a particular day and the true overall AADT is a value which can be defined as a “Daily Flow Factor”. This factor is used to scale the traffic counts obtained from non-continuous count sites associated with the continuous site, in order to take account of seasonal variations in traffic flow which occurs throughout a typical year. The average of the scaled daily totals at the non-continuous sites is the derived AADT for that site.

AADTs can be subdivided by lane and vehicle composition. When quoting AADTs, they should be rounded to the nearest multiple of ten.

### **9.2.2 *Vehicle Kilometres Travelled (VKT)***

VKT is the product of the AADT and the length of the roadway link within which the count was obtained. Link VKTs can be summed as desired such that a total VKT over a State Highway or Region can be obtained. The annual change in VKT over the entire network provides an indication of the growth in traffic volumes throughout the state highway network.

### **9.2.3 *Equivalent Standard Axles (ESA)***

ESA's are determined from measurements of vehicle axle loadings, either from WiM stations, Police Commercial Vehicle Investigation Unit (CVIU) sites or other commercial vehicle weighing installations. The precise details of these calculations are provided in the Pavement Design Manual and are not included here as subtle changes may be made to the formulae in the future.

## **10. TRAFFIC MONITORING SYSTEM (TMS) OPERATION**

The key to the whole Traffic Monitoring Method lies within the TMS database software, which fulfils the functions of being a central repository for the collected data, a data manipulator and a reporting tool to produce the necessary summaries of data to assist with infrastructure planning. Since the software is internet-based it is easily accessible by authorised end users throughout the country. The internet site has its own on-line help which includes a comprehensive User Guide for the system.

The internet site comprises a number of menus and sub-menus which can be accessed by the end user to either load data or provide data outputs. At its most basic level there are five separate areas within the internet site and these are summarised below.

### **10.1 Operational Data**

This area of the internet site allows the user to view details of the various counter sites within the network and the basic components of the node/link network as described in Section 4.1.

### **10.2 Traffic Data**

Through this area of the internet site, the regional traffic monitoring consultants can load raw data into the system. After the data is loaded, the TMS carries out a validation check of the data and notifies the consultants of any apparent anomalies. The consultant is also able to delete loaded data through this area.

### **10.3 Reports**

#### ***10.3.1 Recorded Data***

The reports produced in this area show the actual count data uploaded into the TMS prior to the application of any seasonal adjustments or internal TMS calculations.

Reports that can be output include:

- hourly volumes for all days of a month
- hourly volumes over a week
- 15 minute volumes for the peak hours (6am to 10am, 3pm to 7pm) for all days of a week, including a 5-day average and a moving hour average for all 5 weekdays
- actual count data by day, week, month, quarter or year
- counts in the increasing, decreasing directions and combined flows for each of the four Transit length bin classes
- an un-summarised display of actual counter data

These reports are useful for easily obtaining an overview of the counts measured in the field and are useful for detecting any obvious anomalies within the data.

### ***10.3.2 Summarised Data***

These reports show the adjusted count data, which have been factored to take account of Daily Flow Factors, reclassifications and motorway on/off ramp adjustments.

Reports can be obtained which show:

- summary data for a particular site, such as AADT, Daily Flow, Flow Factor and VKT
- the AADTs for all sites in a region
- all the calculated Daily Flow Factors
- a 7 day ADT for actual and reclassified data
- the trend in AADTs for a range of years
- the annual VKT for a site, highway or region
- the AADT outputs as per the State Highways Traffic Volumes publication produced by Transit on an annual basis
- the calculations relating to reconciling traffic volumes along a motorway system which uses counts measured at certain locations and a system of adding or subtracting on-ramp and off-ramp counts respectively
- the AADT statistics in a format suitable for export to the RAMM system

These reports are ultimately used as a basis for highway asset infrastructure forward planning.

### ***10.3.3 Site Details***

The reports within this area deal with the various count sites as opposed to the traffic data itself.

The reports produced here can show:

- details of the site, including location, and lane information
- availability of data at a particular site (complete, incomplete or missing data)
- days where there is missing data for a control (parent) site but data available for the non-continuous (child) site
- number of days counted for specified sites
- all the sets of data loaded against a site, including the status and date range of each dataset.

These reports can be used to assess the various data issues associated with the various monitoring sites.

### **10.3.4 Weigh-in-Motion**

The reports produced here are primarily related to the data collected at the Weigh-in-Motion stations along the road network. These include tabulations of:

- ESA statistics for the 4 axle groups defined in the Austroads Pavement Design Guide, New Zealand Supplement
- ESA statistics for vehicles classified according to the number of axles
- Axle load distributions for the 4 axle groups as defined in the Austroads Pavement Design Guide, New Zealand Supplement
- Heavy motor vehicle distributions according to PAT type, a scheme that classifies vehicles according to number of axles and axle configuration.

This summarised data can be used to assist assessing the activity of heavy vehicles using the road network and planning the necessary alterations to the network to accommodate these vehicles.

### **10.4 User Administration**

This area of the internet site is available to carry out any administrative tasks which may be required by the end user. At this stage there is only one facility available that allows end users to change their TMS access passwords.

### **10.5 Help**

The final area on the internet site deals with the online help. The items included here are:

- the general User and Administrator guides
- a quick reference guide which can be downloaded and printed
- a document outlining lane numbering conventions for Traffic Monitoring purposes
- a template document for use in requesting changes to TMS operation or reporting. Once filled in this can easily be emailed to the TMS System administrator or the TMS regional administrator for consideration.

All documents are provided in Microsoft Word format and can be easily downloaded and printed for future reference. The documents are also amended from time to time and the internet site is updated accordingly.

## **11. LINKS TO OTHER SYSTEMS**

At present TMS is able to directly interface with the RAMM system via a simple mechanism. However this interface relies on the Site ID and link nodes within both systems being entirely consistent.

In the future it is expected that TMS will be fully compatible with other road asset systems such as the new Location Referencing Management System (LRMS).

## 12. THE FUTURE

As time progresses and new technological breakthroughs in the transportation field are discovered, Transit's Traffic Monitoring Strategy and associated systems should be sufficiently robust to cope with the changes. Already, the ATMS systems in Auckland and Wellington demonstrate the potential for what can be achieved in terms of data collection. Additionally as transportation applications for new technological advances such as GPS and 3G Communications are developed, it is likely that the accuracy of data and efficiency of data retrieval will be enhanced notably.

Overall, given the improvements the future of Transit's Traffic Monitoring Method looks bright, allowing better forecasting of state highway use in the future and subsequently more efficient allocation of resources to ensure *“a safe and efficient state highway system which meets the needs of road users and the communities it serves.”*

**APPENDIX A**  
**TRANSIT NEW ZEALAND VEHICLE**  
**CLASSIFICATION SCHEME**



## Vehicle Classification Scheme (NZTA 2011)

NZTA Axle Class	Vehicle Types in Class	Axles	Groups	Criteria	Maximum axle spacing < 10m			Length Range (WIM data)	NZTA EEM Class	Light or Heavy	NZTA Length Class	Austroads 1994 Class
					AS1-2	AS2-3	AS3-4					
1	oo (very short 2 ax veh = motorbike)	2	1	2 ax, AS 1 criterion	>=0.5, <1.75	-	-	>1.5 - 2.5	(PC)	Light	VS	1
2	o-o (short 2 axle vehicle = car)	2	2	2 ax, AS 1 criterion	>=1.75, < 3.2	-	-	2.5-5.5 (4-6)	PC & LCV	Light	S	1
3	o-o-o (car towing 1 axle trailer)	3	3	3 ax, AS 1,2 criteria	>2.1, < 3.2	>2.1	-	7 -11	PC & LCV	Light	M	2
	o-o-oo (car towing tandem trailer)	4	3	4 ax, AS 1,3 criteria	>2.1, < 3.2	>2.1	<=1.0	8 -13			M	2
	o-o-o-o (car towing car)	4	4	4 ax, AS 1,2,3 criteria	>2.1, < 3.2	>2.1	>2.1	10 -15			M	2
4	o----o (truck or bus)	2	2	2ax AS 1 criterion	>=3.2m	-	-	5 - 12	Bus & MCV		M	3
	o-o-o-o (truck towing light trailer)	3	3	3 ax, AS 1,2 criteria	>=3.2m	>2.1, <=6.8	-	8 -16			L	6
	o-o-oo (truck tow light 2 ax trailer)	4	3	4 ax, AS 1,3 criteria	>=3.2m	>2.1	<=1.0	9 -17			L	7
5	o-oo (truck or bus/coach)	3	2	3 axles, 2 groups	>=3.2m	<=2.1	-	7 -12	Bus & HCV1	Heavy	M	4
	o-oo (tractor without semi-trailer)	3	2	3 axles, 2 groups	>2.1, < 3.2	<=2.1	-	6 -8			M	4
	oo-o (twin steer truck)	3	2	3 axles, 2 groups	<=2.1	-	-	7 -12			M	4
	o-o-----o (artic e.g. bread truck)	3	3	3 ax, AS 1,2 criteria	>=3.2m	>6.8	-	11 -17			L	6
	o-oo--o (truck tow light 1 ax trailer)	4	3	4 ax, AS 1,2,3 criteria	>=3.2m	<=2.1	>2.1	10 -17			L	7
	oo-o--o (twin steer tow 1 ax trailer)	4	3	4 ax, AS 1,3 criteria	<=2.1	-	>2.1	10 -17			L	7
6	oo-oo (heavy truck)	4	2		<=2.1	-	>1.0, <=2.1	7 - 13	HCV1	Heavy	M	5
	o-ooo (heavy truck)	4	2	4,5 axles, 2 groups	>2.1	<=2.1	>1.0, <=2.1	7 -11			M	5
	oo-ooo (heavy truck)	5	2		-	-	-	8 -13			M	5
7	o-o-oo (artic A112)	4	3	4 ax, AS 1,2,3 criteria	>2.1	>2.1	>1.0, <=2.1	12 -18	HCV1	Heavy	L	7
	o-oo-o (artic A121)	4	3	4 ax, AS 1,2,3 criteria	>2.1, <3.2	<=2.1	>2.1	12 -18			L	7
	o-o-o-o (truck tow heavy trailer)	4	4	4 axles, 4 groups	>=3.2	>2.1	> 2.1	13 -17			VL	7
8	o-oo-oo (truck tow light trailer)	5	3		-	-	-	10-18	HCV2	Heavy	VL	8
	o-oo-oo (artic)	5	3	5 axles	-	-	-	12-17			L	8
	o-o-----ooo (artic)	5	3		-	-	-	12 -17			L	8
	o-oo-o-o (T+T)	5	4	3,4,5 groups	-	-	-	13 -18			VL	8
	o-o-o-o-o (mobile crane)	5	5		-	-	-	10 -13			L	8
9	o-oo-ooo (artic)	6	3		-	-	>2.2, <12.0	13 -18	HCV2	Heavy	L	9
	oo-oo-oo (artic)	6	3		-	-	-	13 -18			L	9
	o-ooo-ooo (artic)	7	3	6-8 axles	-	-	-	> 16			L	9
	o-oo-oooo (artic)	7	3	3 groups	-	-	-	> 17			L	9
	oo-oo-ooo (artic)	7	3		-	-	-	-			L	9
	oo-oo-oooo (artic)	8	3		-	-	-	-			L	9
	o-ooo-oooo (artic)	8	3		-	-	-	-			L	9
10	o-oo-o-oo (T+T)	6	4		-	-	-	-	HCV2	Heavy	VL	10
	oo-o-o-oo (T+T)	6	4		-	-	-	-			VL	10
	oo-oo-o-o (T+T)	6	4	6 axles	-	-	-	-			VL	10
	o-oo-o-o-o (T+T)	6	5	4,5 groups	-	-	-	-			VL	11
	o-o-oo-o-o (A train)	6	5		-	-	-	-			VL	11
	o-oo-o-o-o (A train)	6	5		-	-	-	-			VL	11
11	o-oo-oo-oo (T+T)	7	4		>2.2m	-	-	-	HCV2	Heavy	VL	10
	o-oo-oo-oo (B train)	7	4	7 axles, not twin steer	>2.2m	-	-	-			VL	10
	o-oo-oo-o-o (A train)	7	5	(AS 1 criterion)	>2.2m	-	-	-			VL	11
12	oo-oo-o-oo (T+T)	7	4		<=2.2m	-	-	-	HCV2	Heavy	VL	10
	oo-o-oo-oo (T+T)	7	4		<=2.2m	-	-	-			VL	10
	oo-oo-oo-oo (T+T)	8	4		<=2.2m	-	-	-			VL	10
	oo-oo-oo-ooo (T+T)	9	4	7-11 axles	<=2.2m	-	-	-			VL	10
	oo-oo-oooo-oo (T+T)	9	4	twin steer	<=2.2m	-	-	-			VL	10
	oo-oo-oooo-ooo (T+T)	10	4	(AS 1 criterion)	<=2.2m	-	-	-			VL	10
	oo-oo-oooo-oooo (T+T)	10	4		<=2.2m	-	-	-			VL	10
	various (twin steer A train)	7-11	5		<=2.2m	-	-	-			VL	11
13	o-oo-ooo-oo (B train)	8	4		>2.2m	-	-	-	HCV2	Heavy	VL	10
	o-oo-ooo-ooo (B train)	8	4		>2.2m	-	-	-			VL	10
	o-oo-oooo-ooo (B train)	9	4		>2.2m	-	-	-			VL	10
	o-oo-oooo-oooo (B train)	10	4	8-11 axles	>2.2m	-	-	-			VL	10
	o-oo-ooo-o-o (A train)	8	5	not twin steer	>2.2m	-	-	-			VL	11
	o-oo-ooo-o-o (A train)	8	5	(AS 1 criterion)	>2.2m	-	-	-			VL	11
o-oo-ooo-o-oo (A train)	8	5		>2.2m	-	-	-	VL	11			
14		any	-	Everything else	-	-	-					

NZTA Length Class: VS= 0.5-2.0m S=2.0-5.5m M=5.5-11m L=11-17m VL>17m  
 Axles: Number of axles  
 Groups: Number of axle groups ( an axle group is where axles are less then 2.1m apart.  
 AS1-2: Distance between first and second axle  
 AS2-3: Distance between second third axle  
 AS3-4: Distance between third and fourth axle

# **APPENDIX B**

## **TELEMETRY STATION SITES**

## Telemetry Station sites (by Transit Region and State Highway)

### North Island

NORTH ISLAND		
Transit Region	SH	Locality
1 – Northland	1N	Kawakawa
		Wellsford
2 – Auckland	1N	Hadfields Beach
		Auckland Harbour Bridge
		Ellerslie
		Panama Rd
		Drury
		Bombay
3 – Waikato	1N	Taupiri
		Karapiro
		Lichfield
		Hallets Bay
	2	Mangatawhiri
		Waihi
	3	Te Kuiti
	25A	Hikuae
	27	Kaihere
	32	West Lake Taupo
4 - Bay of Plenty	2	Te Puna
		Onhinepanea
	5	Tarukenga
		Waipa
	29	Kaimai
	30	TeNgae (Rotorua)
		Lake Rotoma
33	Paengaroa	
5 – Gisborne	2	Ormond
6 - Hawkes Bay	2	Tangoio
	5	Te Pohue
	50	Napier South
7 – Taranaki	3	Tongaporutu
		Tariki
		Waitotara
	45	Hawera
8 – Manawatu-Wanganui	1N	Hihitahi
		Sanson
		Ohau
	2	Norsewood
	3	Manawatu Gorge
	4	Horopito
Upokongaro		
9 – Wellington	1N	Pukerua Bay
		Ngauranga Gorge
	2	Clareville
		Rimutaka
		Ngauranga Gorge
	58	Pauatahunui

## Telemetry Station sites (by Transit Region and State Highway)

### South Island

SOUTH ISLAND		
Region	SH	Locality
10 - Nelson-Marlborough	6	Hira
		Stoke
		Murchison
11 – Canterbury	1S	Kaikoura
		Dunsandel
		Timaru
		St Andrews
	7	Lewis Pass
	73	Springfield
	74	Cranford St Chch
12 – West Coast	6	Punakaiki
		Chesterfield
	7	Ahaura
13 - Otago	1S	Green Island
		Milton
	8	Alexandra
14 - Southland	1S	Gore
		Invercargill
	6	Winton

# **APPENDIX C**

## **WEIGH-IN-MOTION SITES**

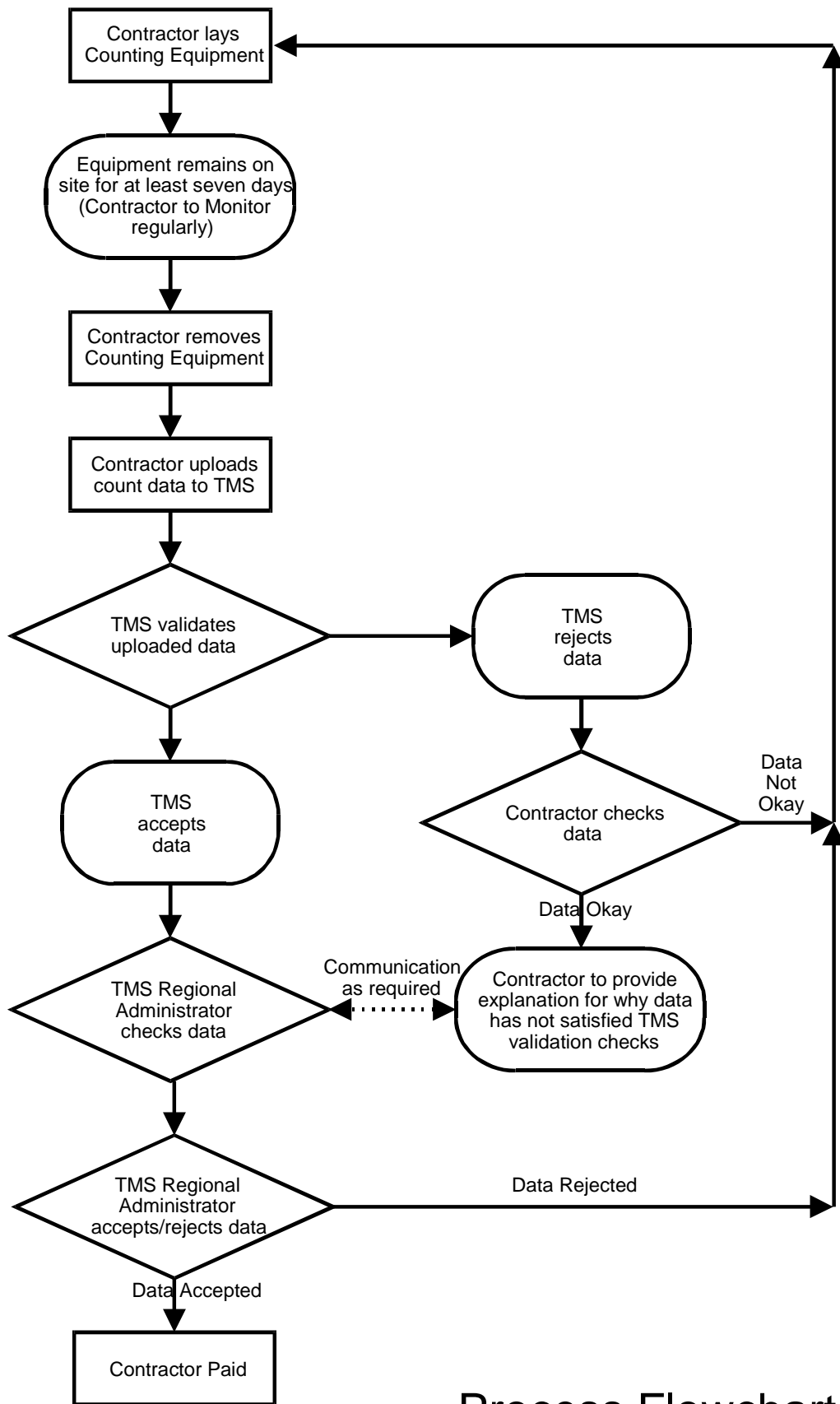
## Weigh in Motion Sites

<b>NORTH ISLAND</b>		
<b>Transit Region</b>	<b>SH</b>	<b>Locality</b>
2 - Auckland	1N	Auckland Southern Motorway, Drury
3 - Waikato	1N	Tokoroa
4 - Bay of Plenty	2	Te Puke

<b>SOUTH ISLAND</b>		
<b>Transit Region</b>	<b>SH</b>	<b>Locality</b>
11 - Canterbury	1S	Waipara

**APPENDIX D**

**PROCESS FLOWCHART**



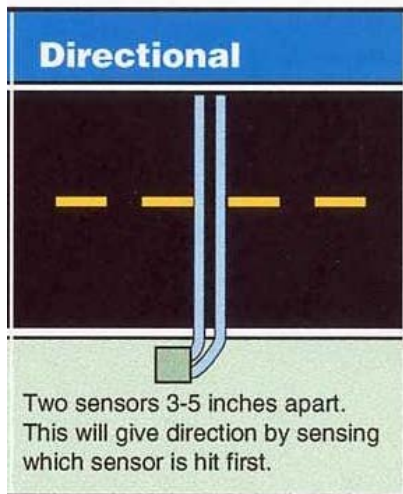
Process Flowchart

**APPENDIX E**

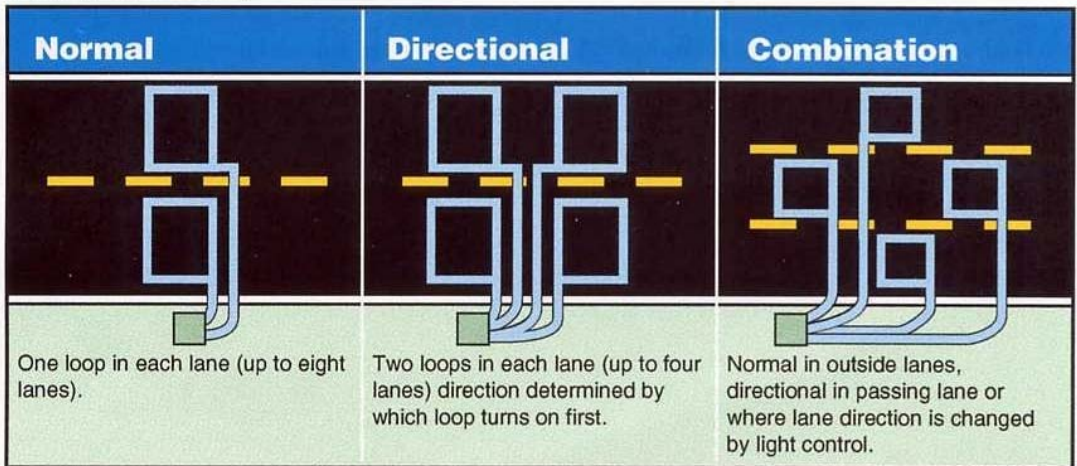
**POSSIBLE TUBE AND LOOP**

**LAYOUT CONFIGURATIONS**

Counts (axle sensors)



Counts (loop detectors)



Note: Piezo sensors can be used in the same arrays as the above loops.

**Sensor Arrays for Classification**

Axle (road tube / piezo / resistive)

