BEFORE THE COMMISSIONERS APPOINTED BY THE DUNEDIN CITY COUNCIL

LUC-2020-293

IN THE MATTER of 20 Bay Road, Warrington

BETWEEN **NEW ZEALAND MOTOR CARAVAN ASSOCIATION**

Applicant

BRIEF OF EVIDENCE OF CHRIS ROSSITER FOR NEW ZEALAND MOTOR CARAVAN ASSOCIATION

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STATEMENT OF EVIDENCE OF CHRIS ROSSITER BSC, BA(OPEN), CPENGNZ

Introduction

1. My full name is Michael Christopher Rossiter. I hold the position of Principal Transportation Engineer at Stantec New Zealand Limited (Stantec). I have been in this position since 2013 and have been employed at Stantec (and TDG prior to its incorporation with Stantec) since 2006. Prior to joining TDG in 2006, I was employed as a Principal Systems Engineer and Technical Manager with BAE Systems in England.

2. I hold the academic qualifications of Bachelor of Science from the University of Exeter and Bachelor of Arts (Open) from the Open University.

3. I am registered as a Chartered Engineer with Engineering New Zealand. I have over 35 years engineering experience including 14 years' transportation engineering in New Zealand on a wide range of projects involving transportation engineering, transportation planning and assessment, analytical investigations and road safety audits.

4. My recent experience within the Dunedin area includes:

    a. Investigating the transport effects of establishing additional health related activities at the Te Kaika Medical Centre, Caversham;

    b. Investigating the transport effects of establishing additional health related activities at the Te Kaika Medical Centre, Caversham;

    c. Investigating the transportation effects of a proposed quarry in Middlemarch;

    d. Investigating the transportation and road safety effects of the proposed new roads in a residential subdivision, Westacott Heights, near Halfway Bush, Dunedin;

e. Investigating the transportation effects of a proposed swimming pool in Milton;

f. Investigating the transportation effects of a rezoning submission on the Dunedin Second Generation Plan;

g. Investigating the transportation effects of Plan Change 41/41A to the Clutha District Plan;

h. Providing transportation design advice in relation to Concept Design for the New Dunedin Hospital;

i. Providing transportation design advice for a new ACC building in Dunedin;

CODE OF CONDUCT

5. I have read the Code of Conduct for Expert Witnesses in the Environment Court Consolidated Practice Note (2014). I agree to comply with this Code of Conduct. This evidence is within my area of expertise, except where I state I am relying on what I have been told by another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

6. I have been engaged by the New Zealand Motor Caravan Association (NZMCA) to prepare this evidence.

SCOPE OF EVIDENCE

7. I was responsible for managing the preparation of the Integrated Transport Assessment report (ITA) that accompanied the application[1]. I prepared the response on the transport related matters in the Council's Request for Further Information (RFI)[2].

8. My evidence does not re-traverse matters which are already addressed there, other than noting any changes to the local environment.

[1] Integrated Transport Assessment, 20 Bay Road, Warrington, June 2020
[2] LUC-2020-293, 20 Bay Road, Warrington Request for Further Information, 3 November 2020

9. This evidence will build on the Assessment of Environmental Effects report (AEE), in response to:

    a. Issues raised by Submitters;

    b. Comments and issues from the Dunedin City Council's Reporting Officers Section 42A Report (the s42A report); and,

    c. Feedback on consent conditions.

EXECUTIVE SUMMARY

10. The proposed Motor Caravan Park will be developed in two stages. The first stage will provide 46 marked camp sites and the second stage a further 10 sites. To provide some flexibility with the usage of each site, the application seeks approval for up to 60 certified, self-contained vehicles and caravans to be on site.

11. The ITA includes the expected traffic generation of the Motor caravan Park with 50 of the proposed sites being occupied to reflect the likely demand in the summer holiday period. I have received some additional information from the NZMCA for three other similar sized facilities. My analysis of the usage of those sites suggests that reaching an occupancy level of 50 sites at Warrington is only likely to occur on one or two days of the year and that an occupancy level of 40 sites would be more likely during the main summer holiday period, typically the three-week period commencing the weekend before Christmas. Based on that analysis, I consider that the assessment based on 50 sites being occupied represents a worst-case scenario.

12. With 40 occupied sites, the Motor Caravan Park would be expected to generate about 80 vehicle movements per day (vpd) and have a peak hour generation of 10-15 vehicle movements per hour (vph). In my opinion, the addition of this volume of traffic to the wider road network will not contribute to noticeable effects because this has ample capacity to carry the forecast volumes and the access route generally forms part of a sign-posted route to the Warrington Reserve.

13. The greatest effects will be on the section of Bay Road between Hill Road and the site access. This section of road currently carries about 190 vpd and the addition of 80-100 vpd in the summer will be noticeable to local residents because of this low baseline. With this additional traffic, the peak two-way traffic volume on Bay Road could reach 35 vph although I consider this unlikely because while the holiday season will increase activity at the NZMCA site, it will reduce vehicle movements at the residential properties.

14. Although the traffic volumes on Bay Road will be low, there will be occasions when two vehicles will need to pass each other. Since the Motor Caravan Park involves larger vehicles, it is proposed that Bay Road is widened so that two large vehicles can pass each other without the need to traverse the gravelled footpath on the south side of the road. I consider that this represents an appropriate road network improvement.

15. There is a large hedge on the western side of Hill Road which is located within the road reserve and does constrain the sightlines on the Bay Road western approach to the Hill Road / Bay Road intersection. In practice, I do not consider that the shortfall in sight distance represents a significant safety concern in this location because of the low vehicle speeds on the road network in this area. The small radius corners require drivers to travel at speeds of less than 30km/h to negotiate the corners safely. However, although no crashes have been reported at the intersection, I consider that increasing the sight distance would still provide some safety benefits. Since the hedge is located on Council road reserve, any alterations will be the responsibility of Council. Any changes are likely to affect the existing vehicle access to 37 Bay Road.

16. Two of the submissions opposing the application raise the option of access to the camping ground being via the Esplanade and Warrington Reserve. This represented the preferred route in a report prepared by Carriageway Consulting in 2019. I also consider that access via the Reserve would be preferrable to access via Bay Road as it would be more consistent with the existing signage for campervans. However, I understand that this option was not supported by Council at the pre-application stage and the Application has been progressed on the basis of access from Bay Road.

17. The Council Officer appears to acknowledge that access via the Esplanade and Reserve would represent a logical route and that the primary objection is a legal matter. As I have discussed, I consider that

there would be benefits to approving this access route as it would reduce any potential adverse effects on Bay Road.

18. In summary, I would support an access route via Esplanade and the Reserve as suggested in the submissions if approval for that route was granted by Council subject to appropriate conditions in relation to maintenance of the access road.

19. Ms Bombay describes a permitted baseline scenario in her evidence and considers that 15 dwellings could be developed on the NZMCA site. The average daily traffic generation associated with this level of development would exceed the NZMCA activity even on its busiest day of the year. For much of the year, the NZMCA activity will generate less vehicle movements than would be associated with just six households.

20. Based on my assessment of the expected traffic generation of the proposed Motor Caravan Park, I have concluded that there are no transport effects that would not be appropriately mitigated by the resource consent conditions being proposed by the Applicant.

EVIDENCE IN CHIEF

Integrated Transport Assessment

21. The ITA provides a description of the transport networks surrounding the proposed camping ground at 20 Bay Road in Warrington. I am not aware of any changes to the road network since that report was prepared.

22. I have used the Waka Kotahi Crash Analysis System to investigate whether there have been any crashes reported within Warrington since the ITA was prepared. One non-injury crash was reported in September 2020 on Bank Street when the handbrake on a vehicle failed, and the vehicle rolled down the road into a nearby property. A copy of the crash report is included in Appendix A to my statement.

23. In my opinion, the nature and numbers of crashes that have been reported within Warrington in the last five years does not raise any specific safety concerns with the road network.

Request for Further Information

24. The s92 Request for Further Information (RFI) sought more detail on the following transport matters:

    a. Hill Road / Bay Road intersection;

    b. Access Route;

    c. Road Construction; and,

    d. Site Access and manoeuvring.

25. An initial response to the transport matters was issued in September 2020 and then subsequently updated in November 2020 to correct an error in relation to traffic generation rates. In that revised response, I stated that the expected traffic generation of the Motor Caravan Park would be 30-35 movements per day on average during the off-peak periods and about 100 movements per day on average during the summer peak period, typically the three-week period encompassing

Christmas and New Year. During the summer peak period, the busiest hour of the day is expected to involve 15-20 vehicle movements on the driveway.

26. I have now received some additional information from the NZMCA which suggests that these estimates of vehicle movements are high. The NZMCA have provided me with occupancy information for three of their facilities that are of a similar size (50-55 sites) to the proposed site in Warrington. Figure 1 shows the number of nights that different occupancy levels were recorded at three sites in 2019, Waimate, Murchison and Franz Josef. Table 1 shows the cumulative occupancy rates for each site, that is, the proportion of days of the year as a percentage for which the occupancy was less than 10, 20 or 30 vehicles.

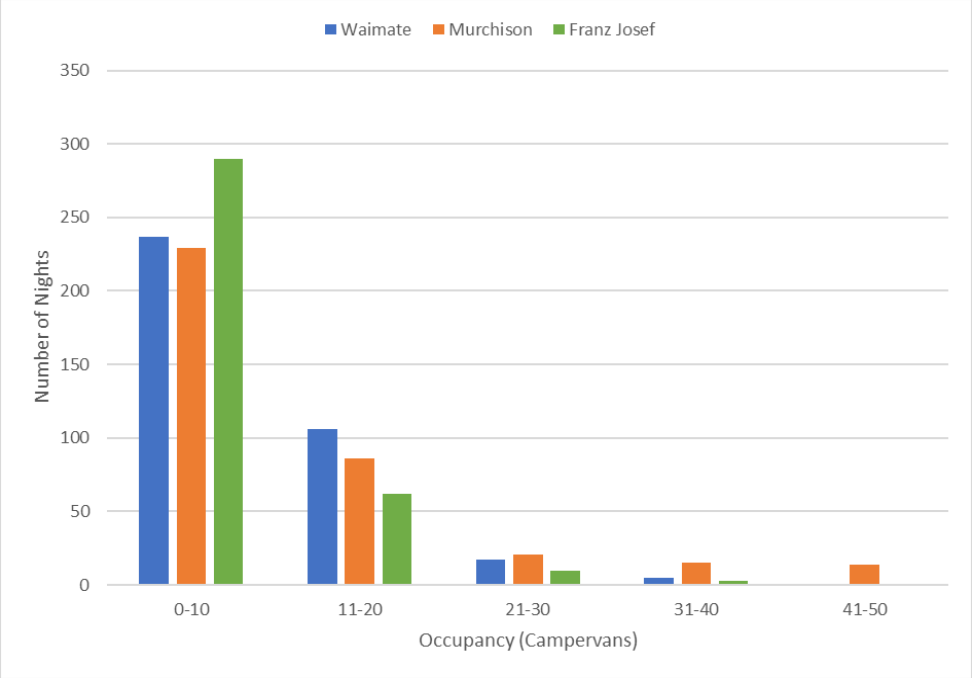

Figure 1: Campground Occupancy Levels

Occupancy	Waimate	Murchison	Franz Josef
<=10	65%	63%	79%
<=20	94%	86%	96%
<=30	99%	92%	99%

Table 1: Cumulative Occupancy Levels

27. Table 1 indicates that occupancy levels of less than 10 vehicles occurred for about 70% of all days. The 90th percentile occupancy rate which represents the normal design threshold for traffic generation was less than 20 vehicles. The 98th percentile occupancy rate which would reflect conditions in the busiest week of the year was less than 30 vehicles.

28. Although the Warrington site will have a higher capacity of 60 vehicles than the three sites above, based on the above pattern of usage, I would expect the busiest week of the year to have an average of less than 40 vehicles on site, a 90th percentile day to have less than 25 vehicles on site and a typical off-peak period day to have less than 10 vehicles. Based on these occupancy levels, the Warrington site would generate about 80 vehicle movements per day on average during the busiest week of the year and less than 15 vehicle movements per hour in the busiest hour of the day.

29. The average daily traffic generation during the summer with the 90th percentile occupancy level is likely to be closer to 50 vehicle movements per day with a peak hourly volume of less than 10. Outside of the main holiday period, the data suggests that the Warrington site would typically generate less than 20 vehicle movements per day.

30. In summary, on the basis of this occupancy information, I consider that the traffic generation of the Warrington site is likely to be lower than suggested in the ITA.

31. As noted in the RFI response, there is a large hedge on the western side of Hill Road which is located within the road reserve and does constrain the sightlines on the Bay Road western approach to the Hill

Road / Bay Road intersection. In practice, I do not consider that the shortfall in sight distance represents a significant safety concern in this location because of the low vehicle speeds on the road network in this area. The small radius corners require drivers to travel at speeds of less than 30km/h to negotiate the corners safely. This was also reflected in the average vehicle speeds recorded on Bay Road between the Hill Road intersection and Esplanade in the traffic survey over the 2019-20 holiday period of about 30km/h. Although no crashes have been reported at the intersection, I consider that increasing the sight distance would provide some safety benefits. This is addressed in the Council Officer's report which states:

> *the unauthorised encroachment of the hedge and carport on the Hill Road/Bay Road intersection is an existing situation that will require the Council to address rather than requiring works to be undertaken by the applicant.*

32. As part of my investigations in response to the RFI, I arranged for some vehicle tracking analysis to be undertaken with and without the widening of the Hill Road / Bay Road intersection. This is included in Appendix B of my statement. In my opinion, this demonstrates that NZMCA member vehicles can negotiate the intersection without improvements being made but that widening the intersection would ensure that two-way movement of large vehicles would be possible. In practice, I consider that the potential for this type of conflict will be very low because the volume of movements generated by the Motor Caravan Park, even during peak season, will be low.

33. Appendix B also includes drawings showing vehicle tracking paths along the access route to the site and within the site. This clearly shows that the site provides ample space for manoeuvring of the larger vehicles that would be anticipated on the site.

Submissions

34. There have been five submissions on the resource consent application with four in opposition and one in support. The transport related matters in the submissions can be broadly grouped as follows:

a. Effects on Bay Road (Marsh, Muschamp);

b. Driveway (Price, Marsh);

c. Site access location (Price, Muschamp); and,

d. Permitted Baseline (Muschamp).

Bay Road

35. Based on the information available on the MobileRoad website3, the average daily traffic volume on Bay Road west of Hill Road is about 190 vpd. This is broadly aligned with the expected traffic generation of 19 households based on a traffic generation rate of 10 vpd per dwelling or 24 households at 8 vpd per household. Since there are about 20 households on Bay Road between Hill Road and the site entrance, I consider that the MobileRoad estimate of traffic volumes is reasonable.

36. The busiest hour of the day for residential activity typically accounts for about 10 percent of the daily traffic volume and on this basis, I would expect the existing peak hour traffic volume on Bay Road to be less than 20 vehicle movements per hour (vph).

37. The establishment of the Motor Caravan Park could increase the average daily traffic at the eastern end of Bay Road by about 80 vpd during the busiest week of the year and by about 100 vpd if 90 percent of all sites were occupied, a level that is likely on only one or two days of the year.

38. If the peak period of vehicle activity coincided with the peak hour volumes on Bay Road, then the hourly volumes could be about 35 vph. In practice, I would expect the traffic volumes to be lower because:

a. The peak period of activity at the Motor Caravan Park does not coincide with commuter peak periods;

[3] www.mobileroad.org.nz

b. During the peak holiday season, vehicle movements associated with the residential activity will be lower because of the holidays;

39. Even with a two-way volume of 35 vph, there will be a low incidence of two-way movement as that represents about one movement every two minutes.

40. The submissions raise concerns about the need for two large vehicles to pass each other without using the footpath on the southern side of the road. Although there will be a low incidence of two-way movement, widening Bay Road will enable this to occur more easily. Widening is required as part of the proposed resource consent conditions to reduce the likelihood of vehicles needing to traverse the footpath. In the event that a driver was not comfortable with the space available even with the proposed widening and chose to use the adjacent footpath, I would not expect this to occur if pedestrians were present as drivers are required to pay due care and attention to all road users.

41. Overall, I consider that the proposed widening on the northern side of the road as required by the resource consent conditions will be sufficient to address the safety concerns that have been raised.

Driveway Design

42. The proposed resource consent conditions require that the driveway is sealed for a distance of at least 15m from the Bay Road property boundary. I understand that this will reduce vehicle movement noise compared with travel on a gravelled surface. It will also reduce the potential for transfer of mud or gravel onto Bay Road.

43. The proposed position of a gate allows for a vehicle to enter the driveway and stop clear of Bay Road. This represents best practice design to minimise any potential for vehicles to need to stop across the footpath or on Bay Road.

Site Access Location

44. Prior to my involvement in this project, NZMCA had commissioned an investigation of access options to the site[4]. I have attached a copy of this report to my evidence as Appendix C. In its summary, that investigation recommended access to the site was via Esplanade and the Reserve, largely because this was an established and signposted route to the existing campground. In my opinion, this represents the most logical access route. I understand that during the early consultation with Council, Council indicated that they did not support this route and as a result, the application has been progressed on the basis of access via Bay Road.

45. I consider that the transportation benefits of providing access via the Esplanade and Reserve would include:

    a. There would no change to the volume or type of vehicle movements on Bay Road west of Hill Road.

    b. There would no change in the volume or type of vehicle movements on the Bay Road driveway and therefore, no change in the potential for vehicles to generate noise or dust on the driveway.

46. I have been provided with a copy of a memorandum from the Council Parks and Recreation Services dated 29 July 2021[5]. I have the following comments on that memorandum.

    a. I acknowledge that use of the accessway through the reserve will require approval from Council.

    b. My analysis of traffic effects has been based on all vehicle movements to the proposed being additional to any movements to the existing freedom camping ground in the Reserve. In practice this represents a very conservative scenario as some of the existing users of the camping ground

[4] Proposed Motor Caravan Site Warrington, Access Options, Carriageway Consulting, September 2019
[5] Page 533 of the Hearing Agenda

are likely to be members of the NZMCA. This means that approval of the Motor Caravan Park is likely to result in some transfer of vehicle movements from the reserve to Bay Road. If access was provided through the reserve, this also means that the increase in vehicle movements through the reserve would be less than 80 vpd.

47. The Esplanade sealed carriageway ends at the Warrington Reserve and access to the camping ground is via an unsealed, gravelled road. If access to the NZMCA site was approved through the domain, then I consider that it would be appropriate for the conditions of consent to include requirements for some improvements to that access route to reduce the need for ongoing maintenance.

48. In summary, I would support an access route via Esplanade and the Reserve as suggested in the submissions if approval for that route was granted by Council subject to appropriate conditions in relation to maintenance of the access road.

Permitted Baseline

49. The property at 20 Bay Road is partly zoned Township and Settlement and partly as Coastal Rural in the Dunedin City Proposed Second Generation District Plan. Mrs Bombay discusses the planning controls that affect the property and what this means in terms of any permitted baseline for development on the site in her evidence.

50. In her evidence, Ms Kelly has indicated that she considers that at least 15 residential units could be established on the site.

51. The Dunedin Code of Subdivision and Development 2010 requires that a traffic generation rate of eight vehicle movements per day is used for design purposes in relation to Rural or Rural Residential Lots. Based on this rate, the development of 15 residential lots at 20 Bay Road could create 120 vpd on the driveway and on Bay Road. This is higher than the volume of movement that I would expect at the Motor Caravan Park at all times of the year.

52. I have used traffic count information collected by Christchurch City Council to demonstrate the typical pattern of traffic generation for residential activity. Figure 2 shows the hourly variation in traffic volumes on Nayland Street in Sumner in 2017. Nayland Street is classified as a Collector Road and provides access to the residential areas of Sumner and beach suburb of Taylors Mistake only. The dominant period of activity is 6:00am to 6:00pm. The morning peak in the outbound data reflects travel to work while the afternoon peak in the inbound flows reflects return journeys rom workplaces.

Figure 2: Hourly Variation in Traffic Volumes for Residential Activity

53. Table 1 shows the three hour flows as a percentage of the full day flows. It shows that about 5% of the total daily flow occurred between 9:00pm and 6:00am. If this pattern of flows occurred with the baseline scenario suggested by Ms Kelly, then there would be about six movements along the driveway during the overnight period with five of these likely to occur before midnight.

Period	Inbound	Outbound	Combined
9:00 – 12:00pm	4.8%	2.8%	3.8%
0:00 – 3:00am	0.8%	0.4%	0.6%
3:00 – 6:00am	0.4%	1.2%	0.8%
Total	**5.9%**	**4.3%**	**5.1%**

Table 2: 3-hour flows as percentage of daily traffic volumes

54. Camping does not typically generate a demand for travel during the night. A survey of vehicle movements at other NZMCA sites undertaken by OPUS[6] (now WSP) on behalf of NZMCA in 2016 found that about 2% of the daily volume of traffic movement occurred between 9:00pm and midnight and less than 1% occurred between midnight and 6:00am. During the busiest week of the year, this suggests that the Warrington site could generate two vehicle movements on the driveway between 9:00pm and midnight and one movement before 6:00am. This is lower than with residential activity in the permitted baseline scenario identified by Ms Bombay .

55. Another difference is in the types of vehicles using the driveway as the Motor Caravan Park users will typically be travelling in larger vehicles than would normally be associated with residential activity. I understand that this could contribute to higher noise even with the low vehicle speeds on the site.

56. Overall, I consider that the proposed Motor Caravan Park would have less effect on the road network than the permitted baseline scenario described by Ms Bombay. I have noted that my calculation of the 90th percentile daily traffic generation, 50 vpd, is comparable with the expected traffic generation of only six dwellings.

S42a Report

57. I have read the Council Officer's report and have the following comments on the transportation matters that are discussed in

[6] NZMCA Vehicle Movement Surveys, OPUS, December 2016

Paragraphs 88-91. The option of access to the site through the Warrington Reserve is discussed in Paragraph 91.

58. The Council Officer appears to acknowledge that access via the Esplanade and Reserve would represent a logical route and that the primary objection is a legal matter. As I have discussed, I consider that there would be benefits to approving this access route as it would reduce any potential adverse effects on Bay Road.

Proposed Resource Consent Conditions

59. I have reviewed the proposed resource consent conditions. Conditions 24-30 relate to the design of the site access and conditions 31-35 to the Bay Road access route. I consider that these conditions subject to the amendments proposed by Ms Bombay are appropriate with the proposed site access arrangement via Bay Road.

Conclusions

60. Based on my assessment of the expected traffic generation of the proposed Motor Caravan Park, I have concluded that there are no transport effects that could not be appropriately mitigated by the resource consent conditions proposed by the Applicant.

61. Although the Application has been progressed on the basis of access being provided via the existing vehicle crossing at 20 Bay Road, I would support an access route via Esplanade and the Reserve as suggested in the submissions if approval for that route was granted by Council.

Chris Rossiter

Stantec New Zealand

24 August 2021

Appendix A Vehicle Tracking Investigation

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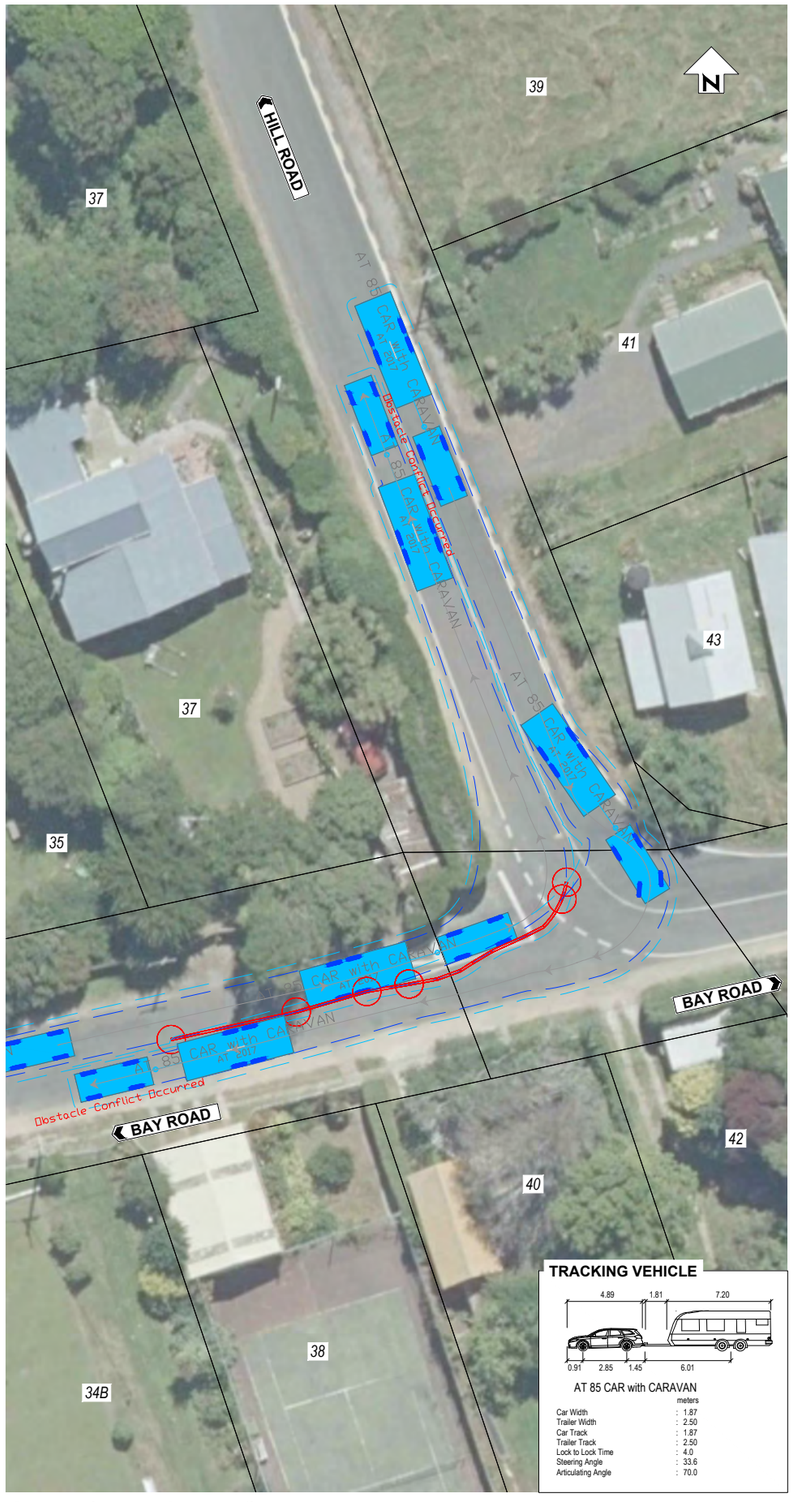

TRACKING VEHICLE

AT 85 CAR with CARAVAN — meters

Car Width	:	1.87
Trailer Width	:	2.50
Car Track	:	1.87
Trailer Track	:	2.50
Lock to Lock Time	:	4.0
Steering Angle	:	33.6
Articulating Angle	:	70.0

TRACKING VEHICLE

VW_Maui Plat_B4_Berth — meters

Width	:	2.20
Track	:	2.20
Lock to Lock Time	:	6.0
Steering Angle	:	43.8

TRACKING VEHICLE

Mitsi_Fuso_22seat — meters

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Track	:	1.75
Lock to Lock Time	:	6.0
Steering Angle	:	43.8

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CAD REVIEW		
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PROF REGISTRATION:		

Stantec

Client:

20 BAY ROAD, WARRINGTON
BAY ROAD/HILL ROAD INTERSECTION

VEHICLE TRACKING
SHEET 1 OF 3

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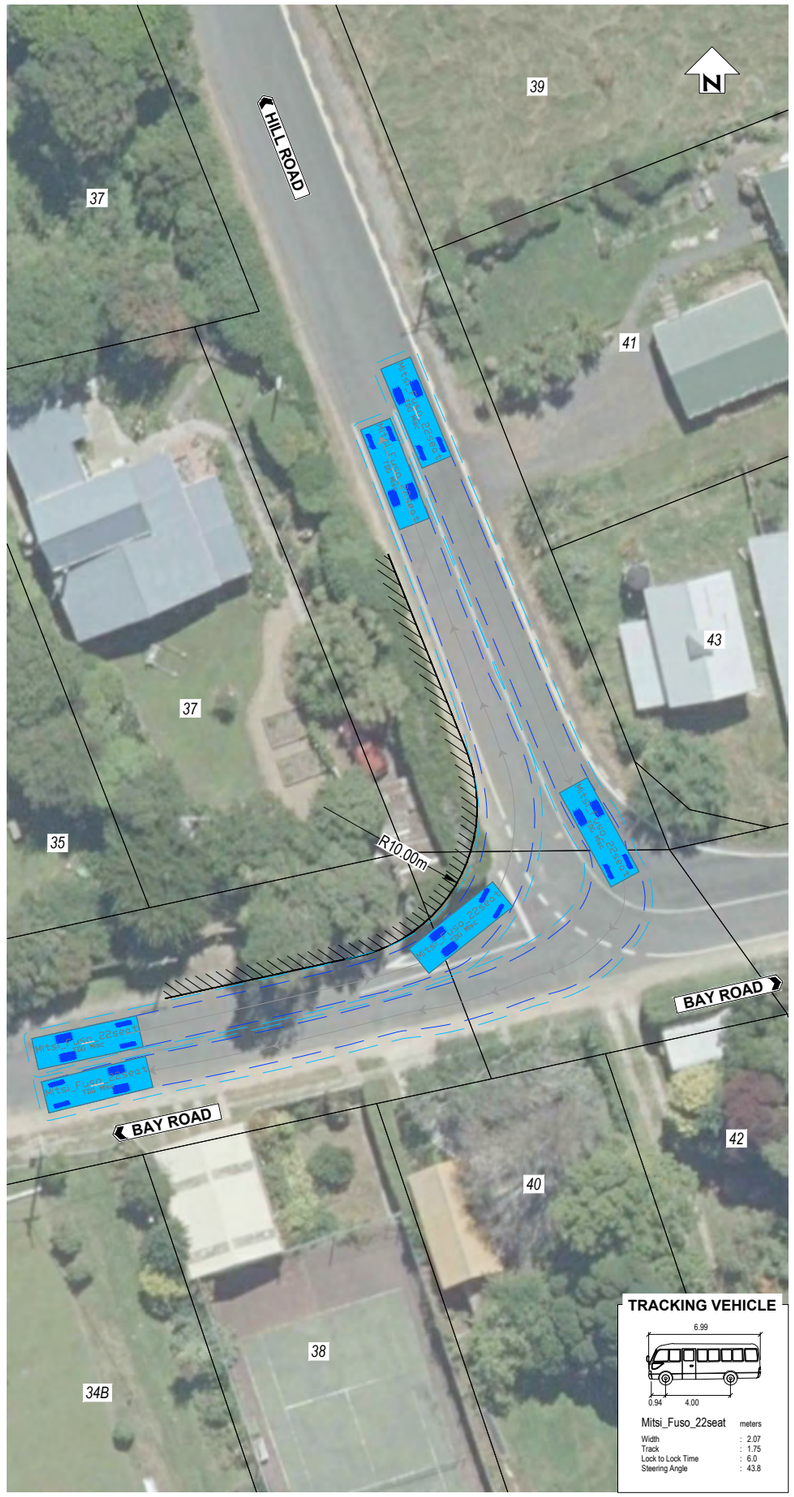

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Stantec

Client:

20 BAY ROAD, WARRINGTON
BAY ROAD/HILL ROAD INTERSECTION

VEHICLE TRACKING
SHEET 2 OF 3

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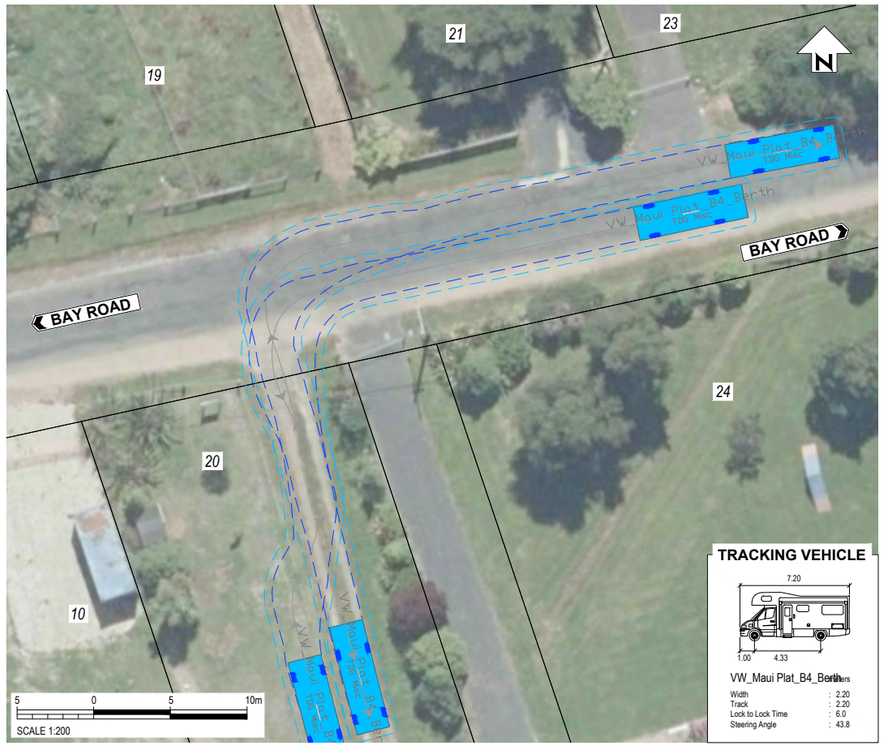

TRACKING VEHICLE

VW_Maui Plat_B4_Berth — meters

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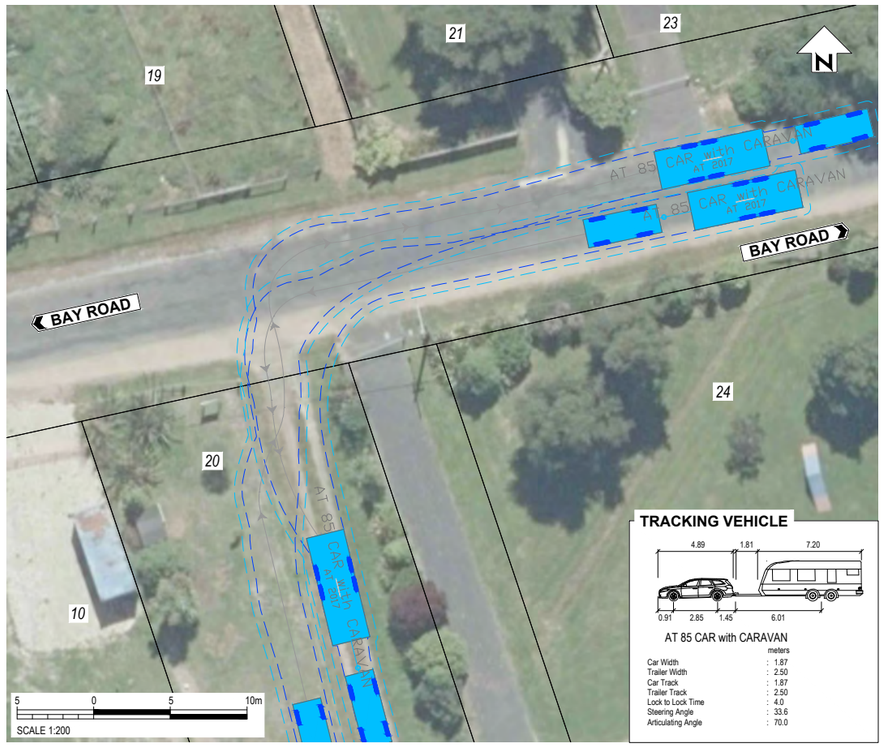
Track	: 2.20
Lock to Lock Time	: 6.0
Steering Angle	: 43.8



TRACKING VEHICLE

AT 85 CAR with CARAVAN — meters

Car Width	: 1.87
Trailer Width	: 2.50
Car Track	: 1.87
Trailer Track	: 2.50
Lock to Lock Time	: 4.0
Steering Angle	: 33.6
Articulating Angle	: 70.0

TRACKING VEHICLES

VW_Maui Plat_B4_Berth — meters

Width	: 2.20
Track	: 2.20
Lock to Lock Time	: 6.0
Steering Angle	: 43.8

AT 85 CAR with CARAVAN — meters

Car Width	: 1.87
Trailer Width	: 2.50
Car Track	: 1.87
Trailer Track	: 2.50
Lock to Lock Time	: 4.0
Steering Angle	: 33.6
Articulating Angle	: 70.0

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Stantec

Client:

20 BAY ROAD, WARRINGTON
ACCESS & SITE

VEHICLE TRACKING
SHEET 3 OF 3

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Appendix B Motor Caravan Site Warrington Access Options

Proposed Motor Caravan Site
Warrington

Access Options

CARRIAGEWAY
CONSULTING
traffic engineering | transport planning

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1. Introduction

1.1. The New Zealand Motor Caravan Association proposes to develop a new site for overnight motor caravan stays at 20 Bay Road, Warrington, approximately 20km northeast of Dunedin.

1.2. This report sets out the ways in which access could be gained to the site, taking into account current road geometries and constraints. It is based on a site visit carried out in August 2019.

2. Site Overview

2.1. Location

2.1.1. The site is located at 20 Bay Road, Warrington. The location of the site in the context of the local area is shown in Figure 1.

Figure 1: General Location of Development Site

2.2. Roading Classification

2.2.1. The Dunedin City District Plan classifies Coast Road as a Collector Road, with a role of carrying through traffic and also providing direct property access. All other roads within Warrington are Local Roads, with a primary role of providing direct property access.

3. Current Traffic Flows and Road Safety Records

3.1. Traffic Flows

3.1.1. The MobileRoad website has been used to identify the daily traffic flows on each road, as shown below.

Figure 2: Daily Traffic Flows within Warrington (Two-Way Vehicle Movements)

3.1.2. It can be seen that traffic flows are very light. Peak hour traffic flows are typically around 10% of the daily flows, meaning that even in the busiest periods, most roads within Warrington carry an average of one vehicle every two minutes. Park Road is the busiest road but this carries an average of one vehicle movement every minute at the peak times.

3.2. Road Safety

3.2.1. The NZTA Crash Analysis System has been used to identify all reported crashes on the roading network within Warrington for the period 2010 to 2019 inclusive[1]. This showed that there has been just five crashes recorded in the township over this period on roads that could be used by motor caravans.

[1] A ten-year period has been used in view of the low traffic flows

Figure 3: Location of Reported Crashes, 2010 to 2019

3.2.2. The crash locations and circumstances were as follows:

- On Coast Road, just north of Park Road, two drivers turning left out of Park Road failed to give way to a westbound vehicle on Coast Road, and in taking evasive action, the vehicle on Coast Road left the road. It resulted in minor injuries;
- Further north on Coast Road, a car broke down and in attempting to move the vehicle to the side of the road, the driver left the road. This did not result in any injuries;
- At the Coast Road / Perry Street intersection, a driver exiting Perry Street failed to give-way for another vehicle on Coast Road, and the vehicles collided. This did not result in any injuries;
- At the Perry Street / Couper Street curve, a vehicle travelling too quickly struck another vehicle head-on. This did not result in any injuries; and
- At the Park Road / Bank Road intersection, a driver ran into the rear of another vehicle that was parked by the side of the road. This did not result in any injuries.

3.2.3. Two of these crashes are unrelated to the road geometry. Of the other three, two were recorded at locations where there are constraints in the roading network as described in more detail below.

4. Constraints in Current Transportation Networks

4.1. Route Options

4.1.1. Given the location of the site, there are several options which could be considered to gain access. It is possible to gain access from the west:

- Option West1: Coast Road (west), Park Road, Bank Road, Bay Road;
- Option West2: Coast Road, Park Road, Hill Road, Bay Road;
- Option West3: Coast Road, Park Road, Bank Road, Bay Road, Esplanade (then through the reserve); and
- Option West4: Coast Road, Park Road, Hill Road, Esplanade (then through the reserve).

4.1.2. It is also possible to gain access from the east:

- Option East1: Coast Road, Perry Street / Couper Street, Bank Road, Bay Road;
- Option East2: Coast Road, Perry Street / Couper Street, Park Road, Hill Road, Bay Road;
- Option East3: Coast Road, Perry Street / Couper Street, Bank Road, Bay Road, Esplanade (then through the reserve); and
- Option East4: Coast Road, Perry Street / Couper Street, Park Road, Hill Road, Esplanade (then through the reserve).

4.1.3. Each of these routes has been visited to identify whether they would be suitable for larger vehicles (that is motor caravans). The following sections set out specific constraints that have been identified.

4.2. Coast Road / Perry Street Intersection

Figure 4: Location of Constraint

Photograph 1: Looking East Towards Perry Street from Coast Road

4.2.1. The intersection is a priority controlled crossroads which does not have any turning lanes. As can be seen in Photograph 1, there is a crest curve in Coast Road to the immediate west of the intersection and this reduces the sight distance (for drivers approaching the intersection and also those turning out of the intersection) to around 60m. In view of the speed limit on Coast Road of 50km/h, a sight distance of 73m is typically required.

4.2.2. One possible outcome of this limited sight distance is that if a vehicle was to be waiting on Coast Road to turn right into Perry Street, another eastbound vehicle would not have sufficient distance in which to stop unless the driver was being highly attentive to the situation.

4.2.3. For drivers exiting Perry Street, the combination of a grassy bank and the crest curve restrict the sight distance towards the west. Measured at 3.5m from the limit line (whereas 7m would be more common), the sight distance is 56m. Toward the east, a property boundary limits the sight distance to 42m. In this case, the usual sight distance for a 50km/h speed limit would be 123m.

Photographs 2 and 3: Sight Distance to the Left and Right from Perry Street

4.2.4. One outcome of the limited sight distance is that even if drivers emerging from Perry Street were to wait until Coast Road was completely clear before beginning their exit manoeuvre, the vehicle would be unable to fully pull out and accelerate without the risk that another vehicle would appear on Coast Road and hit them. By way of comparison, sight distance of 42m to 56m are appropriate for intersections where through traffic is only travelling at 30km/h.

4.2.5. The general type of crash that results from this type of deficiency is one where a driver pulls out from the side road and is struck by a vehicle on the main road. It is of note that one of the five crashes recorded in Warrington over the past ten years is of this type.

4.3. Perry Street / Couper Street Curve

Figure 5: Location of Constraint

Photograph 4: Looking North Towards Curve

4.3.1. At the end of Perry Street, the formed road turns through 90-degrees and becomes known as Couper Street. The curve radius (measured along the centreline) is just 14m. Although motor caravans are of different lengths, the swept path of a standard 6.4m truck requires at least an 8m radius. Moreover, because the front and rear wheels of vehicles inscribe different radii, the effective width required for the vehicle making such a turn is 4.5m.

4.3.2. The outcome of this is that:

- The front wheels of a southbound vehicle would remain in the correct traffic lane, but the rear wheels would move considerably into the opposing traffic lane; and
- On exiting the curve, the front wheels of a northbound vehicle would have to be within the opposing traffic lane in order to ensure that the rear wheels remained in the correct traffic lane.

4.3.3. As can be seen on Photograph 4, the sightlines around the curve are very limited due to the hedge on the inside of the curve. On-site measurements indicated that in some locations, the sight distance was less than 20m. As a result, if a motor caravan was to be undertaking the turn, then an oncoming vehicle would be unlikely to be able to see them in time to avoid a collision.

4.3.4. It is also of note that there are no chevron signs or advisory speed limit at the curve to alert drivers to the geometry.

4.3.5. The general type of crash that results from this type of road geometry is one where one driver crosses the centreline and strikes an oncoming vehicle. It is of note that one of the five crashes recorded in Warrington over the past ten years is of this type.

4.4. Couper Street Curve and Railway Level Crossing

Figure 6: Location of Constraint

Photograph 5: Looking South Towards Curve and Railway Level Crossing

4.4.1. On the northern approach to the level crossing, Couper Street turns towards with a more north-south alignment and at the same time it descends to cross the railway. The curve is 17m in radius, and the roadway is formed with a 6m width, meaning that again there is a risk of drivers of larger vehicles having to cross the centreline. The gradient of the road is around 1 in 6, making it very steep and with a risk that in wet conditions a driver may slide onto the railway.

4.4.2. On the southern approach to the level crossing, the road rises sharply over the last 6m with a gradient of more than 1 in 5. The roadway then becomes flat again as it crosses the railway. The sudden change of gradient creates a high risk that larger vehicles will scrape or 'ground' as they cross the railway.

4.5. Bank Road Curve

Figure 7: Location of Constraint

Photograph 6: Looking East Towards Curve

4.5.1. The curve in Bank Road has a radius of around 16m meaning that again, there is a risk that larger vehicles will need to cross the centreline. This risk is compounded in this location because the carriageway width is 4.6m and there is a concrete bollard on the inside of the curve which prevents over-running. In addition, the horizontal curve is at a sag curve in the road.

4.6. Bay Road / Hill Road Intersection

Figure 8: Location of Constraint

Photograph 7: Looking South Towards Curve

4.6.1. This intersection is priority controlled but with traffic travelling north-east having the right-of-way and traffic on Bay Road (towards the west) having to yield. However, there are no chevron signs at the intersection to advise drivers on Hill Road about the presence of the curve, with has a radius of around 18m (and therefore is better able to accommodate larger vehicles).

4.6.2. Drivers travelling from north to east have limited sight distances due to the presence of a property boundary on the northeastern side of the intersection. However the curve also means that drivers have to slow down and although no formal observations have been made, it is likely that the sight distance is appropriate for the prevailing speeds.

4.6.3. Drivers emerging from Bay Road to turn towards the left have limited sight distances along Hill Road (north) due to a mature hedge which appears to protrude well into the road reserve.

Photograph 8: Sight Distance Towards North for Drivers Exiting Bay Road

4.7. Other Constraints and Opportunities

4.7.1. It was noted that most roads within Warrington have a seal width that is less than current design codes. This includes (but is not limited to) Bay Road itself, where the seal is 4.8m wide, compared to a usual minimum width under current codes of 5.5m. However this is in large part mitigated through the very low traffic flows which each road carries. This not only means that the potential for meeting another vehicle is low, but that there is greater opportunity to find a suitable location to pull to the side of the road to allow the other vehicle to pass.

4.7.2. There is a signed freedom camping site at Warrington Domain. The route for this is clearly signed at all decision points from the Coast Road / Park Road intersection, and the return route (from the camp site to the main roads) is signed as “To Highway”.

Figure 9: Location of Signed Route to Camp Ground

4.7.3. During site visits it was noted that Park Road and Hill Road were generally suitable for higher traffic volumes. No constraints to sight distances were observed at the Park Road / Bank Road and Park Road / Hill Road intersections.

4.8. Summary of Locations of Key Constraints

Figure 10: Overall Location of Constraints

5. Discussion

5.1. Unsuitable Routes

5.1.1. In view of the roading geometry, and the prevailing crash record, it is considered that a route using Perry Street / Couper Street and crossing the railway should be avoided:

- The Coast Road / Perry Street intersection has a significant shortfall in sight distances and one crash has already been recorded where this could be a contributing factor;
- The Perry Street / Couper Street curve radius is tight and vehicles will likely have to cross into the opposing traffic lane to undertake the movement. One crash has already been recorded where this could be a contributing factor;
- The vertical alignment at the railway is such that it is likely that larger vehicles could scrape or 'ground'

5.1.2. It is considered that a route using Bank Road / Bay Road should be avoided:

- The width of the carriageway and radius of the Bank Road / Bay Road curve means that vehicles will likely have to cross into the opposing traffic lane to undertake the movement;
- A concrete bollard on the inside of the curve means that drivers are likely to shy away from the edge of the traffic lane to a greater extent than usual, making it more likely that vehicles will cross the centreline.

5.2. Suitable Routes

5.2.1. Based on site visits, there are no obvious constraints that would preclude Park Road and Hill Road from being used by motor caravans. This route is already used as the signed route into the camp site at the domain.

5.2.2. There are two options as to the way in which motor caravans could then reach the proposed site, via Bay Road or via Esplanade and the domain.

5.2.3. The route via Esplanade is already used by such vehicles, and also by vehicles towing caravans, and therefore by definition the route must be suitable. It has therefore not been considered in any further detail.

5.2.4. Vehicles travelling towards the site via Bay Road must turn right from Hill Road. The roading geometry here is insufficient for this movement to take place without the motor caravan over-running into the eastbound traffic lane of Bay Road. A review of land boundaries shows that in practice, the road reserve is at least 6m wider in this location than visually appears to be the case due to the overgrown vegetation. Consequently it would be possible, through removing the vegetation and reinstating the legal boundary, to provide sufficient manoeuvring space for motor caravans.

5.2.5. The access leg into the site is around 20m wide. This is ample for a suitable vehicular access to be formed. There is also sufficient width within Bay Road for radii to be created at the mouth of the access to enable larger vehicles to turn. The volume of traffic on Bay Road is not sufficient that auxiliary turning lanes would be required.

5.2.6. Vehicles leaving the site are required to turn left from Bay Road onto Hill Road. Again, at present, this movement would be difficult without the vehicle then over-running into the

southbound traffic lane on Hill Road due to the hedge. However removal of the hedge and reinstatement of the legal road boundary would address this matter.

Figure 11: Estimated Site Boundaries at Hill Road / Bay Road (Source: Dunedin City Council GIS)

5.2.7. That said, the removal of the hedge and the widening of the intersection seal would appear to be out-of-context for Warrington, in that traffic flows are low and it is likely that the constrained environment results in reduced vehicle speeds (and thus safety benefits). As a result, while an intersection improvement scheme to improve swept paths and sight distances the optimum solution from a solely transportation perspective, there are other reasons why such a scheme would not be suitable.

5.2.8. Overall then, there are two viable solutions to serve the site:

- Via Park Road, Hill Road and Esplanade, and then via the reserve; or
- Via Park Road, Hill Road and Bay Road, with a widening of the seal and removal of mature landscaping at the Hill Road / Bay Road intersection.

5.2.9. Given the low traffic flows and the amenity values of the landscaping (it is clear that the hedge is maintained), it considered that a route via the domain would be the better option. However if appropriate permissions for this are not achieved, then access via Bay Road is possible. Routing via the domain also means that the existing signage scheme for the camp site can be maintained, rather than new signage being installed.

6. Summary

6.1. Based on site visits there are constraints to the road geometry in several locations which may give rise to adverse road safety effects. Consequently, it is considered that Perry Street and Couper Street and Bank Road should not be used for gaining access to the site

6.2. There are no constraints to an access route via Park Road and Hill Road, and it is therefore recommended that these are used.

6.3. With regard to the use of Bay Road or Esplanade (and the domain) to access to the site, there are presently no technical or geometric constraints to using Esplanade and the domain.

6.4. There is currently mature vegetation on the northwestern corner of the Hill Road / Bay Road intersection which will result in drivers turning northwards (on exiting the site via Bay Road) having to cross the centreline of Hill Road. This movement also has limited sight distances. However the legal road reserve appears to be in a different location to that which is seen on site, and in particular, the mature and well-maintained hedge appears to be within the legal road. Removing the hedge and reinstating the legal boundary would remove the current constraints for the west-to-north movement at the intersection.

6.5. It is likely that there are good amenity-related reasons why the hedge should be retained though, and creating a larger intersection would not be in keeping with the current environment round Warrington where roads are relatively narrow and geometries are constrained.

6.6. Consequently it is recommended that efforts are made to achieve access to the site via Esplanade and the domain. In addition, this route is already signed and therefore will be straightforward for motor caravan owners to identify and use.

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