# Project Kea

# Waste to Energy Plant, Glenavy

## Transportation Assessment Report

22 November 2022

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**Project:** Project Kea

**Report title:** Transportation Assessment Report

**Document reference:** J002129 Project Kea, Glenavy-final2.docx

**Date:** 22 November 2022

| Report Status | Prepared By | Reviewed By | Approved By |
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# 1 INTRODUCTION

Commute Transportation on behalf of South Island Resource Recovery Limited ('SIRRL') have prepared a Transport Assessment ('TA') for a new Energy from Waste (EfW) Plant (the 'facility') on a circa 15 ha site on Morven Glenavy Road in Glenavy, Waimate District.

The facility is proposed to receive 365,000 tonnes of municipal solid waste per annum, incinerate it and convert the heat energy into steam that will drive a steam turbine. The surplus electrical energy generated by the facility is proposed to be exported to the local electricity network.

The development is proposed to comprise the following:

- 43,176 $m^2$ main plant building;
- 810 $m^2$ pump station;
- 2,250 $m^2$ wastewater treatment plant;
- 40 $m^2$ diesel tank area;
- 2,820 $m^2$ auxiliary maintenance workshop;
- 8,000 $m^2$ temporary storage area for containerised construction waste, bottom ash and vitrified fly ash;
- 40 $m^2$ weighbridge room, and
- 3,300 $m^2$ administration building.

In total, the buildings on-site are proposed to have a floor area of 60,436 $m^2$. A total of 70 parking spaces are proposed to serve the facility.

All vehicle access to the site will occur via Morven Glenavy Road. Heavy vehicles are proposed to use an access on Morven Glenavy Road on the southern boundary, while light vehicles (staff and visitors) are proposed to use an access on Morven Glenavy Road on the eastern boundary. For this report, these are referred to as the 'heavy vehicle access' and 'light vehicle access'.

This report assesses the effects of the proposed development and compliance with relevant Waimate District Plan rules. In particular, this report assesses the following:

- The existing site conditions including crash history, road layout, stock crossings, level crossings etc;
- The traffic generating potential of the proposed development and the effects on the State Highway 1('SH1')/ Carrolls Road intersection;
- Assessment of proposed parking, loading and access provisions; and
- the mitigation measures proposed to address any adverse transport effects arising from the proposed development.

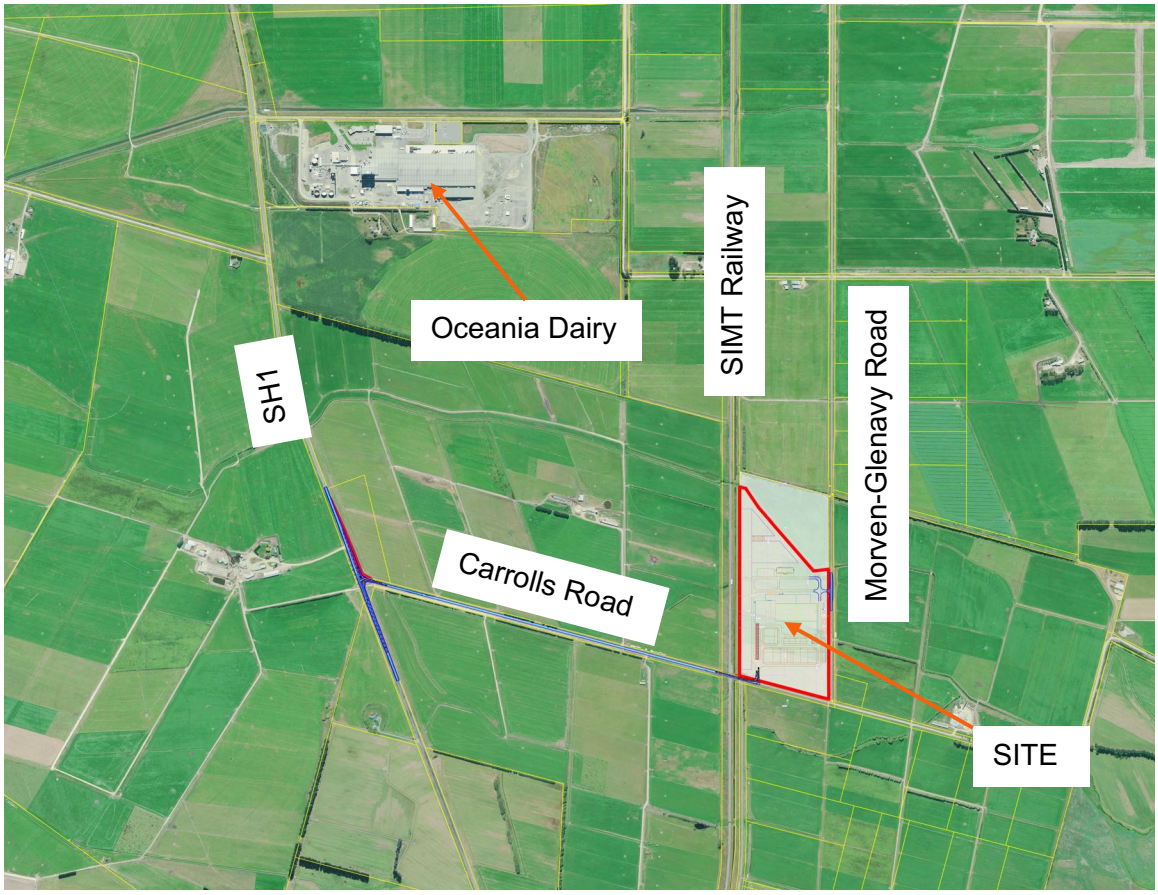
By way of summary, it is considered by this assessment that if the proposed development as detailed in this report is undertaken, minimal adverse effects to the function, capacity and safety of the surrounding transport network are anticipated.

# 2 EXISTING ROAD ENVIRONMENT

## 2.1 SITE LOCATION AND ROAD LAYOUT

The site is located on Morven Glenavy Road in Glenavy, Waimate District. Figure 1 below shows the location of the site in relation to the surrounding road network.

**Figure 1: Site Location**




The development site is bounded by the South Island Main Trunk railway ('SIMT') to the west, Morven Glenavy Road to the south and east, and Whitneys Creek to the north. The site is located in the 'Rural Zone' as per the Waimate District Plan[1] ('District Plan').

Morven Glenavy Road runs in a general north-south direction from Glenavy in the south to Morven in the north. It has a single lane in each direction with a sealed width of approximately 6.5m to 7.0m, and has a typical rural form i.e. no footpaths, and open drains. It deviates around the site with Morven Glenavy Road on both the southern and

[1] Planning Map 24, Waimate District Plan

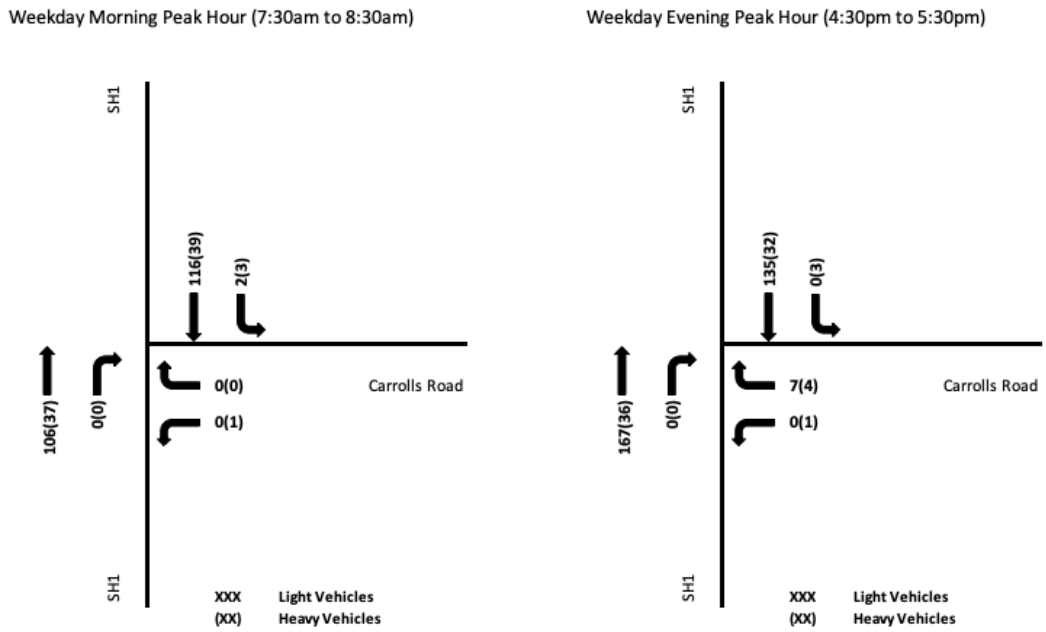
eastern boundaries. The speed limit on Morven Glenavy Road is an open road speed limit i.e. 100 km/hr.

Carrolls Road extends east toward the site from SH1, and changes into Morven Glenavy Road to the east of the SIMT railway. Carrolls Road is unsealed and has a width of approximately 5 m. No speed limits are posted and therefore are assumed to be the same as Morven Glenavy Road and SH1 i.e. 100 km/hr.

## 2.2 TRAFFIC VOLUMES

No traffic count data for Morven Glenavy Road or Carrolls Road is publicly available on the Waimate District Council website. Despite this, traffic counts were undertaken at the SH1/ Carrolls Road intersection to assess the impacts of the development on this intersection. The traffic counts were undertaken on Thursday 26 May, 2022. The results of the traffic surveys are summarised in Figure 2.

**Figure 2: SH1/ Carrolls Road Intersection – Existing Traffic Volumes**




Based on the above, it is estimated Carrolls Road carries less than 100 vehicles per day (vpd). While no data is available for Morven Glenavy Road, a meeting with Waimate District Council representatives indicated it would likely be in the order of 200 to 300 vpd.

## 2.3 ROAD SAFETY

An assessment of the surrounding area's safety record has been carried out using the New Zealand Land Transport Agency Waka Kotahi's ('Waka Kotahi') CAS database for all reported crashes at the following locations:

- Within a 800 m radius of the SH1/ Carrolls Road intersection;
- Along Carrolls Road between SH1 and Morven Glenavy Road;
- Along Morven Glenavy Road on the southern and eastern frontages of the site;
- Within a 50 m radius of the Morven Glenavy Road/ Carrolls Road intersection (west of the site) and the Morven Glenavy Road/ Carrolls Road intersection (east of the site), and
- Within a 500 m radius of the proposed light vehicle access on Morven Glenavy Road.

The search was undertaken for the five-year period from 2017 to 2021 inclusive, in addition to any data entered into the system for 2022.

No crashes were identified within the search area and importantly, there were no crashes identified at the SH1 intersection, or at the level crossing.

From an assessment of the crash history, there is no indication of any significant safety concerns near the subject site.

## 2.4 ALTERNATIVE TRANSPORT MODES

Given the rural nature of the site, there are no nearby public bus services providing travel alternatives for staff. Similarly, while it is possible for staff to ride a bicycle to and from the site (there are no restrictions preventing this), given the high vehicle speeds on the neighbouring roads, and limited road shoulders to accommodate cyclists, it is unlikely staff would consider this a safe means of transport for travel to and from the site. Furthermore, some shifts will work overnight and further reduce opportunities for cycling.

Given the above, it is expected that all staff will travel to and from the site by private vehicles, and this has been assessed in the traffic modelling of the SH1/ Carrolls Road intersection.

In terms of municipal solid waste (MSW) and construction waste deliveries to the facility, the site will cater for both road and rail modes. The site was specifically selected to be close to major centres and near SH1 and the SIMT railway. A rail siding will be provided within the site however in the short term it is likely, and it has been conservatively assumed, that all waste material is delivered by truck.

# 3 PROPOSED DEVELOPMENT

## 3.1 THE FACILITY

As noted, the proposal plans to construct an Energy from Waste facility on a circa 15 ha site on Morven Glenavy Road in Glenavy, Waimate District.

The facility is proposed to receive 365,000 tonnes of municipal solid waste per annum, incinerate it and convert the heat energy into steam that will drive a steam turbine. The surplus electrical energy generated by the facility is proposed to be exported to the local electricity network.

The development is proposed to comprise the following:

- 43,176 $m^2$ main plant building;
- 810 $m^2$ pump station;
- 2,250 $m^2$ wastewater treatment plant;
- 40 $m^2$ diesel tank area;
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- 40 $m^2$ weighbridge room, and
- 3,300 $m^2$ administration building.

In total, the buildings on-site are proposed to have a floor area of 60,436 $m^2$. A total of 70 parking spaces are proposed to serve the facility.

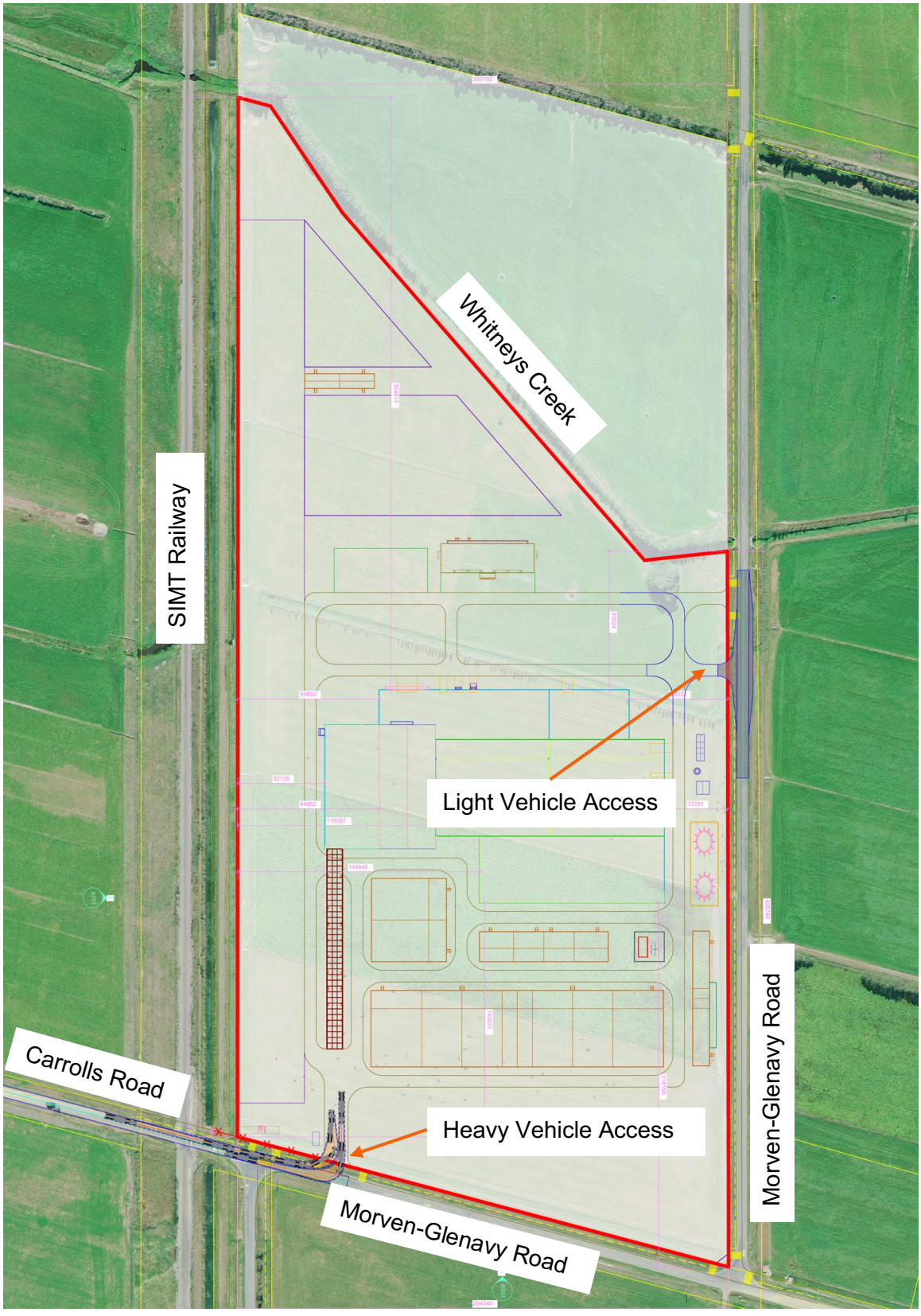
All vehicle access to the site will occur via Morven Glenavy Road. Heavy vehicles are proposed to use an access on Morven Glenavy Road on the southern boundary, while light vehicles (staff and visitors) are proposed to use an access on Morven Glenavy Road on the eastern boundary. For this report, these are referred to as the 'heavy vehicle access' and 'light vehicle access'.

The facility is proposed to operate 24 hours per day and have staffing levels as follows:

- 3 x shifts of 14 operational staff working 7 days per week (Monday to Sunday). Shift times are yet to be determined but it is estimated there will be three 8-hour shifts per day (12 am to 8 am, 8 am to 4 pm, 4 pm to 12 am), and
- 32 x management staff working 5 days per week (Monday to Friday). These staff are expected to follow general business hours (8 am to 5 pm).

Figure 3 shows the proposed development.

**Figure 3: Proposed Development**



## 3.2 PROPOSED TRANSPORT IMPROVEMENTS

Several transport upgrades are proposed to accommodate the proposed facility. These are summarised below:

- SH1/ Carrolls Road intersection upgrade including provision of right turn bay on SH1 south, and an auxiliary left turn lane on SH1 north. Given 24 hour operation of the facility, a street lighting upgrade is also proposed at the intersection;
- Widening, sealing and pavement upgrade of Carrolls Road between SH1 and the heavy vehicle access. Given 24 hour operation of the facility, edge marker posts and raised reflective pavement markers (RRPMs) are proposed to be installed along the road for delineation purposes;
- A new stock crossing tunnel on Carrolls Road (in approximately same position as SC031 on Waimate GIS maps);
- Level crossing upgrade including provision of barriers, flashing lights and bells;
- Given 24 hour operation of the facility, a street lighting upgrade is also proposed within the general area comprising the level crossing, Morven Glenavy Road/ Carrolls Road intersection, and the heavy vehicle access;
- Street lighting upgrade at the second Morven Glenavy Road intersection at south-eastern corner of site, and
- Shoulder widening on Morven Glenavy Road within the vicinity of the light vehicle access. The shoulder widening is proposed to be in accordance with the Waka Kotahi Planning Policy Manual (Diagram D).

The proposed transport upgrades are shown in the concept drawings in **Attachment A**.

# 4 TRIP GENERATION

## 4.1 GENERAL ASSESSMENT METHODOLOGY

The trip generating potential of the site has been estimated based on detailed plans of staffing levels, proposed staff shifts and proposed inbound and outbound truck delivery schedules. This information is commercially sensitive however the key results from the analysis of the staff and delivery movements are summarised in the following sections.

## 4.2 TRUCK TRIP GENERATION

The facility is proposed to cater for up to 68 trucks per day, or 136 truck movements per day (68 inbound and 68 outbound). In time, the facility can cater for transporting waste by rail but initially, this is proposed to be undertaken by truck. The assessment within this report assumes 100% of waste being delivered to site by truck.

The majority of trucks are expected to be articulated truck and trailers, or single unit hook trucks. Examples of the type of trucks expected to visit the site are shown in Photograph 1 and Photograph 2.

**Photograph 1: Truck and Trailer Example**

**Photograph 2: Hook Truck Example**

Truck movements are proposed to occur over a 24-hour period however for assessment purposes, we have conservatively assumed they occur over a 12-hr period to account

for potential peaking in movements during typical business hours. Based on this assessment methodology, we conclude the following:

- 12[2] truck movements in the morning commuter peak hour comprising 6 inbound and 6 outbound movements, and
- 12 truck movements in the evening commuter peak hour comprising 6 inbound and 6 outbound movements.

## 4.3 LIGHT VEHICLE TRIP GENERATION

Light vehicle movements are proposed to comprise both operational staff movements, and management staff movements. For assessment purposes, all staff are assumed to use private vehicles.

As detailed in Section 3.1, the operational staff are likely to have shift changes during, or close to, the morning and evening peak hours. For assessment purposes, the following has been assumed:

- Morning peak hour – 14 day shift staff arriving and 14 night shift staff departing, and
- Evening peak hour – 14 evening shift arriving and 14 day shift departing.

In addition, during the working week (Monday to Friday), management staff are likely to arrive in the morning peak hour and depart in the evening peak hour. For assessment purposes, the following is assumed:

- Morning peak hour – 32 management staff arriving, and
- Evening peak hour – 32 management staff departing.

In total, there are expected to be 148 light vehicle movements per day (74 inbound and 74 outbound).

## 4.4 TRIP GENERATION SUMMARY

Based on the previous sections, Table 1 summarises the predicted trip generation.

[2] 136 truck movements per day/ 12 hours per day = 11.33 trucks per hour (rounded up to 12 trucks per hour for assessment)

**Table 1: Trip Generation Calculations**

| | AM Peak Hour | | PM Peak Hour | | Daily | |
|---|---|---|---|---|---|---|
| | In | Out | In | Out | In | Out |
| Heavy vehicle movements | 6 | 6 | 6 | 6 | 68 | 68 |
| Light vehicle movements | 46 | 14 | 14 | 46 | 74 | 74 |
| **Total** | **52** | **20** | **20** | **52** | **142** | **142** |

As shown, the development site is estimated to generate up to 72 vehicle movements per hour in the peak hours, and 284 vehicle movements per day.

For context, the site has an overall area of circa 15 ha and a building area of 60,436 $m^2$. This equates to peak hour trip rates of 4.8 trips per ha (based on site area) or 0.12 trips per 100 $m^2$ (based on building area), and daily trip rates of 18.93 trips per ha (based on site area) or 0.47 trips per 100 $m^2$ (based on building area).

## 4.5 COMPARISON TO PUBLISHED RATES

The trip generation of the facility has been compared to published data. It is considered that the best available comparative data is in NZTA RR453[3]. The facility is considered best represented by warehouse type activities (noting that manufacturing activities have higher trip generation rates). Table 2 shows this data.

**Table 2: Trip Generation Rate Comparison**

Trips and parking related to land use

| Land use | New Zealand[a] | | Australia[b] | | United Kingdom[c] | | USA[c] | |
|---|---|---|---|---|---|---|---|---|
| | Trip generation rates | | Trip generation rates | | Trip generation rates | | Trip generation rates | |
| | Daily (vpd) | Peak hour (vph) | Daily (vpd) | Peak hour (vph) | Daily (vpd) | Peak hour (vph) | Daily (vpd) | Peak hour (vph) |
| Video stores | 74.1/100m² GFA | 25.4/100m² GFA | - | - | - | - | - | 14.64/100m² GFA |
| Drive-in fast food restaurant | 362/100sm² GFA | 52.2/100m² GFA | - | 180/site | 387.61/100m² GFA | 39.41/100m² GFA | 534.04/100m² GFA | 36.43/100m² GFA |
| Restaurants | 73.3/100m² GFA | 18/100m² GFA | 60/100m² GFA | 5/100m² GFA | 40.35/100m² | 5.96/100m² | 136.87/100m² GFA | 12.0/100m² GFA |
| | | | | | | | 4.83/seat | 0.41/seat |
| Bars & taverns | 92.1/100m² GFA | 15.6/100m² GFA | - | - | 56.5/100m² | 5.81/100m² | - | - |
| Gymnasiums | 37.2/100m² GFA | 7.4/100m² GFA | 45/100m² GFA | 9/100m² GFA | 25.2/100m² GFA | 3.0/100m² GFA | - | 3.92/100m² GFA |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| Warehouses | 2.4/100m² GFA | 1/100m² GFA | 4/100m² GFA | 0.5/100m² GFA | 5.55/100m² FA | 0.27/100m² GFA | 3.83/100m² GFA | 0.34/100m² GFA |
| Medical centres | 64.1/100m² GFA | 14.2/100m² GFA | 60/100m² GFA | 15/100m² GFA | 39.23/100m² GFA | 5.78/100m² GFA | 7.75/ employee | 1.31/ employee |
| | 31/ prof staff | 6.5/ prof staff | | | | | | |
| Hospitals | 14.1/100m² GFA (12/ bed) | 2.3/100m² GFA (1.3/ bed) | 7.5/ bed | 1 bed | 12.88/100m² GFA (15.07/bed) | 1.3/100m² GFA (1.53/ bed) | 11.8/ bed | 1.45/ bed |
| Preschools | 4.1/ child | 1.4/ child | - | 1.4/ child | 2.4/ pupil | 0.5/ pupil | 4.48/ student | 0.82/ student |
| Primary schools | 1.6/ pupil | 0.7/ pupil | - | - | 1.19/ pupil | 0.39/ pupil | 1.29/ student | 0.45/ student |

[3] New Zealand Transport Agency Research Report 453, November 2011, Table 8.10

The trip generation has been calculated based on the above rates and compared to the predicted trip generation outlined in Section 4.4. Table 3 shows the comparison to published rates and whether these are less than (shown in red), or greater than (shown in green) the predicted trip generation of the facility.

**Table 3: Trip Generation Comparison to Published Rates**

| Facility | | New Zealand | | Australia | | UK | | USA | |
|---|---|---|---|---|---|---|---|---|---|
| Daily | Hourly | Daily | Hourly | Daily | Hourly | Daily | Hourly | Daily | Hourly |
| **284** | **72** | 1,450 | 604 | 2,417 | 302 | 3,354 | 163 | 2,315 | 205 |

As shown above, all published 'Warehouse' rates are above the predicted trip generation of the facility. As such, the facility is considered to be a low traffic generating industrial activity, and is not generating traffic volumes beyond that which would typically be expected by this type of activity.

## 4.6 TRIP DISTRIBUTION

In distributing vehicle movements onto the road network, it is assumed that all heavy vehicle movements, and all light vehicle movements, will travel to and from the site via the SH1/ Carrolls Road intersection.

The origins and destinations of vehicles travelling to and from the site has been comprehensively assessed by the applicant. The following data has been provided for estimating the distribution of traffic movements:

- 85% of heavy vehicle movements travel to/from the north;
- 15% of heavy vehicle movements travel to/from the south;
- 70% of light vehicle movements travel to/from the north, and
- 30% of light vehicle movements travel to/from the south.

Based on the trip generation values in Table 1, and the distribution above, the estimated additional movements at the SH1/ Carrolls Road intersection are summarised in Figure 4. The proposed traffic movements at the intersection (existing plus additional movements) are summarised in Figure 5.

**Figure 4: SH1/ Carrolls Road Intersection – Additional Traffic Volumes**

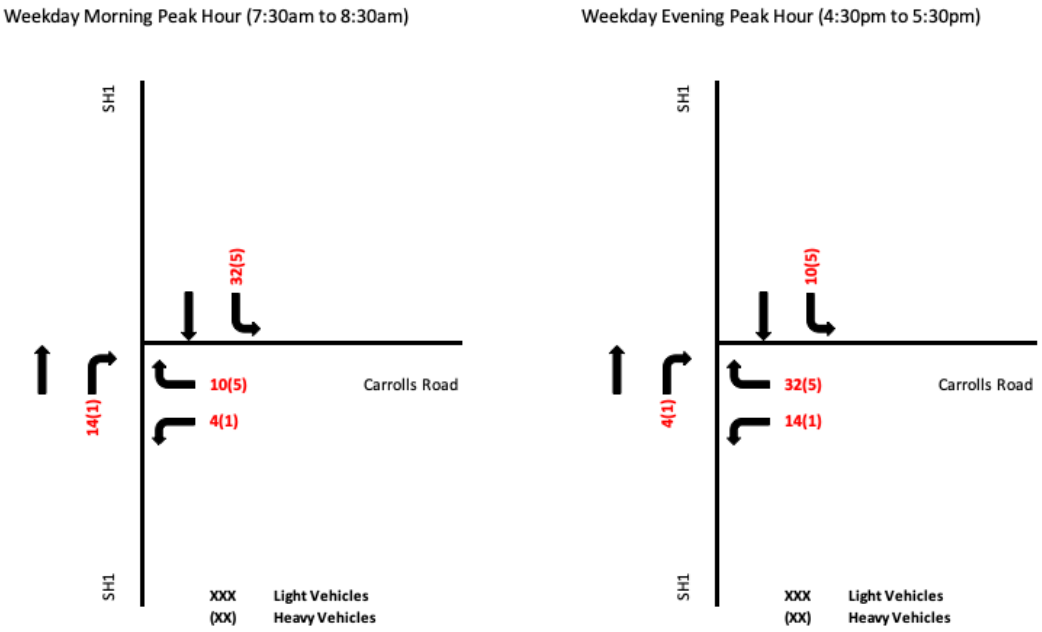
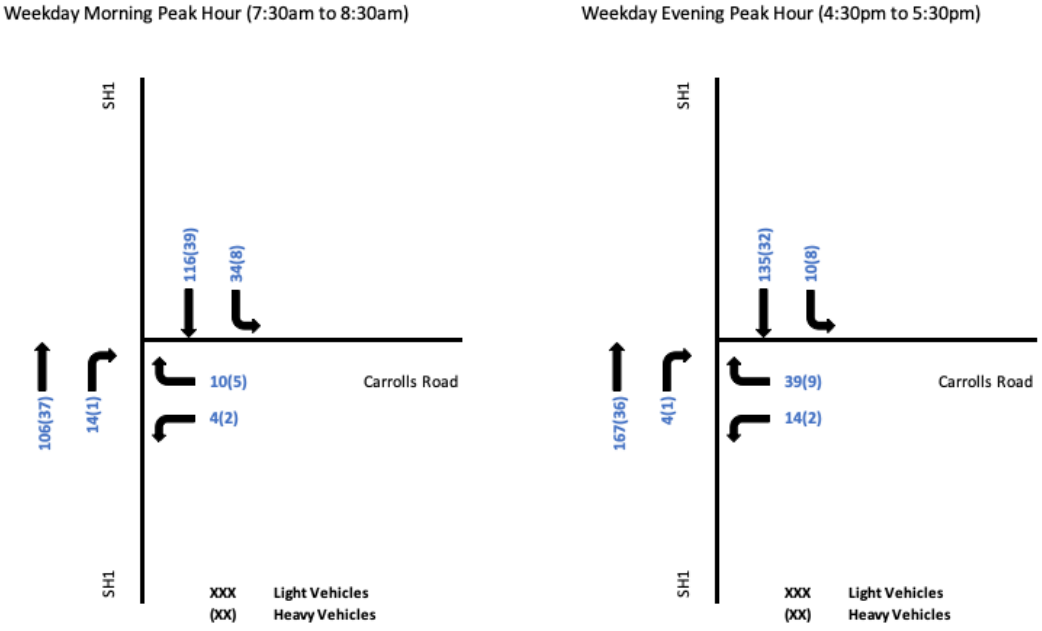



**Figure 5: SH1/ Carrolls Road Intersection – Proposed Traffic Volumes**




The effects of the development on the performance of the SH1/ Carrolls Road intersection are discussed in the following section.

# 5 EFFECTS ON THE ROAD NETWORK

The SH1/ Carrolls Road intersection has been modelled in SIDRA to understand how it is likely to perform once the site is developed. Intersection models have been prepared for the following scenarios:

- Morning peak hour with existing traffic volumes and existing intersection layout (AM existing);
- Morning peak hour with proposed traffic volumes and upgraded intersection layout (AM proposed);
- Evening peak hour with existing traffic volumes and existing intersection layout (PM existing), and
- Evening peak hour with proposed traffic volumes and upgraded intersection layout (PM proposed).

SIDRA default values have been used and in particular, the critical and follow-up gap acceptance values (7 seconds and 4 seconds respectively) have not been modified. The speeds on SH1 are assumed to be 100 km/hr while the speeds on Carrolls Road are assumed to be 60 km/hr (however these speeds make minimal difference to the modelling results).

The results of the morning peak hour scenarios (AM existing and AM proposed) are summarised in Table 4 and Table 5. The results of the evening peak hour scenarios (PM existing and PM proposed) are summarised in Table 6 and Table 7.

**Table 4: SH1/ Carrolls Road Intersection – Existing Morning Peak Hour Intersection Performance**

| Vehicle Movement Performance | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] veh/h | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
| South: SH1 | | | | | | | | | | | | | | |
| 2 | T1 | 143 | 37 | 151 | 25.9 | 0.091 | 0.0 | LOS A | 0.0 | 0.1 | 0.00 | 0.00 | 0.00 | 99.7 |
| 3 | R2 | 1 | 0 | 1 | 0.0 | 0.091 | 8.0 | LOS A | 0.0 | 0.1 | 0.00 | 0.00 | 0.00 | 71.5 |
| Approach | | 144 | 37 | 152 | 25.7 | 0.091 | 0.1 | NA | 0.0 | 0.1 | 0.00 | 0.00 | 0.00 | 99.5 |
| East: Carrolls Road | | | | | | | | | | | | | | |
| 4 | L2 | 1 | 1 | 1 | 100.0 | 0.003 | 13.8 | LOS B | 0.0 | 0.1 | 0.35 | 0.87 | 0.35 | 44.5 |
| 6 | R2 | 1 | 0 | 1 | 0.0 | 0.003 | 9.0 | LOS A | 0.0 | 0.1 | 0.35 | 0.87 | 0.35 | 56.9 |
| Approach | | 2 | 1 | 2 | 50.0 | 0.003 | 11.4 | LOS B | 0.0 | 0.1 | 0.35 | 0.87 | 0.35 | 49.9 |
| North: SH1 | | | | | | | | | | | | | | |
| 7 | L2 | 5 | 3 | 5 | 60.0 | 0.101 | 9.4 | LOS A | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 64.7 |
| 8 | T1 | 155 | 39 | 163 | 25.2 | 0.101 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 99.6 |
| Approach | | 160 | 42 | 168 | 26.3 | 0.101 | 0.3 | NA | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 97.9 |
| All Vehicles | | 306 | 80 | 322 | 26.1 | 0.101 | 0.3 | NA | 0.0 | 0.1 | 0.00 | 0.02 | 0.00 | 98.0 |

**Table 5: SH1/ Carrolls Road Intersection – Proposed Morning Peak Hour Intersection Performance**

| Vehicle Movement Performance | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] veh/h | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
| South: SH1 | | | | | | | | | | | | | | |
| 2 | T1 | 143 | 37 | 151 | 25.9 | 0.090 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 100.0 |
| 3 | R2 | 15 | 1 | 16 | 6.7 | 0.014 | 8.5 | LOS A | 0.1 | 0.4 | 0.33 | 0.63 | 0.33 | 60.9 |
| Approach | | 158 | 38 | 166 | 24.1 | 0.090 | 0.8 | NA | 0.1 | 0.4 | 0.03 | 0.06 | 0.03 | 94.2 |
| East: Carrolls Road | | | | | | | | | | | | | | |
| 4 | L2 | 6 | 2 | 6 | 33.3 | 0.043 | 10.6 | LOS B | 0.2 | 1.4 | 0.46 | 0.92 | 0.46 | 50.2 |
| 6 | R2 | 15 | 5 | 16 | 33.3 | 0.043 | 14.2 | LOS B | 0.2 | 1.4 | 0.46 | 0.92 | 0.46 | 50.0 |
| Approach | | 21 | 7 | 22 | 33.3 | 0.043 | 13.2 | LOS B | 0.2 | 1.4 | 0.46 | 0.92 | 0.46 | 50.0 |
| North: SH1 | | | | | | | | | | | | | | |
| 7 | L2 | 42 | 8 | 44 | 19.0 | 0.027 | 8.3 | LOS A | 0.0 | 0.0 | 0.00 | 0.66 | 0.00 | 67.9 |
| 8 | T1 | 155 | 39 | 163 | 25.2 | 0.097 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 100.0 |
| Approach | | 197 | 47 | 207 | 23.9 | 0.097 | 1.8 | NA | 0.0 | 0.0 | 0.00 | 0.14 | 0.00 | 90.8 |
| All Vehicles | | 376 | 92 | 396 | 24.5 | 0.097 | 2.0 | NA | 0.2 | 1.4 | 0.04 | 0.15 | 0.04 | 88.1 |

As shown above, the intersection works well in the morning peak hour with and without the development. The degrees of saturation, average delays and queues are all low for both model scenarios. As such, the effect of the additional development traffic on the performance of the SH1/ Carrolls Road intersection, with the upgrades proposed, is considered negligible.

**Table 6: SH1/ Carrolls Road Intersection – Existing Evening Peak Hour Intersection Performance**

| Vehicle Movement Performance | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] veh/h | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
| South: SH1 | | | | | | | | | | | | | | |
| 2 | T1 | 203 | 36 | 214 | 17.7 | 0.123 | 0.0 | LOS A | 0.0 | 0.1 | 0.00 | 0.00 | 0.00 | 99.8 |
| 3 | R2 | 1 | 0 | 1 | 0.0 | 0.123 | 8.1 | LOS A | 0.0 | 0.1 | 0.00 | 0.00 | 0.00 | 71.6 |
| Approach | | 204 | 36 | 215 | 17.6 | 0.123 | 0.0 | NA | 0.0 | 0.1 | 0.00 | 0.00 | 0.00 | 99.6 |
| East: Carrolls Road | | | | | | | | | | | | | | |
| 4 | L2 | 1 | 1 | 1 | 100.0 | 0.021 | 13.9 | LOS B | 0.1 | 0.7 | 0.44 | 0.93 | 0.44 | 44.6 |
| 6 | R2 | 11 | 4 | 12 | 36.4 | 0.021 | 12.0 | LOS B | 0.1 | 0.7 | 0.44 | 0.93 | 0.44 | 49.6 |
| Approach | | 12 | 5 | 13 | 41.7 | 0.021 | 12.2 | LOS B | 0.1 | 0.7 | 0.44 | 0.93 | 0.44 | 49.2 |
| North: SH1 | | | | | | | | | | | | | | |
| 7 | L2 | 3 | 3 | 3 | 100.0 | 0.104 | 10.4 | LOS B | 0.0 | 0.0 | 0.00 | 0.01 | 0.00 | 46.9 |
| 8 | T1 | 167 | 32 | 176 | 19.2 | 0.104 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.01 | 0.00 | 99.3 |
| Approach | | 170 | 35 | 179 | 20.6 | 0.104 | 0.2 | NA | 0.0 | 0.0 | 0.00 | 0.01 | 0.00 | 97.4 |
| All Vehicles | | 386 | 76 | 406 | 19.7 | 0.123 | 0.5 | NA | 0.1 | 0.7 | 0.02 | 0.04 | 0.02 | 95.6 |

**Table 7: SH1/ Carrolls Road Intersection – Proposed Evening Peak Hour Intersection Performance**

| Vehicle Movement Performance | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] veh/h | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
| South: SH1 | | | | | | | | | | | | | | |
| 2 | T1 | 203 | 36 | 214 | 17.7 | 0.122 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 99.9 |
| 3 | R2 | 5 | 1 | 5 | 20.0 | 0.005 | 8.9 | LOS A | 0.0 | 0.2 | 0.32 | 0.61 | 0.32 | 60.1 |
| Approach | | 208 | 37 | 219 | 17.8 | 0.122 | 0.2 | NA | 0.0 | 0.2 | 0.01 | 0.01 | 0.01 | 98.4 |
| East: Carrolls Road | | | | | | | | | | | | | | |
| 4 | L2 | 16 | 2 | 17 | 12.5 | 0.128 | 9.7 | LOS A | 0.5 | 3.9 | 0.49 | 0.95 | 0.49 | 53.7 |
| 6 | R2 | 48 | 9 | 51 | 18.8 | 0.128 | 14.1 | LOS B | 0.5 | 3.9 | 0.49 | 0.95 | 0.49 | 52.4 |
| Approach | | 64 | 11 | 67 | 17.2 | 0.128 | 13.0 | LOS B | 0.5 | 3.9 | 0.49 | 0.95 | 0.49 | 52.7 |
| North: SH1 | | | | | | | | | | | | | | |
| 7 | L2 | 18 | 8 | 19 | 44.4 | 0.013 | 9.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.66 | 0.00 | 60.7 |
| 8 | T1 | 167 | 32 | 176 | 19.2 | 0.101 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 100.0 |
| Approach | | 185 | 40 | 195 | 21.6 | 0.101 | 0.9 | NA | 0.0 | 0.0 | 0.00 | 0.06 | 0.00 | 94.0 |
| All Vehicles | | 457 | 88 | 481 | 19.3 | 0.128 | 2.3 | NA | 0.5 | 3.9 | 0.07 | 0.17 | 0.07 | 86.3 |

As shown above, the intersection works well in the evening peak hour with and without the development. The degrees of saturation, average delays and queues are all low for both model scenarios. As such, the effect of the additional development traffic on the performance of the SH1/ Carrolls Road intersection, with the upgrades proposed, is considered negligible.

Full SIDRA output is shown in **Attachment B**.

# 6 PARKING AND LOADING

## 6.1 MINIMUM PARKING SPACE REQUIREMENTS (2.1)

Table 9.1 of the Waimate District Plan outlines the minimum parking requirements for new activities. Energy from waste facilities are not a specific activity in the table, but where an activity is not listed, the activity closest in nature should be used. In this case 'Industrial activity' requires a minimum of 1.5 spaces per 100 $m^2$ gross floor area.

As noted, the proposed buildings on-site have a total area of 60,436 $m^2$ which therefore requires 907 parking spaces to be provided. This is clearly well in excess of what is actually required to accommodate the likely parking demands generated by the site.

Based on the proposed staff numbers, a reasonable parking provision should accommodate the following:

- All management staff (32 spaces);
- Inbound shift staff and outbound shift staff (28 spaces) i.e. allow for shift overlap, and
- Small overhead to allow for potential visitors and maintenance vehicles (10 spaces).

Based on the above, a total parking provision of 70 spaces is considered sufficient to cater for all staff parking demands (including shift changeover) as well as potential visitor and maintenance vehicle parking demands.

With respect to the relevant assessment criteria, the reduced parking provision has been assessed against Rule 5.1 in Table 8 below.

**Table 8: Parking and Loading Assessment Criteria**

| Criterion | Comment |
|---|---|
| a. Whether it is physically practicable to provide the required parking or loading spaces on the site in terms of the existing location of buildings, access to the road, topography and utility location. | The site is capable of accommodating much greater levels of parking however parking is proposed to satisfy generated demands only. |
| b. Whether there is an adequate alternative supply of parking or loading spaces in the vicinity. In general, on-street parking is not considered an alternative. | See above. |
| c. Whether there is another site in the immediate vicinity that has available parking or loading spaces which are not required at the same time as the proposed activity. In such a situation the Council will require the associated | See above. |

| Criterion | Comment |
|---|---|
| parking or loading spaces to be secured in some manner. | |
| d. Whether a demonstrably less than normal incidence of parking or loading will be generated by the proposal, such as due to specific business practice, type of customer, bus transportation. | The site has a maximum of 60 staff on-site at any time. As such 70 parking spaces are proposed to satisfy these likely staff demands as well as allowing for visitor and maintenance vehicles which may occasionally visit the site. |
| e. Whether the Council is anticipating providing public car-parking that would serve the vicinity of the activity, and whether a cash payment towards such public car-parking can be made in lieu of part or all of the parking requirement. | Not applicable. All parking demands are proposed to be accommodated on-site. |
| f. Whether a significant adverse effect on the character and amenity of the surrounding area will occur as a result of not providing the required parking or loading space. | All parking demands are proposed to be accommodated on-site and no significant adverse effects on the character and amenity of the surrounding area are expected. |
| g. The extent to which the safety and efficiency of the surrounding roading network would be adversely affected by parked and manoeuvring vehicles on the roads. | All vehicles travelling to and from the site can do so in a forward direction and parking areas are located well within the site to minimise any adverse effects on the road network. |
| h. Any cumulative effect of the lack of on-site parking and loading spaces in conjunction with other activities in the vicinity not providing the required number of parking or loading spaces. | No cumulative effects are expected with respect to parking. |

Based on the above, all relevant assessment criteria are considered to be satisfied by the proposal.

## 6.2 SIZE OF PARKING SPACES (2.3)

All parking spaces are proposed to be designed in accordance with AS/NZS 2890.1 standards, specifically, all parking spaces are considered to be ‘User class 1’ (Employee and commuter parking) and are proposed to have the following specifications:

- 90 degree angled parking;
- 2.5 m wide parking bays;
- 5.4 m deep parking bays, and
- 6.2 m wide aisle.

These meet the AS/NZS 2890.1 requirements, except the parking bays have been widened to 2.5 m (2.4 m minimum required) to allow for larger vehicles such as utes and SUVs.

## 6.3 CAR SPACES FOR PEOPLE WITH DISABILITIES (2.4)

Where a total of 21-50 spaces are provided, not less than 2 accessible spaces should be provided. For every additional 50 parking spaces, not less than 1 accessible space should be provided.

With a total parking provision of 70 parking spaces, a total of three accessible spaces are therefore required.

Three accessible spaces will be provided on-site near the office building entrance. The dimensions will be as per standard parking spaces except the stall width will be increased to 3.5 m.

## 6.4 CYCLE SPACES (2.5)

Within the Rural Zone, activities shall provide 1 cycle parking space per 20 required parking spaces. As noted, 907 parking spaces are required, and therefore 45 bicycle parking spaces are required. This is considered onerous and instead cycle parking is proposed to be provided at a rate of 1 parking space per 20 provided parking spaces. With a total parking provision of 70 parking spaces, 4 bicycle parking spaces are therefore recommended to be provided.

Two bicycle stands (for 4 x bicycles) are proposed at the main entrance to the office building.

## 6.5 BUS SPACES (2.6)

Bus spaces can be provided in lieu of car parking spaces where buses access the site and serve 30 or more visitors or customers. No significant numbers of visitors are likely at the site, and therefore no bus spaces are proposed to be provided.

As noted, the car parking provision is proposed to satisfy all generated demands.

## 6.6 CASH-IN-LIEU (2.7)

A cash payment may be made in lieu of part or all of the parking requirement in areas where the Council is anticipating creation of public parking that would serve the area of the development. Cash-in-lieu contributions are normally made in centres or business areas where it is physically impossible to accommodate parking demands on-site.

The proposed activity will provide all parking on-site and can accommodate all generated parking demands. No cash-in-lieu contribution is therefore required.

## 6.7 REVERSE MANOEUVRING (2.8)

On-site manoeuvring shall be provided to ensure that no vehicle is required to reverse either onto or off a site where:

- Any development has access to an arterial road;
- Any development requiring 4 or more parking spaces requiring access onto a collector road.
- Any development which is required to provide 10 or more parking spaces.

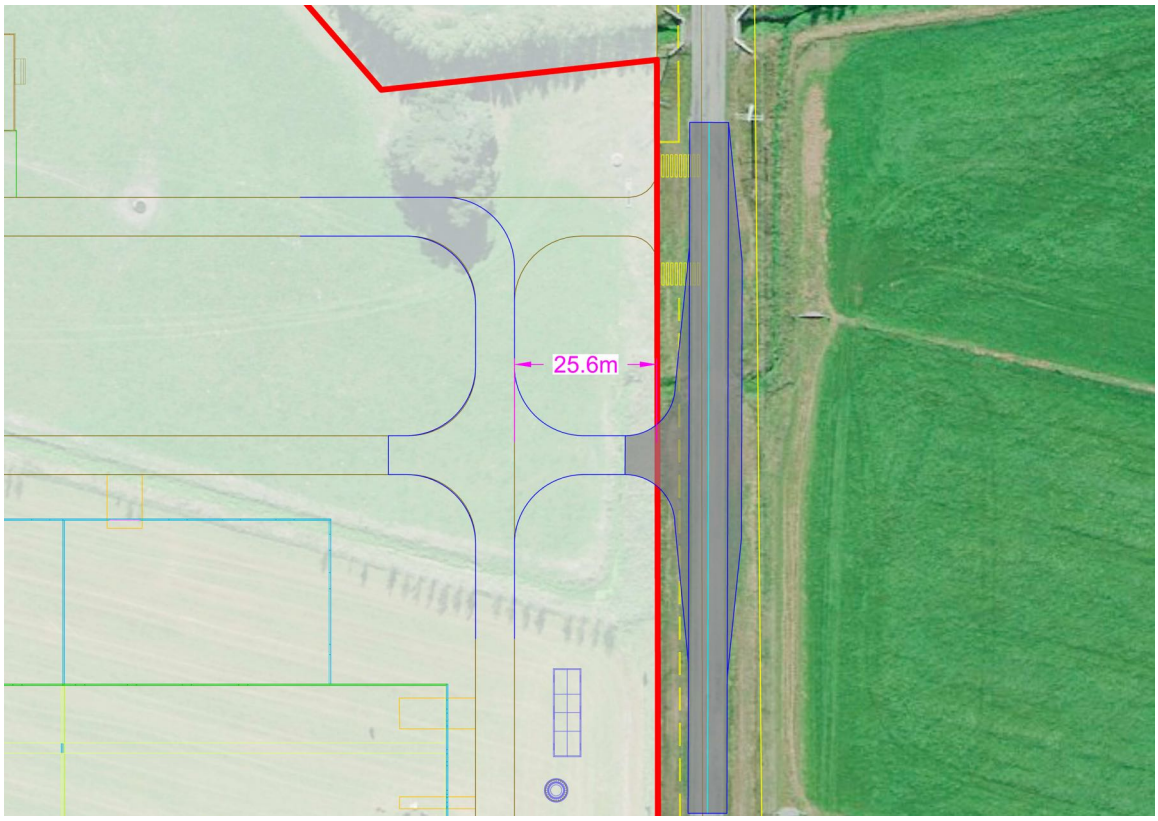
A total of 70 parking spaces are provided on-site and therefore no reverse manoeuvring to or from the road is permitted. The site is designed so that all vehicles can manoeuvre on-site, and enter and exit the site in a forward direction. No reverse manoeuvring is required to or from the proposed vehicle accesses.

## 6.8 QUEUING (2.10)

Table 9.2 outlines the minimum queuing space length required to avoid conflict between vehicles entering the site and potential conflict points. The light vehicle access is proposed to serve all 70 parking spaces, and therefore requires a minimum queuing space length of 15 m.

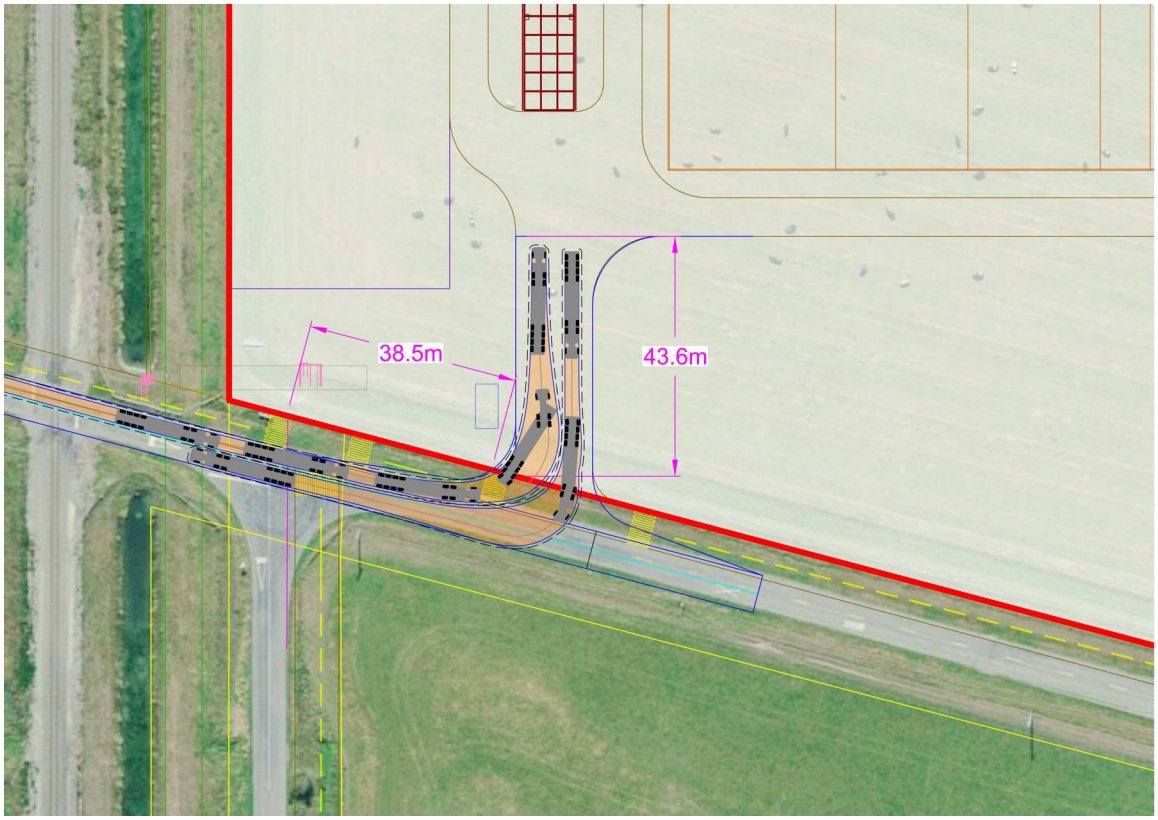
As shown in Figure 6, there is over 25 m available from the Morven Glenavy Road boundary to the first potential conflict point within the site (an internal crossroads intersection).

**Figure 6: Queuing Space Length – Light Vehicle Access**



With respect to the heavy vehicle access, as no parking spaces are served by this access, a minimum queueing space of 5.5 m is required. It is proposed to provide queue storage for two articulated trucks to avoid queuing onto Morven Glenavy Road. The minimum queuing distance between the internal gates and the Morven Glenavy Road boundary is over 40 m. Figure 7 shows the available queuing space length.

**Figure 7: Queuing Space Length – Heavy Vehicle Access**




## 6.9 LOADING (2.11)

Where articulated trucks are used or intended to be used in conjunction with any site, sufficient loading space not less than 11 m depth shall be provided.

The site has been purpose-built to accommodate large articulated vehicles. To control odour, waste trucks will arrive on-site within an enclosed hall area. The hall is designed to allow trucks to travel forward in and forward out, with all loading accommodated on-site.

As noted there will be in excess of 40 m from the site boundary to the entry gates with further storage available on-site prior to the enclosed hall. No queuing back onto Morven Glenavy Road is anticipated at any time.

## 6.10 SURFACE OF PARKING AND LOADING AREAS (2.12)

The surface of all parking, loading and circulation areas on-site are proposed to formed and sealed to minimise noise and dust, and also ensure vehicles can travel to and from the site in a safe manner during all weather conditions.

In addition, the enclosed hall area will be designed to ensure trucks do not drag any unloaded waste out of the hall, and onto the road network.

## 6.11 VEGETATION, TREES AND LANDSCAPING (2.13)

Various rules apply to landscaping near parking and access areas as follows:

- Trees and vegetation shall not be in a position where they would restrict visibility of drivers within 50 m of an intersection or corner of a road.
- Trees and vegetation shall not be in a position where they would cause icing of a road as a result of shading the road between 10 am and 2 pm on the shortest day.
- Landscaping shall not adversely affect the visibility of motorists leaving a site or create an unsafe environment for persons using the car park or the adjacent footpath.
- All car parking areas containing 5 or more spaces shall have a landscape strip 1.5 m deep along the road frontage.

The landscaping design has been developed. The site is of sufficient size, and the parking areas sufficiently isolated from the frontage roads, to ensure the above requirements can be met.

# 7 VEHICLE ACCESS

## 7.1 STANDARDS OF VEHICLE CROSSINGS/ ACCESSES (2.14)

Various vehicle crossing and access standards apply under Rule 2.14 and these are discussed in Table 9.

**Table 9: Rule 2.14 – Standards of Vehicle Crossings/ Accesses**

| Criterion | Comment |
|---|---|
| 2.14.1 All vehicular crossings/accesses onto a State Highway used for private access purposes shall be designed and constructed in accordance with Appendix H - Private Access Standards. | **Not applicable**. Site gains access onto a local road (Morven Glenavy Road) |
| 2.14.2 All vehicular crossings/accesses onto State Highway 82 south of Waihao Back Road used for retail purposes shall, where vehicle trips exceed 60 vehicles per day, be designed and constructed in accordance with Appendix H. For the purposes of determining the number of vehicle trips, and/or equivalent vehicle movements per day, the following shall apply:<br>a. trips calculated either as an annual average, or as a weekly average, whichever is the greater to cater for seasonal peaks.<br>b. one heavy vehicle trip shall be equivalent to 6 vehicle trips. | **Not applicable**. |
| 2.14.3 All vehicular crossings/accesses onto a sealed road, other than a State Highway or in the Rural Zone, shall be formed and maintained to an all-weather standard with the first 5.5 m of the access (as measured from the carriageway) or the full berm width of the adjoining road, whichever is the greater, being formed and sealed or paved to ensure that material such as mud, stone chips or gravel is not carried on to a sealed road. | **Complies**. All circulation areas within the site will be sealed and maintained to an all-weather standard. |
| 2.14.4 All vehicular crossings/accesses onto a sealed road in the Rural Zone, other than a State Highway, shall be formed and maintained to an all-weather standard and shall not result in the migration of material such as mud, stone chips or gravel on to the road. Where an access is used regularly, that is one that is used by vehicles on a regular basis including for the purposes of accesses to dwellings and buildings, the access | **Complies**. All circulation areas within the site will be sealed and maintained to an all-weather standard. The internal hall area will be designed to prevent migration of waste material onto the road network. |

| Criterion | | Comment |
|---|---|---|
| | shall be sealed for 1.5 metres from the edge of the existing seal. Where material such as mud, stone chips or gravel is found to migrate onto the road, the first 5.5 m of the access (as measured from the carriageway) or the full berm width of the adjoining road, whichever is the greater, shall be formed and sealed or paved. Note compliance with this standard does not exempt from standard 2.14.11. | |
| 2.14.5 | All vehicular crossings/accesses onto an unsealed road in the Rural Zone shall be formed and maintained to an all-weather standard and shall not result in the migration of material such as mud, stone chips or gravel on the road. All weather standard means compacted level metal surfacing with a maximum particle size surface material of 20 mm. | **Not applicable**. All accesses and internal roads are proposed to be sealed and connect to a sealed road (Morven Glenavy Road). |
| 2.14.6 | All vehicular crossings/accesses for 10 or less residential units or activities which generate fewer than 100 “normal” car traffic movements per day, shall have standard vehicle culverts and crossings to carry car traffic. | **Not applicable**. Industrial activity is proposed. |
| 2.14.7 | All vehicular crossings/accesses for drive-in accesses and other activities shall have heavy duty vehicle culverts and crossings shall be constructed to carry all types of road traffic. | **Complies**. All vehicle crossings/ accesses serving the site shall be designed to accommodate heavy vehicles. The heavy vehicle crossing/access is proposed to be designed to accommodate HPMV vehicles, while the light vehicle crossing/access is proposed to accommodate medium rigid trucks (as they may use this access occasionally). |
| 2.14.8 | All vehicular crossings/accesses in any other case vehicle crossings/accesses shall be constructed pursuant to Council standards, from the roadway to the road or service land boundary of the site. | **Complies**. See above. |
| 2.14.9 | All vehicular crossings/accesses shall be constructed and maintained at the owners expense. | **Complies**. All vehicle crossings/accesses are proposed to be maintained by the applicant. |
| 2.14.10 | Vehicle access shall cross the property boundary at an angle of 90 degrees, plus or minus 15 degrees and vehicle crossings shall intersect with | **Complies**. Both the heavy vehicle access and light vehicle access approach the boundary, |

| Criterion | Comment |
|---|---|
| the carriageway at an angle of between 45 degrees and 90 degrees. | and Morven Glenavy Road carriageway, at an angle of 90 degrees. |
| 2.14.11 In Rural zones heavy traffic accesses, including those for milk tankers and stock trucks, and any necessary extension of the carriageway width (on either side) shall be designed, constructed and maintained to carry the volume and weight of traffic likely to use the access. The surface shall be constructed to the same standard as the adjoining road carriageway. The access and carriageway extensions shall also be of sufficient area and width to provide for the swept path (turning area) of these heavy vehicles. (Refer to Appendix C for heavy vehicle swept paths.) | **Complies**. The heavy vehicle access has localised widening on the northern side of the road to accommodate articulated vehicle tracking (refer **Attachment A**). This is proposed in conjunction with pavement upgrades along Carrolls Road to accommodate the proposed vehicles likely to visit the site. The light vehicle access will also be upgraded to match existing provisions for Morven Glenavy Road. |
| 2.14.12 Where a lot abuts a State Highway, alternative access to any other road shall be used unless it is impractical for physical or traffic management reasons. | **Not applicable**. Site does not have frontage to a State Highway. |
| 2.14.13 All vehicular accesses shall be designed to ensure efficient drainage, which will be implemented by providing culverts where necessary. | **Will comply**. Site accesses are proposed to be designed to manage stormwater. |
| 2.14.14 Movement of milking dairy herds across any of the following roads shall only be by means of an underpass:<br>• Bathgates Road (Starts: SH82, Ends: Molloys Road)<br>• Blue Cliffs Road (Starts: Kane Lane, Ends: Talbot Road)<br>• Brasells Bridge Road (Starts: Pareora River Road, Ends: District Boundary)<br>• Browns Road (Starts: High Street, Ends: Parsonage Road)<br>• Craigmore Valley Road (Starts: Pareora River Road, Ends: Timaunga Road)<br>• Foleys Road (Starts: SH1, Ends: Hannaton Road)<br>• Glenavy-Tawai Road (Starts: SH1, Ends: Old Ferry Road)<br>• Hakataramea Valley Road (Starts: SH82, Ends: Homestead Road)<br>• Holme Station Road (Starts: Pareora River Road, Ends: Pareora River Bridge | **Not applicable**. It should be noted however that a stock crossing tunnel is proposed under Carrolls Road to avoid interaction between dairy herds and heavy vehicles travelling to and from the site. |

| Criterion | Comment |
|---|---|
| • Horsnells Road (Starts: SH1, Ends: Morven Road)<br>• Ikawai Middle Road (Starts: SH82, Ends: Tawai-Ikawai Road)<br>• Lower Hook Road (Starts: SH1, Ends: Waimate Hunter Road)<br>• Lucks Road (Starts: SH1, Ends: Fletchers Road)<br>• Makikihi Hunter Road (Starts: SH1, Ends: Teschemaker Valley Road)<br>• Manchesters Road (Starts: Molloys Road, Ends: Mitchell Road)<br>• Maytown Road (Starts: Timaru Road, Ends: Hannifins Road)<br>• McNamaras Road (Starts: Molloys Road, Ends: SH1)<br>• Mill Road (Starts: Hunts Road, Ends: Kirks Road)<br>• Molloys Road (Starts: McNamaras Road, Ends: SH1)<br>• Morven Road (Starts: Maclean Street, Ends: Horsnells Road)<br>• Old Ferry Road (Starts: SH1, Ends: Glenavy-Tawai Road)<br>• Pareora Gorge Road (Starts: Evans Crossing Road, Ends: Pareora River)<br>• Pareora River Road (Starts; SH1, Ends: Evans Crossing Road)<br>• Parsonage Road (Starts: Butchers Lane, Ends: Waimate Hunter Road)<br>• Racecourse Road (Starts: Williams Street, Ends: Park Road)<br>• Serpentine Valley Road (Starts: SH82, Ends: Zig Zag Road)<br>• Stokes Road (Starts: Crowes Road, Ends: Morven Beach Road)<br>• Tawai-Ikawai Road (Starts: Ikawai-Middle Road, Ends: Old Ferry Road)<br>• Te Akatarawa Road (Starts: Fishermens Bend Road, Ends: Benmore Dam)<br>• Waihao Back Road (Starts: SH82, Ends SH1)<br>• Waimate Hunter Road (Starts: Whitneys Road, Ends: Makikihi Hunter Road)<br>• All other roads within the District Plan zoned Residential | |

As shown above, all relevant rules can be satisfied.

## 7.2 LENGTH OF VEHICLE CROSSINGS (2.15)

For industrial activity, the minimum crossing length is 4.0 m and the maximum crossing length is 9.0 m.

The heavy vehicle access is proposed to be 20 m wide at the road boundary which exceeds the maximum permitted crossing width of 9.0 m. The reason for the additional width is to accommodate the swept path of articulated vehicles turning into and out of the site simultaneously.

The light vehicle access is proposed to be 11 m wide at the road boundary which exceeds the maximum permitted crossing width of 9.0 m. The reason for the additional width is to accommodate the Diagram D specifications for the access (refer **Attachment A**).

Given there are no footpaths on the access frontages, or no nearby vehicle crossings, the effects of the additional width are considered negligible.

## 7.3 DISTANCES OF VEHICLE CROSSINGS FROM INTERSECTIONS (2.16)

Morven Glenavy Road and Carrolls Road are classified as local roads as per the Road Hierarchy in Rule 3 of Section 9 of the District Plan.

Where the frontage road is a 'Rural' road, and classified as a local road, the minimum separation distance between a vehicle crossing and another local road is 55 m. As shown in Figure 7, there is some 38 m separation distance between the nearest edge of Morven Glenavy Road and the proposed vehicle access. This is some 17 m less than the required minimum.

Despite this, trucks will be turning left in to, and right out of the site, and there is ample visibility between the heavy vehicle access and the intersection. The effects of the reduced separation distance is considered negligible.

## 7.4 SIGHT DISTANCES FROM VEHICLE CROSSINGS (2.17)

There is an open speed limit (100 km/hr) on both Morven Glenavy Road and Carrolls Road near the site. Asa result, the required sight distance in accordance with the District Plan is 210 m.

There is more then 210 m available at the both the proposed heavy vehicle access and the light vehicle access. Photograph 3 and Photograph 4 show the available sight distance at the heavy vehicle access and Photograph 5 and Photograph 6 show the available sight distance at the light vehicle access.

**Photograph 3: Proposed Heavy Vehicle Access – looking west toward SH1**

**Photograph 4: Proposed Heavy Vehicle Access – looking east**

**Photograph 5: Proposed Light Vehicle Access – looking north toward Morven (Source: Google Streetview)**


**Photograph 6: Proposed Light Vehicle Access – looking south toward Glenavy (Source: Google Streetview)**


As shown above, the straight and flat alignment of Morven Glenavy Road and Carrolls Road in front of the accesses enables more than 210 m visibility to be achieved.

## 7.5 ROAD/RAIL LEVEL CROSSINGS (2.18)

Discussions with KiwiRail have been undertaken to assess the safety of the existing level crossing and the proposed development with the proposed mitigation measures (barriers and flashing lights and bells).

A Level Crossing Safety Impact Assessment (LCSIA) has recently been completed by an external consultant in co-operation with KiwiRail. The LCSIA report is shown in **Attachment C**.

## 7.6 HEAVY VEHICLE GENERATION (2.19)

In accordance with the Waimate District Plan, no activity should generate more than 20 heavy vehicle movements per day. As noted, the proposed activity is expected to generate 136 heavy vehicle movements per day, therefore exceeding this threshold. With respect to effects on the road network, the critical intersection for assessment is the SH1/ Carrols Road intersection.

The intersection can comfortably accommodate the traffic movements generated by the proposed activity, and given the relatively minor effects on this intersection, all downstream intersections (e.g. the Morven Glenavy Road/ Carrolls Road intersection) are also anticipated to operate acceptably with the proposed development.

# 8 CONCLUSION

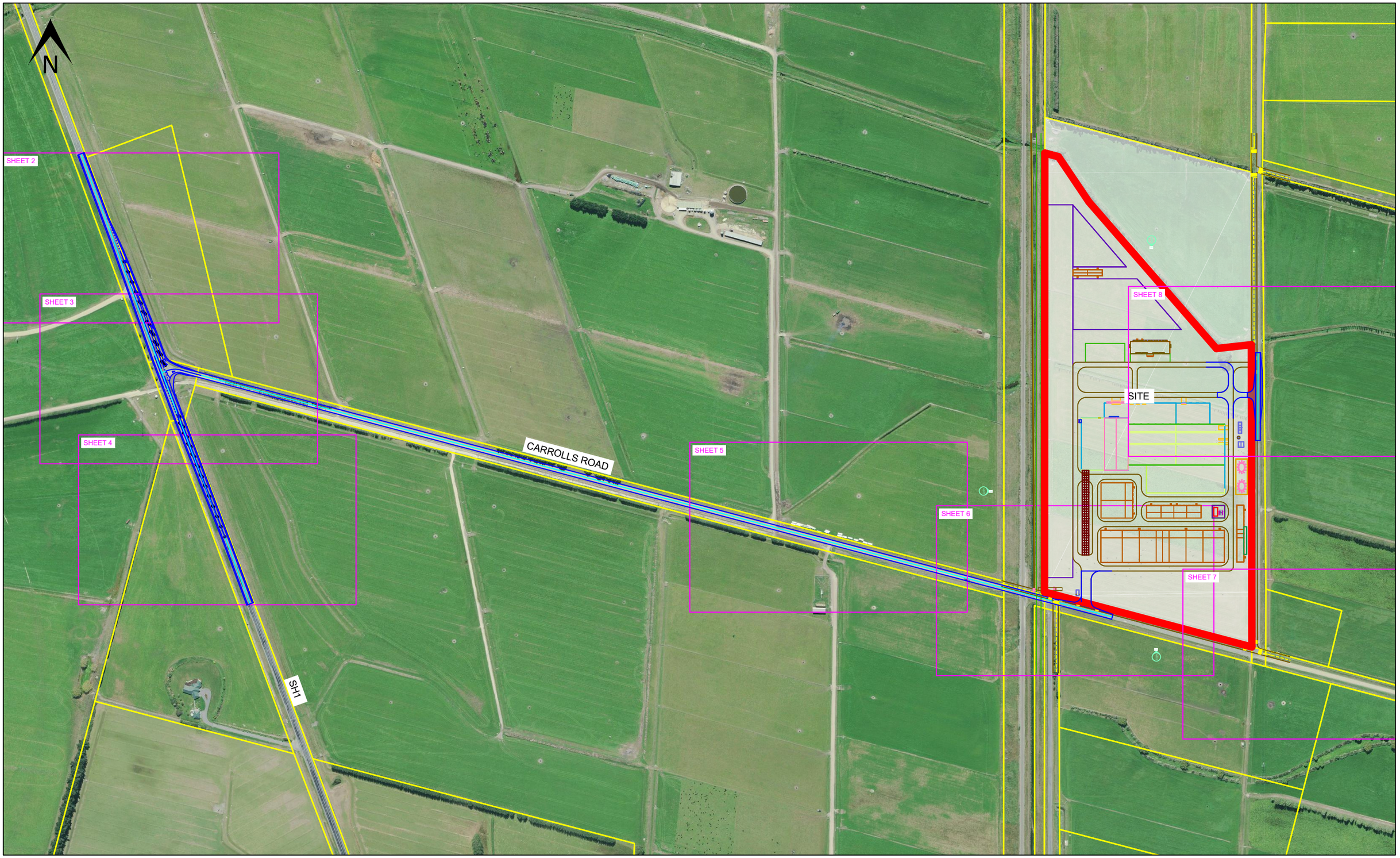
Based on the assessments undertaken in this report, it is concluded that:

- There are no crashes recorded near the site that would indicate a road safety problem for vehicles travelling to and from the site;
- Public transport provisions, and pedestrian and cycling facilities near the site are poor and it is expected that all staff will travel to and from the site by private vehicle. The site has been selected to enable municipal solid waste (MSW) and construction waste to be delivered by both road and rail, however initially all movements will occur via road (heavy vehicles);
- Several transport upgrades are proposed to mitigate the effects of the development including an upgrade to the SH1/ Carrolls Road intersection, Carrolls Road, and the Carrolls Road level crossing;
- The trip generating potential of the site is estimated to be in the order of 136 heavy vehicle movements per day (spread over a 24-hour period) and approximately 148 light vehicle movements per day. The light vehicle movements will comprise shift staff (over a 24-hour period, Monday to Sunday) and management staff (8 am-5 pm, Monday to Friday);
- The proposed development satisfies all relevant parking rules for the site. Sufficient parking is proposed on-site to cater for predicted demands and no overspill onto the surrounding road network is anticipated. Landscaping designs are still progressing however the design intends to meet all requirements of Rule 2.13 of the District Plan (refer Section 9 Transportation of the District Plan);
- The proposed development meets all relevant vehicle crossing and access rules except for length of the heavy vehicle crossing (20 m proposed versus 9 m maximum required) and light vehicle crossing (11 m proposed versus 9 m maximum required), and the separation distance between the heavy vehicle access and the Morven Glenavy Road/ Carrolls Road intersection (38 m proposed versus 55 m minimum required). The effects of these non-compliances are considered negligible.

- A Level Crossing Safety Impact Assessment (LCSIA) has recently been completed and found that the proposed provision of warning bells and barriers can appropriately mitigate risk. Further design detailing will be required to confirm appropriate signage and markings to complement the flashing lights, bells and barriers.

Overall, it is concluded that there are no traffic engineering or transportation planning reasons to preclude acceptance of the proposed Energy from Waste facility.

# ATTACHMENT A – CONCEPT TRANSPORT UPGRADES




| Revision notes: | | |
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| Rev: | Date: | Notes: |

**Drawn by:**
MN
J002129

**Client:**
SOUTH ISLAND RESOURCE RECOVERY LIMITED

**Project:**
PROJECT KEA
CARROLLS ROAD, GLENAVY

**Drawing Title:**
CONCEPT ROAD LAYOUT
SHEET 1

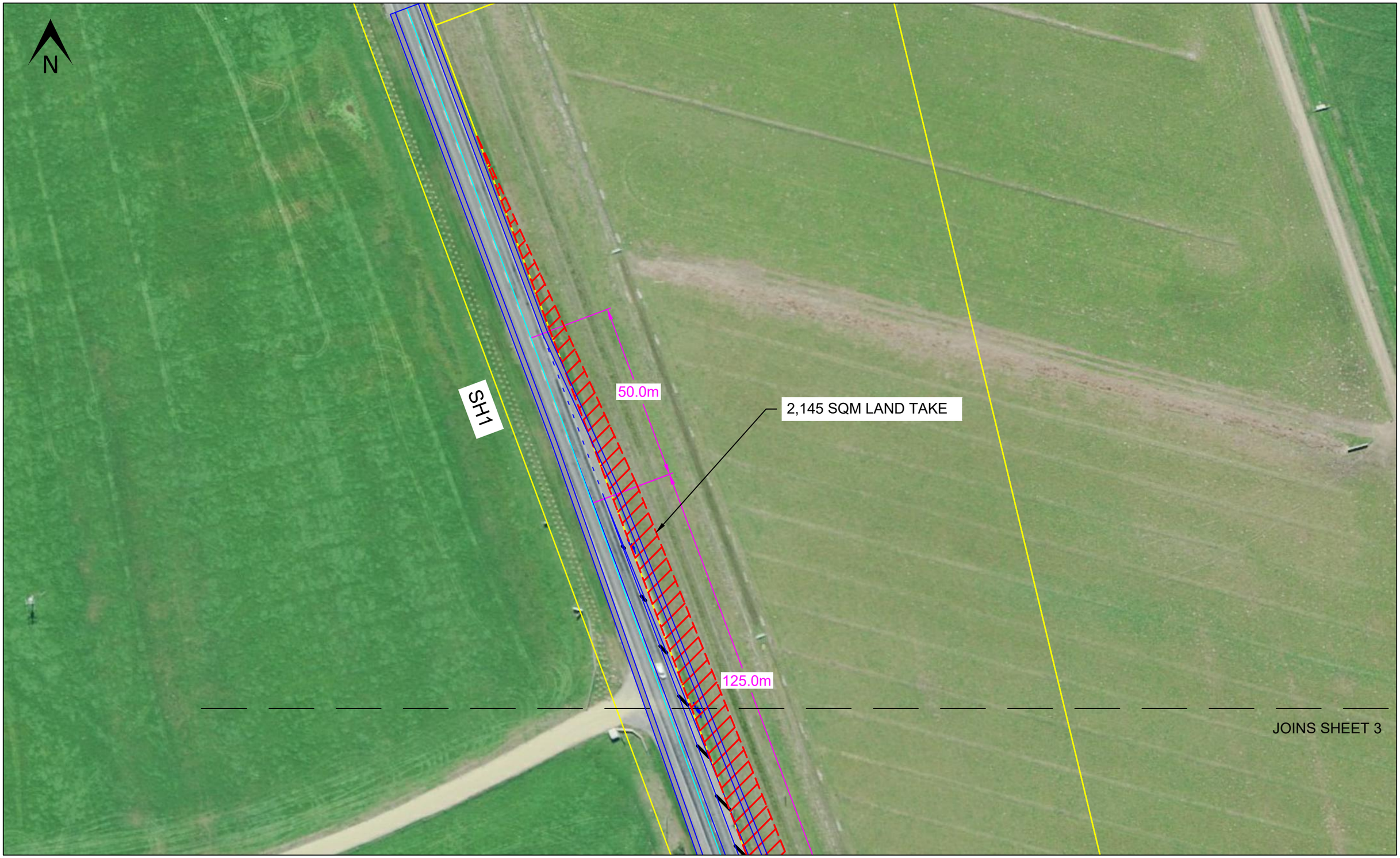
**Date:**
JUNE 2022

**Scale @ A3:**
1:5000

**Revision:**
A

commute TRANSPORTATION CONSULTANTS

**Figure:**
1




**Revision notes:**

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**Drawn by:**
MN
J002129

**Client:**
SOUTH ISLAND RESOURCE RECOVERY LIMITED

**Project:**
PROJECT KEA
CARROLLS ROAD, GLENAVY

**Drawing Title:**
CONCEPT ROAD LAYOUT
SHEET 2

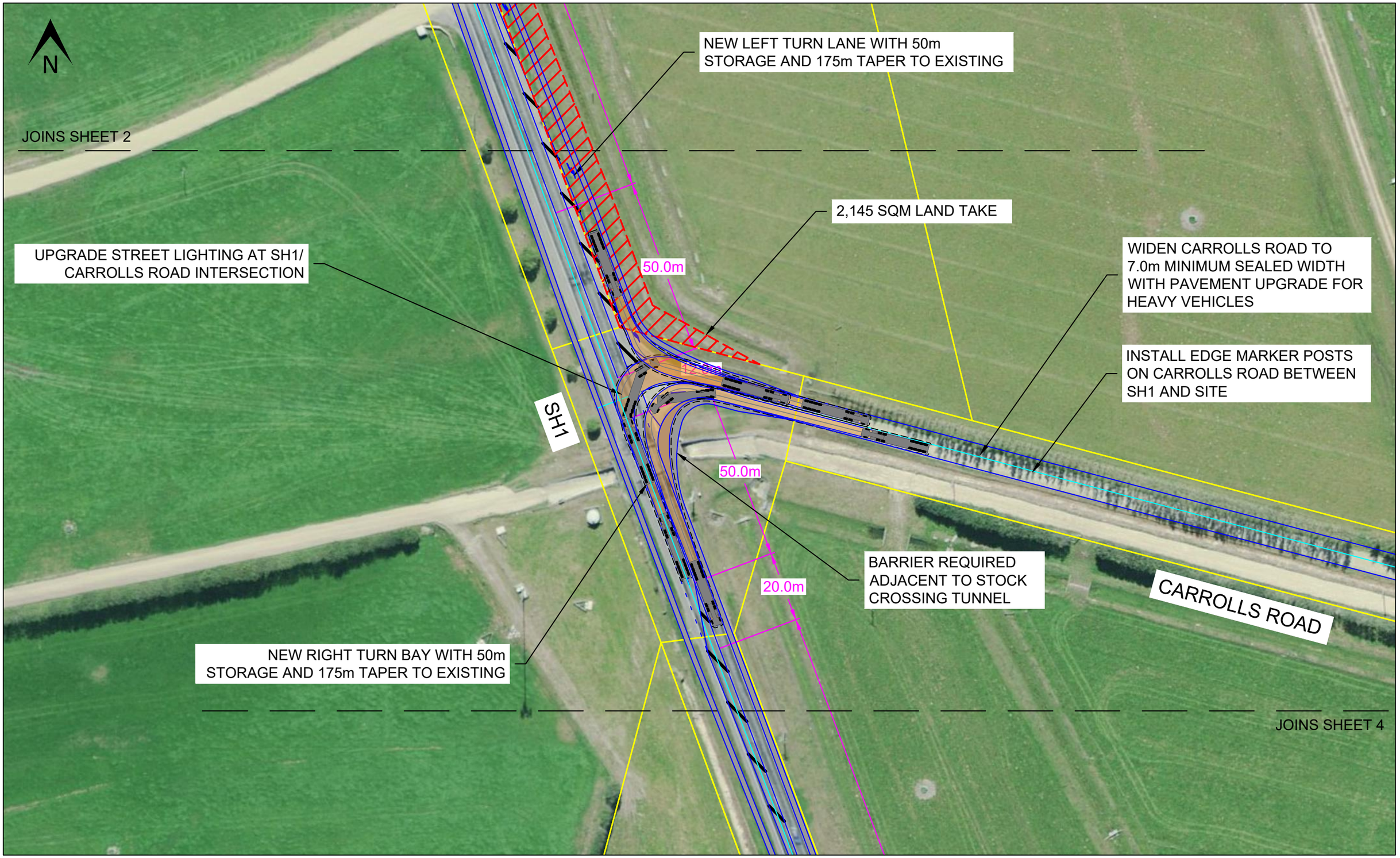
**Date:**
JUNE 2022

**Scale @ A3:**
1:1000

**Revision:**
A

commute TRANSPORTATION CONSULTANTS

**Figure:**
2

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| Drawn by: MN J002129 | Project: PROJECT KEA CARROLLS ROAD, GLENAVY | Date: JUNE 2022 | commute TRANSPORTATION CONSULTANTS | Figure: 3 |
| Client: SOUTH ISLAND RESOURCE RECOVERY LIMITED | Drawing Title: CONCEPT ROAD LAYOUT SHEET 3 | Scale @ A3: 1:1000 | | |
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**Revision notes:**

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J002129

**Client:**
SOUTH ISLAND RESOURCE RECOVERY LIMITED

**Project:**
PROJECT KEA
CARROLLS ROAD, GLENAVY

**Drawing Title:**
CONCEPT ROAD LAYOUT
SHEET 4

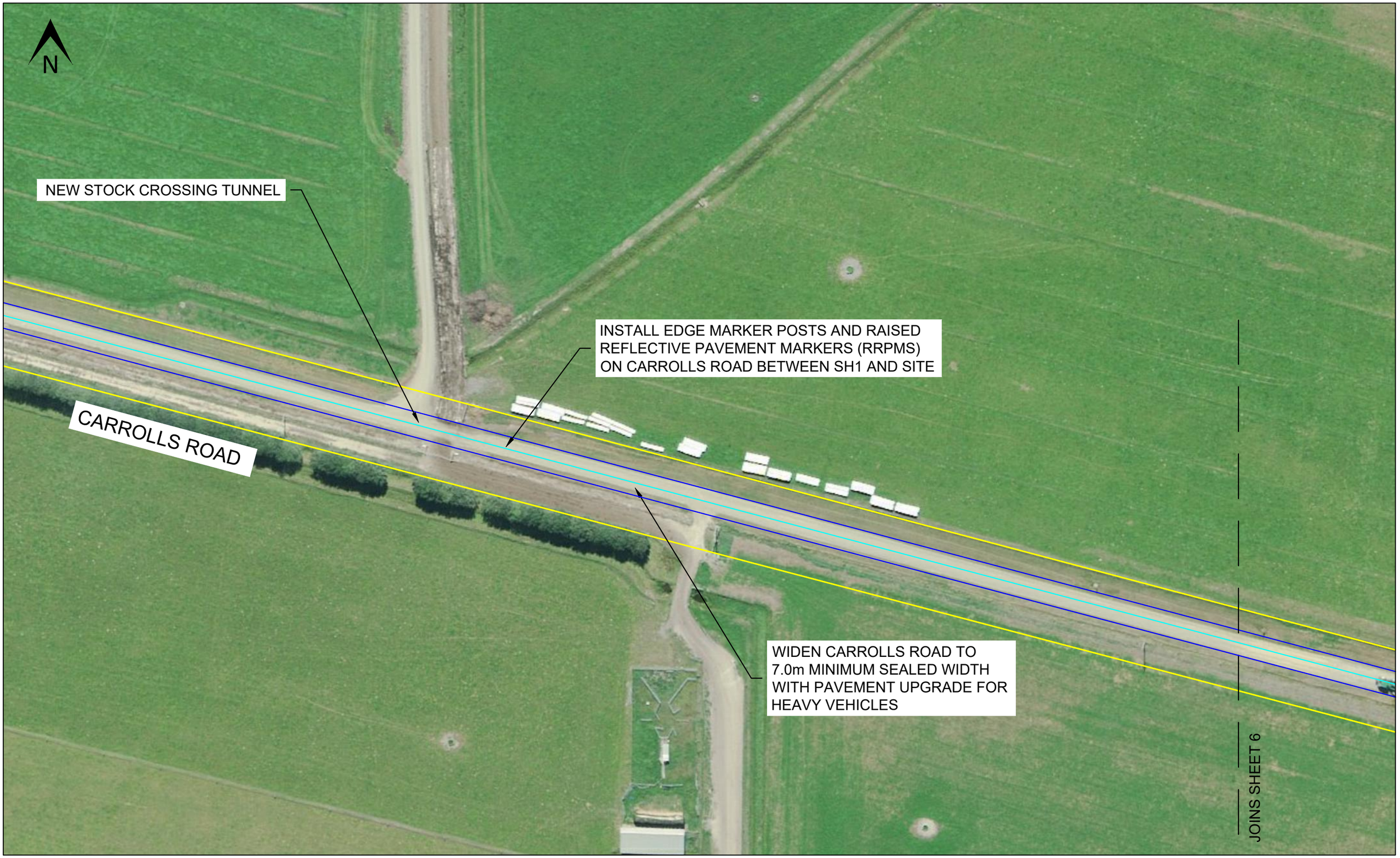
**Date:**
JUNE 2022

**Scale @ A3:**
1:1000

**Revision:**
A

commute TRANSPORTATION CONSULTANTS

**Figure:**
4




**Revision notes:**

| Rev: | Date: | Notes: |
|---|---|---|
| | | |

**Drawn by:** MN
J002129

**Client:** SOUTH ISLAND RESOURCE RECOVERY LIMITED

**Project:** PROJECT KEA
CARROLLS ROAD, GLENAVY

**Drawing Title:** CONCEPT ROAD LAYOUT
SHEET 5

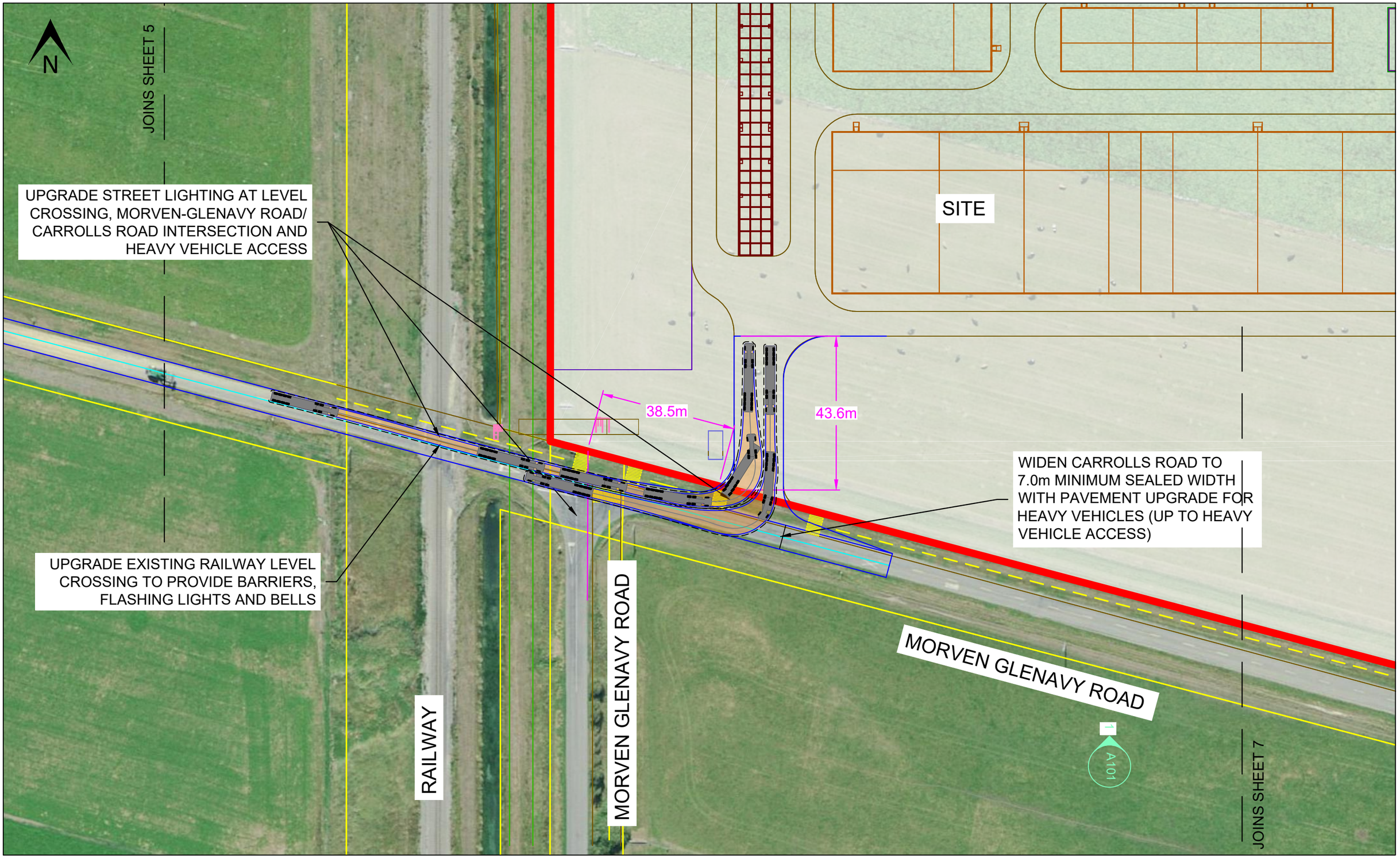
**Date:** JUNE 2022

**Scale @ A3:** 1:1000

**Revision:** A

commute TRANSPORTATION CONSULTANTS

**Figure:** 5




**Revision notes:**

| Rev: | Date: | Notes: |
|---|---|---|

**Drawn by:** MN
J002129

**Client:** SOUTH ISLAND RESOURCE RECOVERY LIMITED

**Project:** PROJECT KEA
CARROLLS ROAD, GLENAVY

**Drawing Title:** CONCEPT ROAD LAYOUT
SHEET 6

**Date:** JUNE 2022

**Scale @ A3:** 1:1000

**Revision:** A

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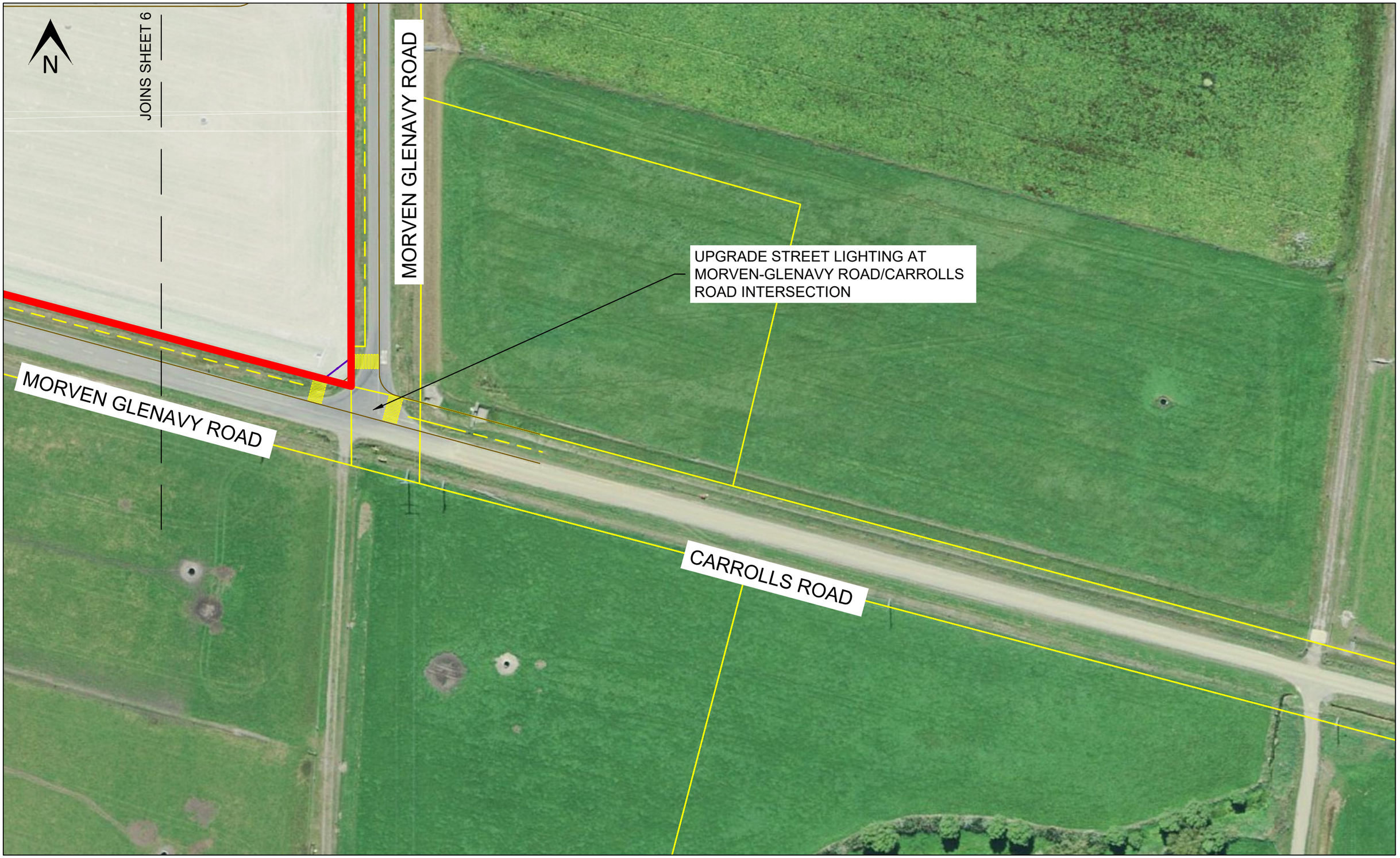
**Figure:** 6




**Revision notes:**

| Rev: | Date: | Notes: |
|---|---|---|
| | | |

**Drawn by:**
MN
J002129

**Client:**
SOUTH ISLAND RESOURCE RECOVERY LIMITED

**Project:**
PROJECT KEA
CARROLLS ROAD, GLENAVY

**Drawing Title:**
CONCEPT ROAD LAYOUT
SHEET 7

**Date:**
JUNE 2022

**Scale @ A3:**
1:1000

**Revision:**
A

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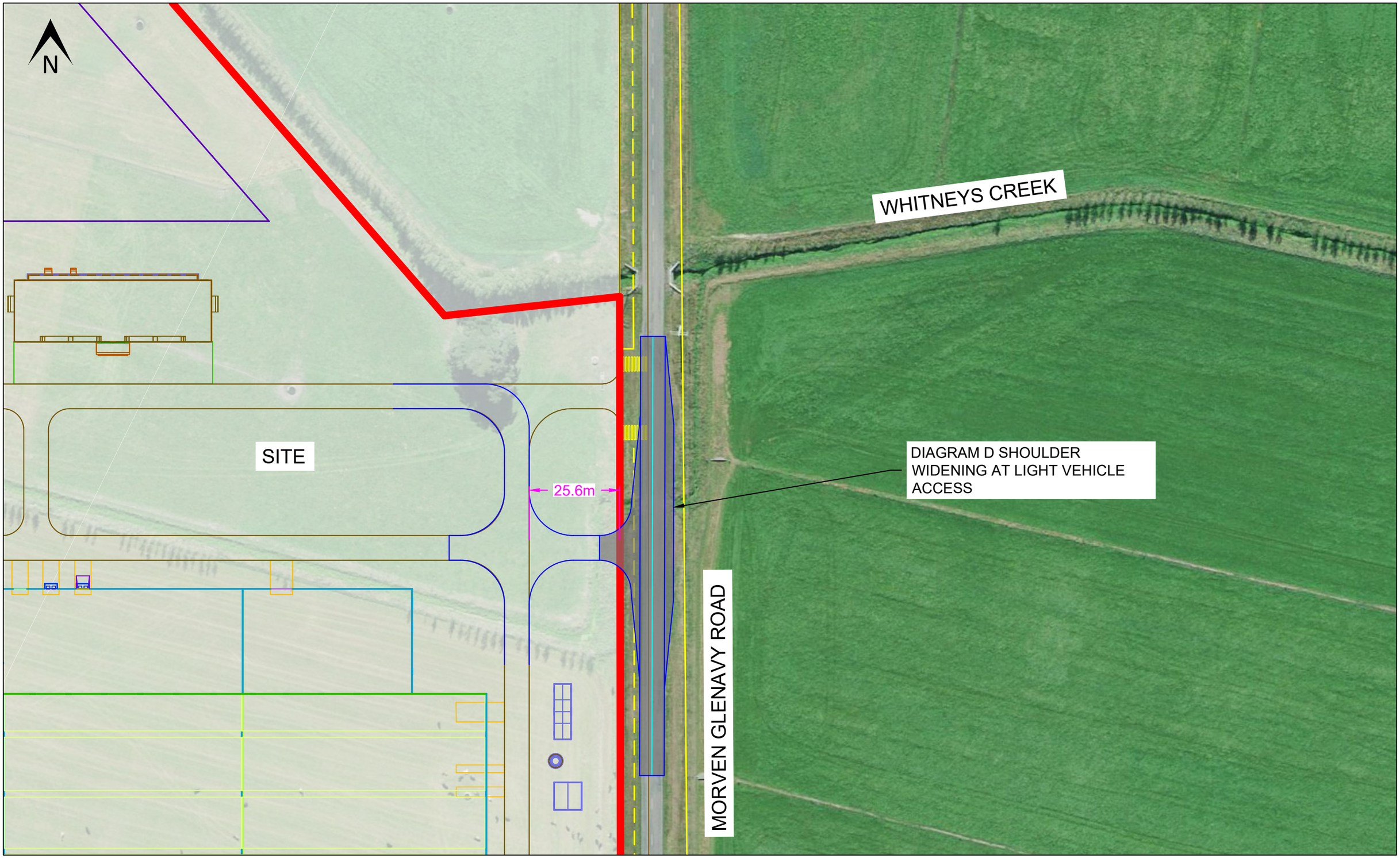
**Figure:**
7




**Revision notes:**

| Rev: | Date: | Notes: |
|---|---|---|
| | | |

**Drawn by:**
MN
J002129

**Client:**
SOUTH ISLAND RESOURCE RECOVERY LIMITED

**Project:**
PROJECT KEA
CARROLLS ROAD, GLENAVY

**Drawing Title:**
CONCEPT ROAD LAYOUT
SHEET 8

**Date:**
JUNE 2022

**Scale @ A3:**
1:1000

**Revision:**
A

commute
TRANSPORTATION CONSULTANTS

**Figure:**
8

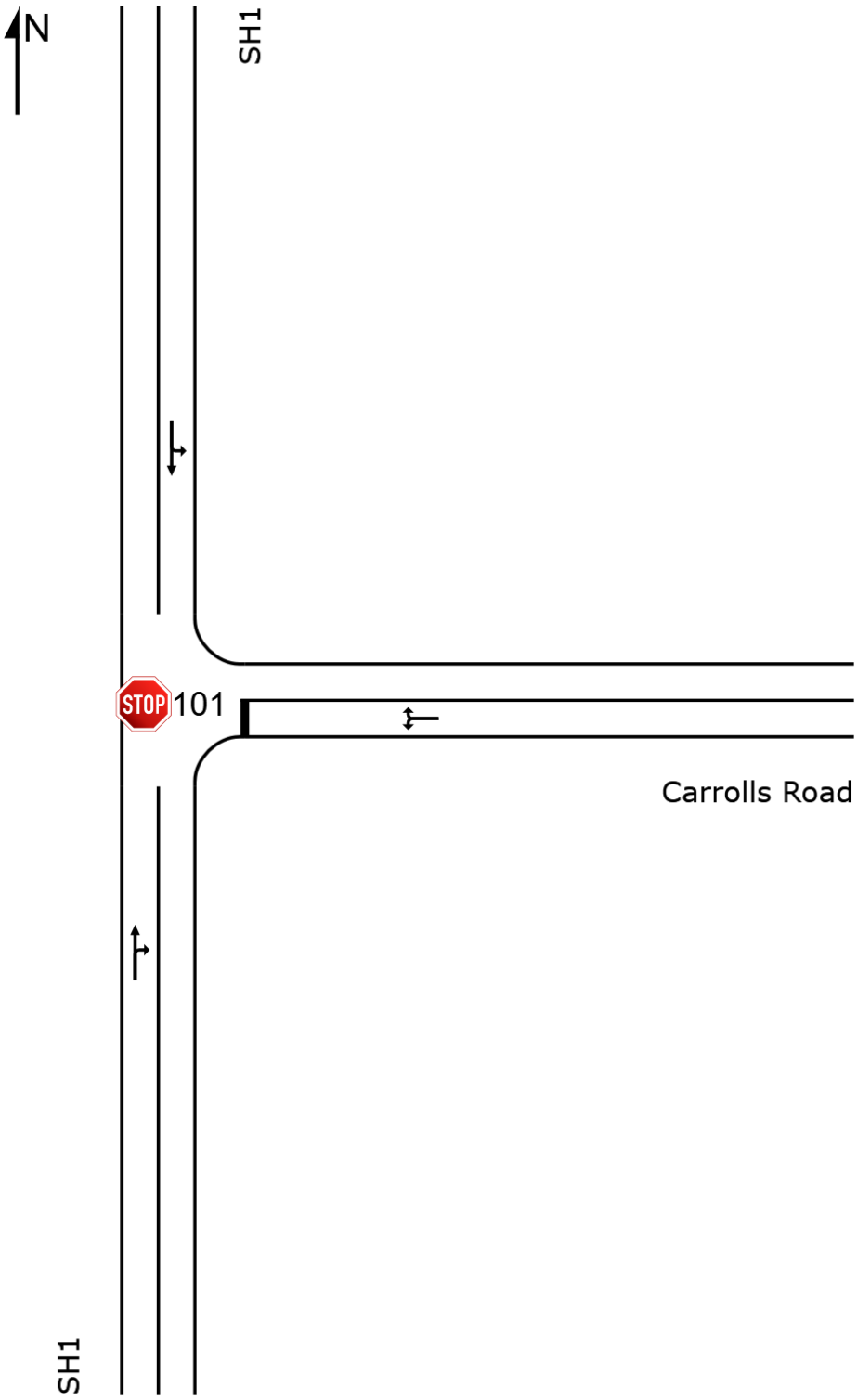
# ATTACHMENT B – SIDRA OUTPUT

# SITE LAYOUT

## Site: 101 [SH1/ Carrolls Road AM Existing (Site Folder: General)]

AM Peak Hour (7:30-8:30)
Site Category: (None)
Stop (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



# MOVEMENT FLOWS FOR SITE (INPUT)

## Approach movement input flow rates (veh/h)

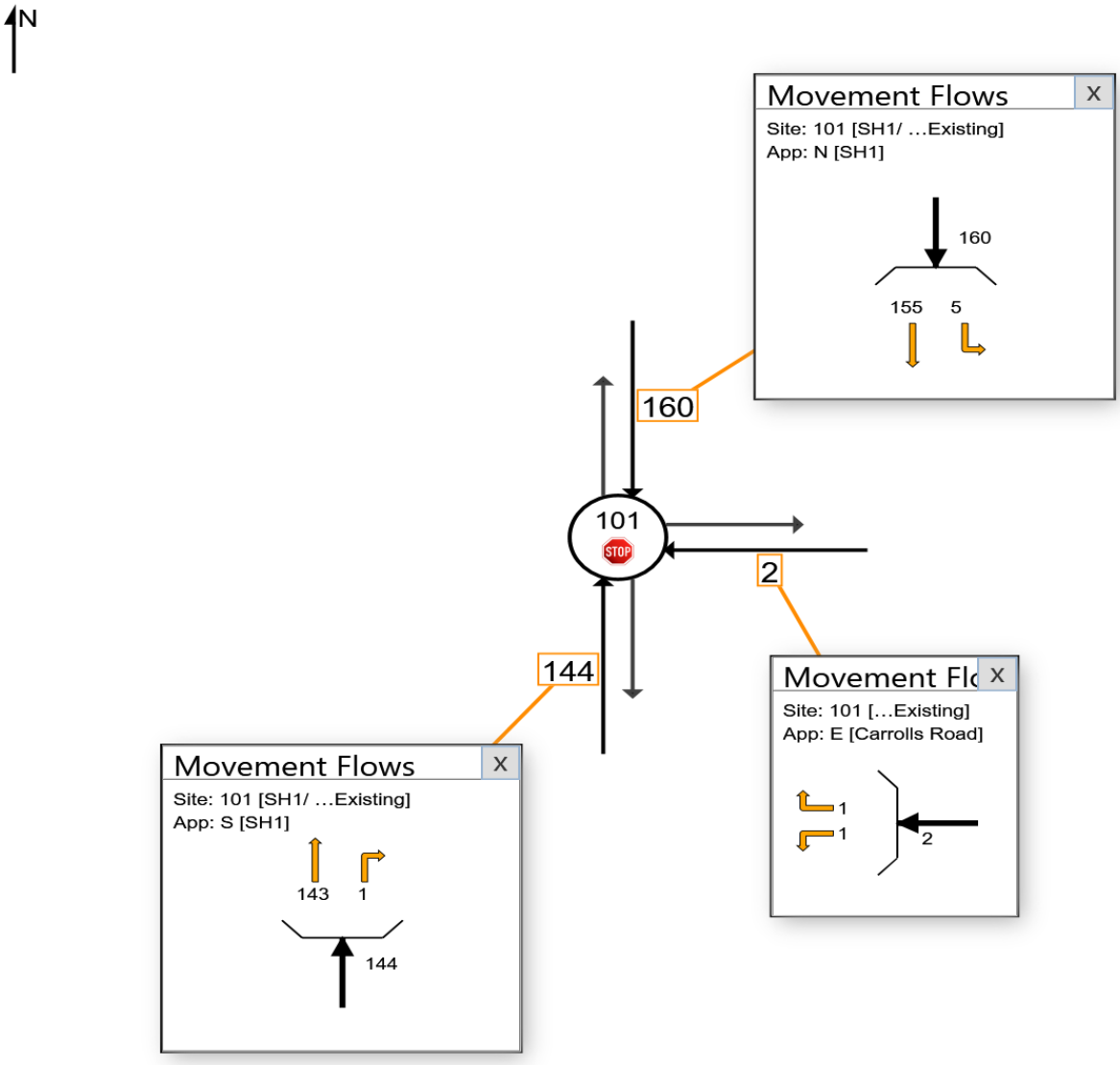
## All Movement Classes

## Site: 101 [SH1/ Carrolls Road AM Existing (Site Folder: General)]

AM Peak Hour (7:30-8:30)
Site Category: (None)
Stop (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
Click and drag popup boxes to move to preferred positions.

Close All Popups



# MOVEMENT SUMMARY

## Site: 101 [SH1/ Carrolls Road AM Existing (Site Folder: General)]

AM Peak Hour (7:30-8:30)
Site Category: (None)
Stop (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] veh/h | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SH1 | | | | | | | | | | | | | | |
| 2 | T1 | 143 | 37 | 151 | 25.9 | 0.091 | 0.0 | LOS A | 0.0 | 0.1 | 0.00 | 0.00 | 0.00 | 99.7 |
| 3 | R2 | 1 | 0 | 1 | 0.0 | 0.091 | 8.0 | LOS A | 0.0 | 0.1 | 0.00 | 0.00 | 0.00 | 71.5 |
| Approach | | 144 | 37 | 152 | 25.7 | 0.091 | 0.1 | NA | 0.0 | 0.1 | 0.00 | 0.00 | 0.00 | 99.5 |
| East: Carrolls Road | | | | | | | | | | | | | | |
| 4 | L2 | 1 | 1 | 1 | 100.0 | 0.003 | 13.8 | LOS B | 0.0 | 0.1 | 0.35 | 0.87 | 0.35 | 44.5 |
| 6 | R2 | 1 | 0 | 1 | 0.0 | 0.003 | 9.0 | LOS A | 0.0 | 0.1 | 0.35 | 0.87 | 0.35 | 56.9 |
| Approach | | 2 | 1 | 2 | 50.0 | 0.003 | 11.4 | LOS B | 0.0 | 0.1 | 0.35 | 0.87 | 0.35 | 49.9 |
| North: SH1 | | | | | | | | | | | | | | |
| 7 | L2 | 5 | 3 | 5 | 60.0 | 0.101 | 9.4 | LOS A | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 64.7 |
| 8 | T1 | 155 | 39 | 163 | 25.2 | 0.101 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 99.6 |
| Approach | | 160 | 42 | 168 | 26.3 | 0.101 | 0.3 | NA | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 97.9 |
| All Vehicles | | 306 | 80 | 322 | 26.1 | 0.101 | 0.3 | NA | 0.0 | 0.1 | 0.00 | 0.02 | 0.00 | 98.0 |

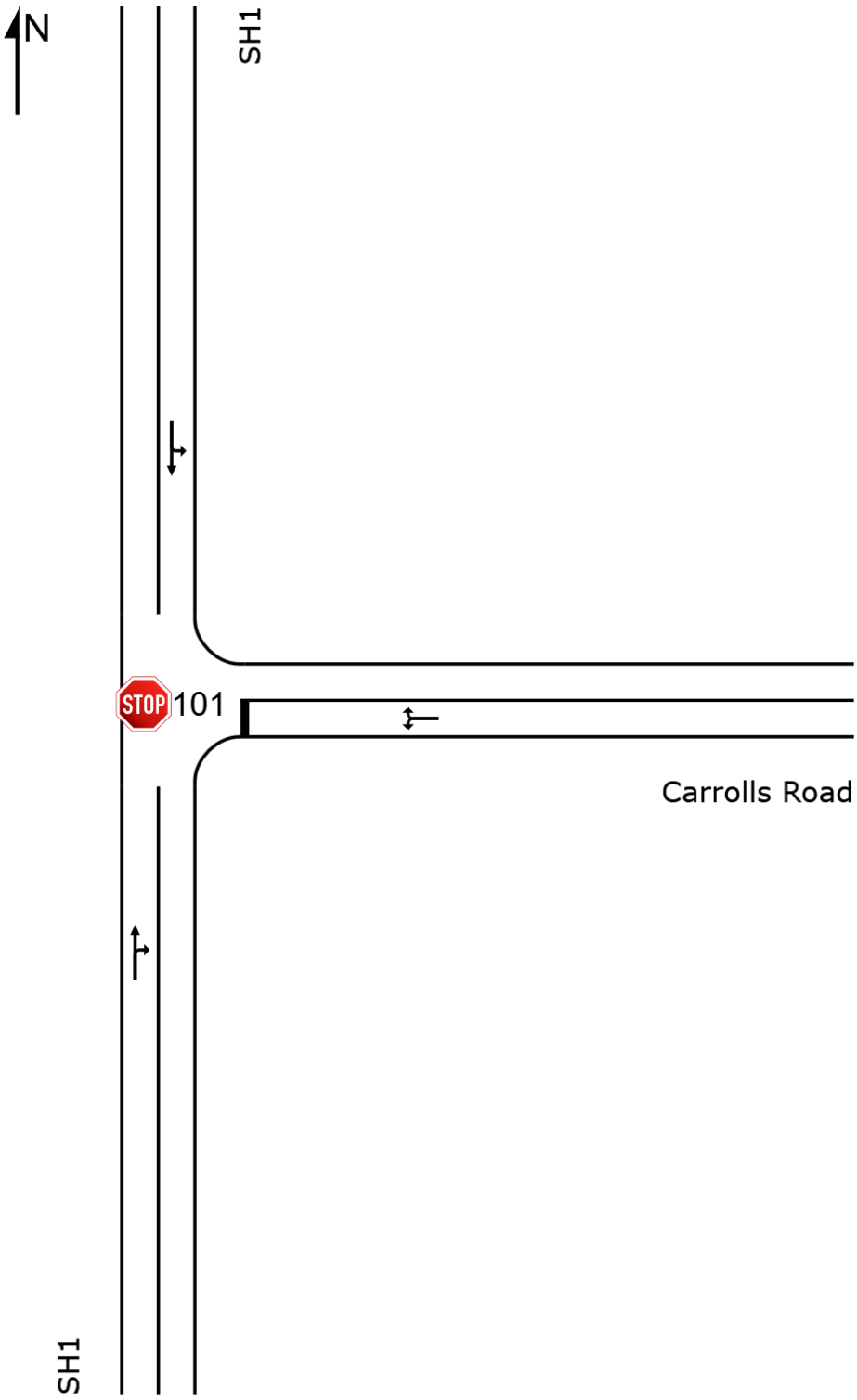
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# SITE LAYOUT

## Site: 101 [SH1/ Carrolls Road PM Existing (Site Folder: General)]

PM Peak Hour (16:30-17:30)
Site Category: (None)
Stop (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



# MOVEMENT FLOWS FOR SITE (INPUT)

## Approach movement input flow rates (veh/h)

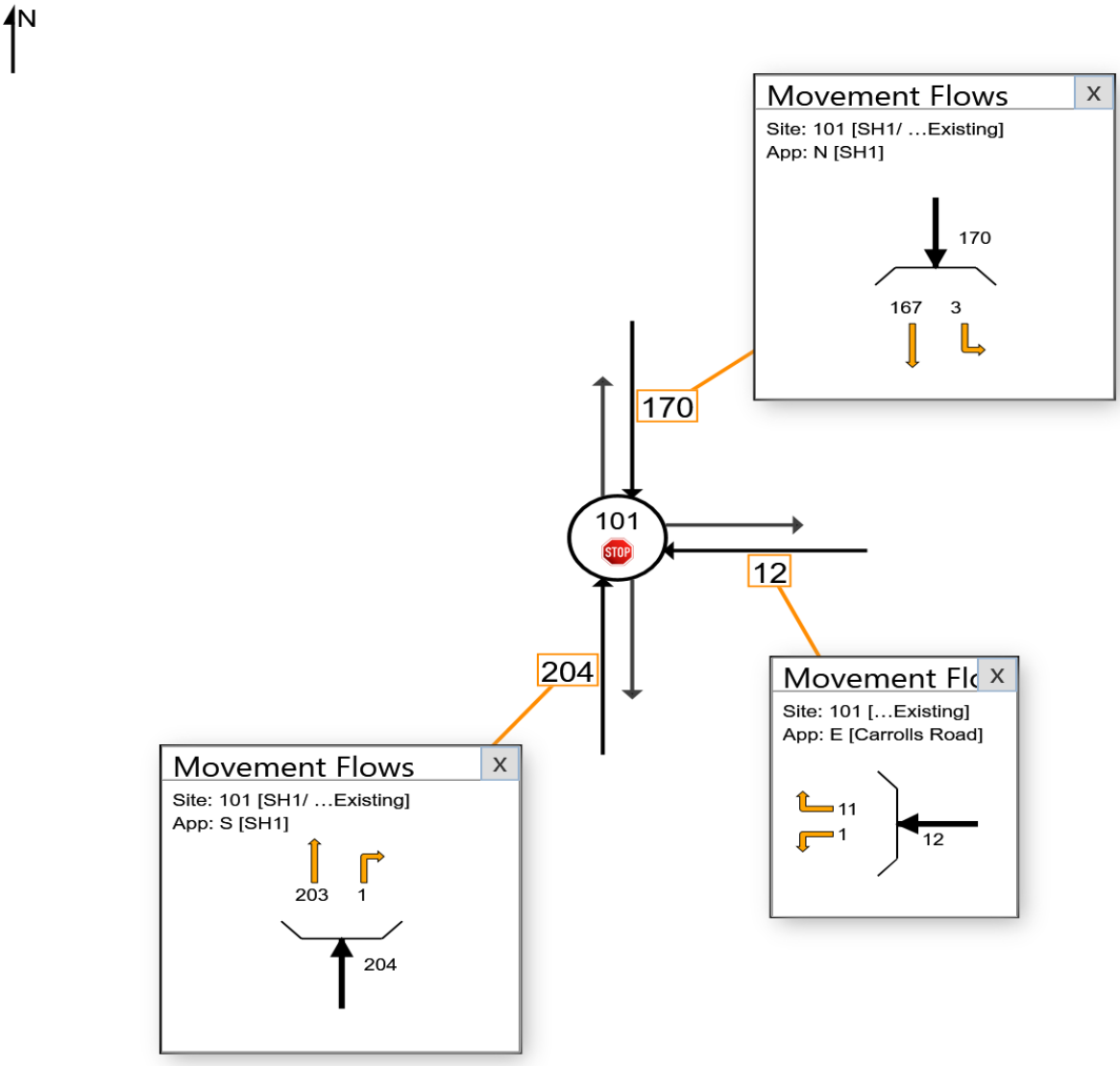
## All Movement Classes

## Site: 101 [SH1/ Carrolls Road PM Existing (Site Folder: General)]

PM Peak Hour (16:30-17:30)
Site Category: (None)
Stop (Two-Way)

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
Click and drag popup boxes to move to preferred positions.

Close All Popups



# MOVEMENT SUMMARY

## Site: 101 [SH1/ Carrolls Road PM Existing (Site Folder: General)]

PM Peak Hour (16:30-17:30)
Site Category: (None)
Stop (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] veh/h | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SH1 | | | | | | | | | | | | | | |
| 2 | T1 | 203 | 36 | 214 | 17.7 | 0.123 | 0.0 | LOS A | 0.0 | 0.1 | 0.00 | 0.00 | 0.00 | 99.8 |
| 3 | R2 | 1 | 0 | 1 | 0.0 | 0.123 | 8.1 | LOS A | 0.0 | 0.1 | 0.00 | 0.00 | 0.00 | 71.6 |
| Approach | | 204 | 36 | 215 | 17.6 | 0.123 | 0.0 | NA | 0.0 | 0.1 | 0.00 | 0.00 | 0.00 | 99.6 |
| East: Carrolls Road | | | | | | | | | | | | | | |
| 4 | L2 | 1 | 1 | 1 | 100.0 | 0.021 | 13.9 | LOS B | 0.1 | 0.7 | 0.44 | 0.93 | 0.44 | 44.6 |
| 6 | R2 | 11 | 4 | 12 | 36.4 | 0.021 | 12.0 | LOS B | 0.1 | 0.7 | 0.44 | 0.93 | 0.44 | 49.6 |
| Approach | | 12 | 5 | 13 | 41.7 | 0.021 | 12.2 | LOS B | 0.1 | 0.7 | 0.44 | 0.93 | 0.44 | 49.2 |
| North: SH1 | | | | | | | | | | | | | | |
| 7 | L2 | 3 | 3 | 3 | 100.0 | 0.104 | 10.4 | LOS B | 0.0 | 0.0 | 0.00 | 0.01 | 0.00 | 46.9 |
| 8 | T1 | 167 | 32 | 176 | 19.2 | 0.104 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.01 | 0.00 | 99.3 |
| Approach | | 170 | 35 | 179 | 20.6 | 0.104 | 0.2 | NA | 0.0 | 0.0 | 0.00 | 0.01 | 0.00 | 97.4 |
| All Vehicles | | 386 | 76 | 406 | 19.7 | 0.123 | 0.5 | NA | 0.1 | 0.7 | 0.02 | 0.04 | 0.02 | 95.6 |

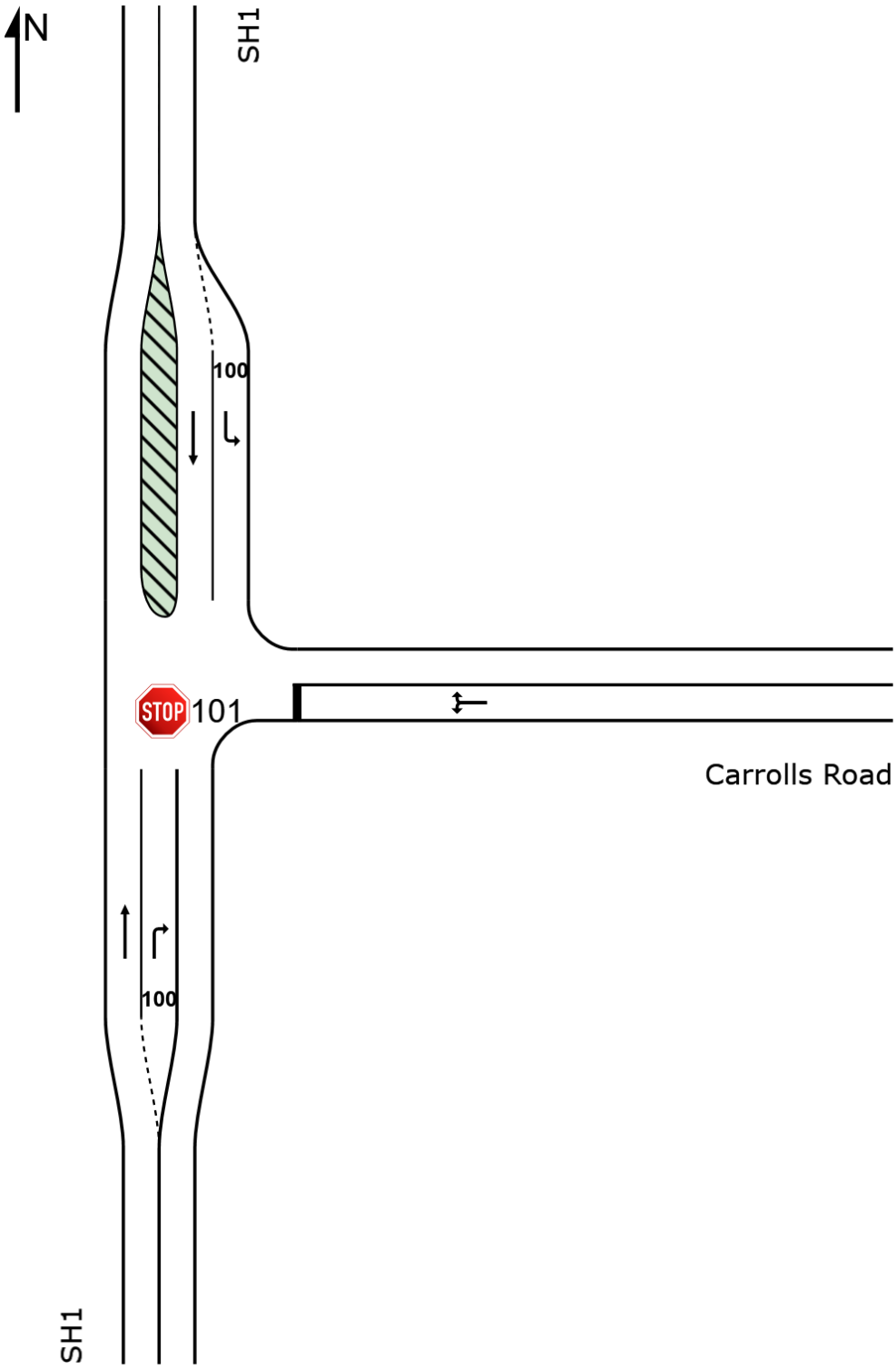
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# SITE LAYOUT

## Site: 101 [SH1/ Carrolls Road AM Proposed (Site Folder: General)]

AM Peak Hour (7:30-8:30)
Site Category: (None)
Stop (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



# MOVEMENT FLOWS FOR SITE (INPUT)

## Approach movement input flow rates (veh/h)

## All Movement Classes

## Site: 101 [SH1/ Carrolls Road AM Proposed (Site Folder: General)]

AM Peak Hour (7:30-8:30)
Site Category: (None)
Stop (Two-Way)

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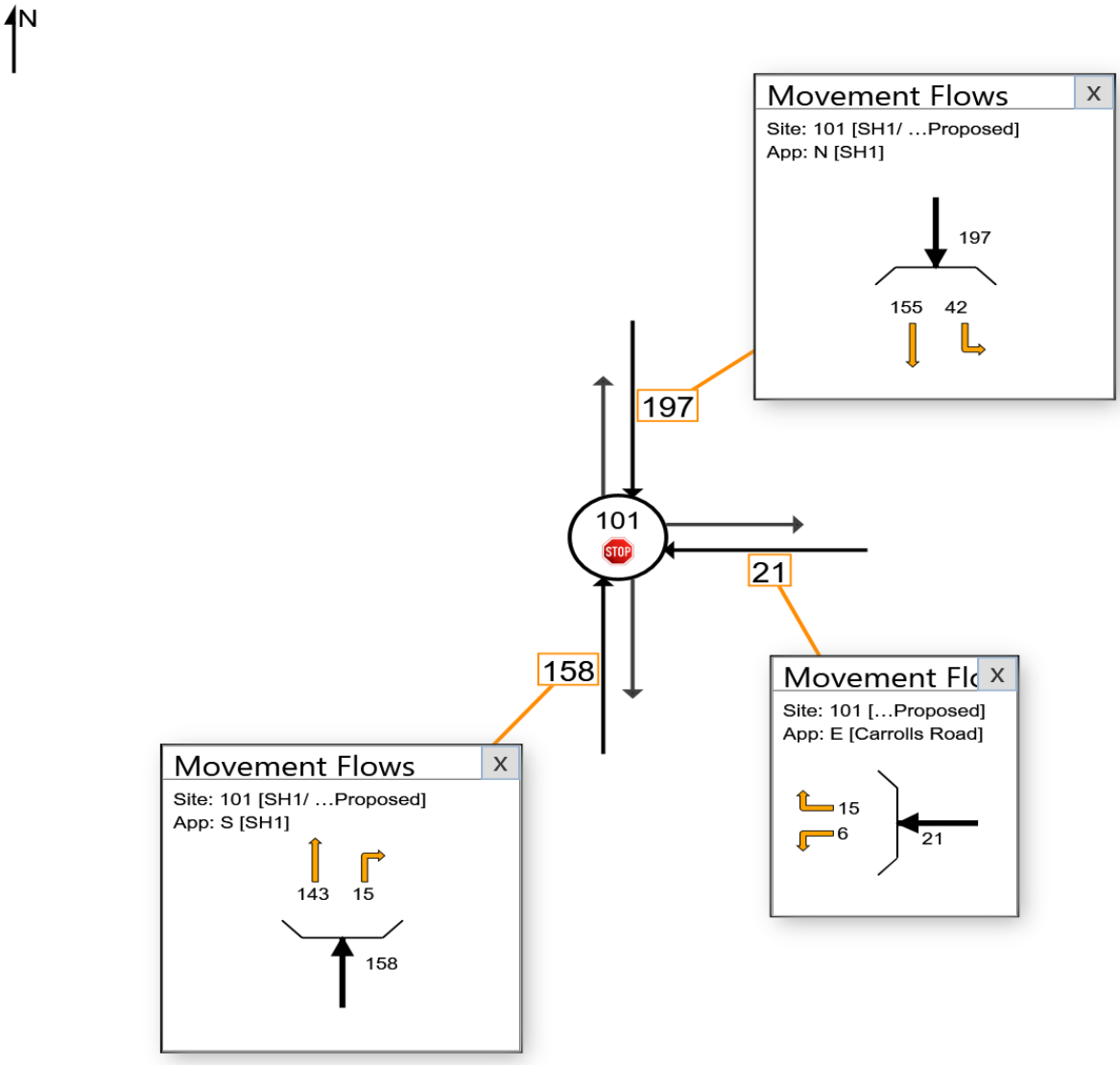

# MOVEMENT SUMMARY

## Site: 101 [SH1/ Carrolls Road AM Proposed (Site Folder: General)]

AM Peak Hour (7:30-8:30)
Site Category: (None)
Stop (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] veh/h | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SH1 | | | | | | | | | | | | | | |
| 2 | T1 | 143 | 37 | 151 | 25.9 | 0.090 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 100.0 |
| 3 | R2 | 15 | 1 | 16 | 6.7 | 0.014 | 8.5 | LOS A | 0.1 | 0.4 | 0.33 | 0.63 | 0.33 | 60.9 |
| Approach | | 158 | 38 | 166 | 24.1 | 0.090 | 0.8 | NA | 0.1 | 0.4 | 0.03 | 0.06 | 0.03 | 94.2 |
| East: Carrolls Road | | | | | | | | | | | | | | |
| 4 | L2 | 6 | 2 | 6 | 33.3 | 0.043 | 10.6 | LOS B | 0.2 | 1.4 | 0.46 | 0.92 | 0.46 | 50.2 |
| 6 | R2 | 15 | 5 | 16 | 33.3 | 0.043 | 14.2 | LOS B | 0.2 | 1.4 | 0.46 | 0.92 | 0.46 | 50.0 |
| Approach | | 21 | 7 | 22 | 33.3 | 0.043 | 13.2 | LOS B | 0.2 | 1.4 | 0.46 | 0.92 | 0.46 | 50.0 |
| North: SH1 | | | | | | | | | | | | | | |
| 7 | L2 | 42 | 8 | 44 | 19.0 | 0.027 | 8.3 | LOS A | 0.0 | 0.0 | 0.00 | 0.66 | 0.00 | 67.9 |
| 8 | T1 | 155 | 39 | 163 | 25.2 | 0.097 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 100.0 |
| Approach | | 197 | 47 | 207 | 23.9 | 0.097 | 1.8 | NA | 0.0 | 0.0 | 0.00 | 0.14 | 0.00 | 90.8 |
| All Vehicles | | 376 | 92 | 396 | 24.5 | 0.097 | 2.0 | NA | 0.2 | 1.4 | 0.04 | 0.15 | 0.04 | 88.1 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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Queue Model: SIDRA Standard.
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HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# SITE LAYOUT

## Site: 101 [SH1/ Carrolls Road PM Proposed (Site Folder: General)]

PM Peak Hour (16:30-17:30)
Site Category: (None)
Stop (Two-Way)

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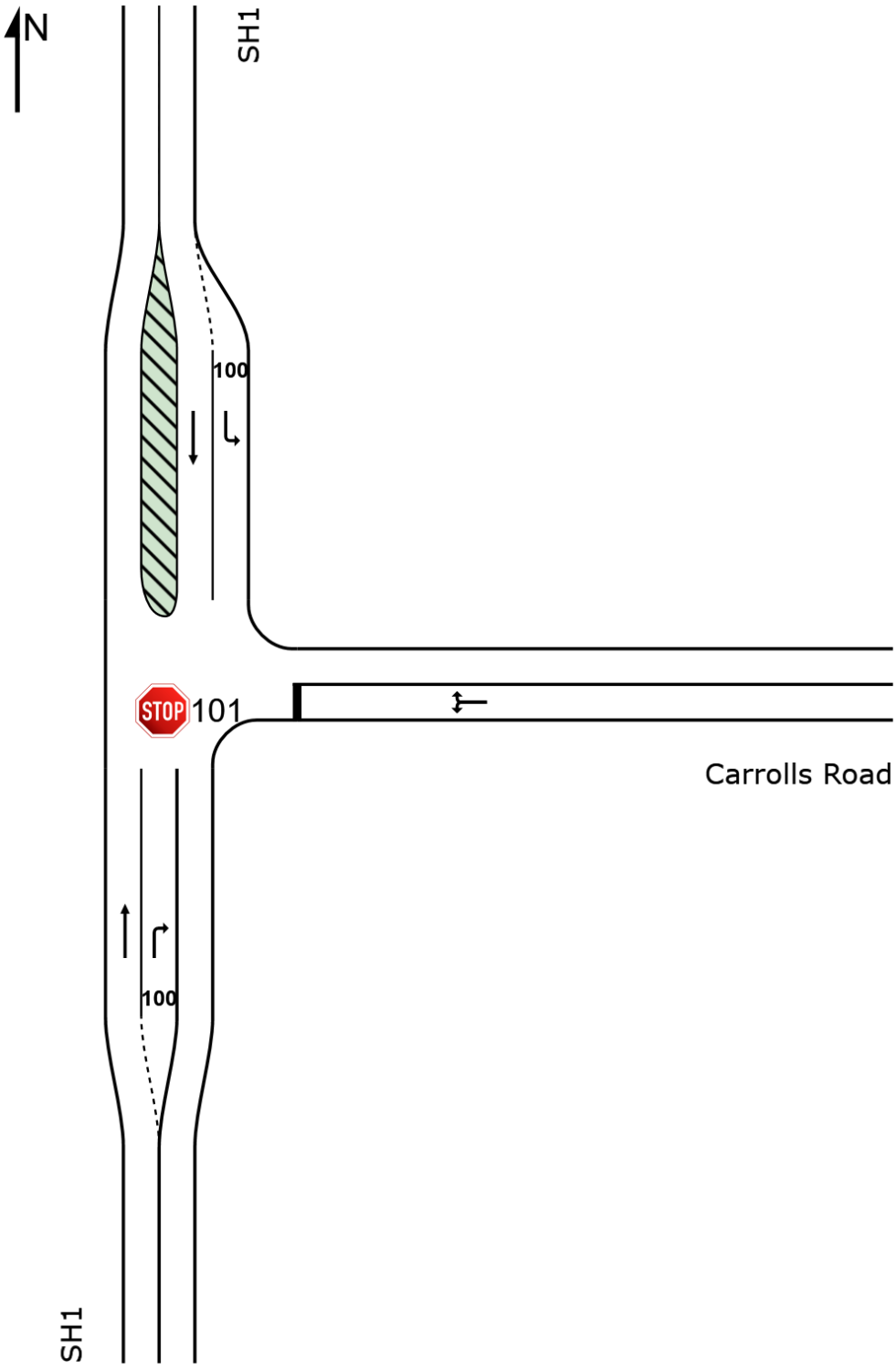

# MOVEMENT FLOWS FOR SITE (INPUT)

## Approach movement input flow rates (veh/h)

## All Movement Classes

## Site: 101 [SH1/ Carrolls Road PM Proposed (Site Folder: General)]

PM Peak Hour (16:30-17:30)
Site Category: (None)
Stop (Two-Way)

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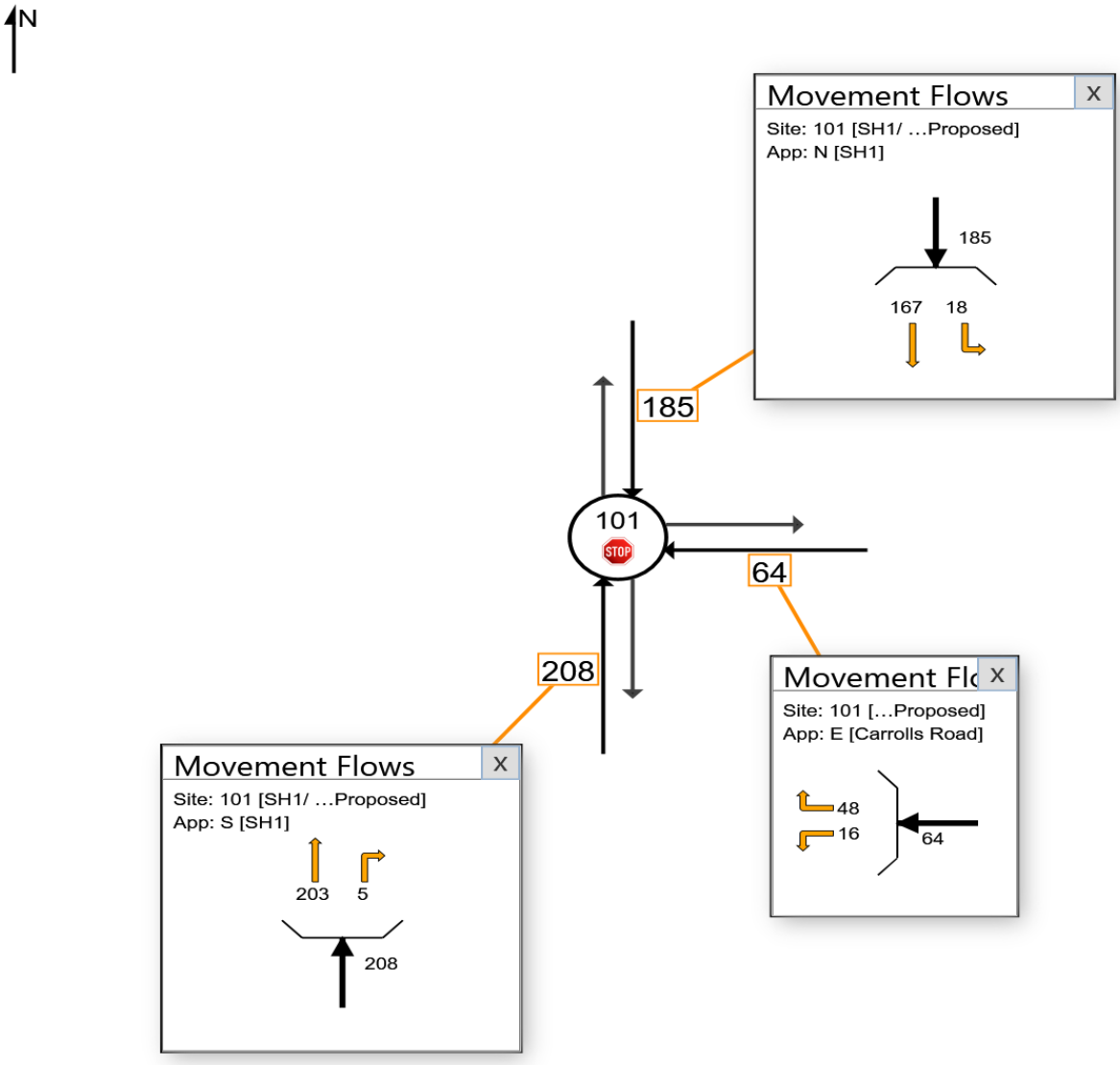

# MOVEMENT SUMMARY

## Site: 101 [SH1/ Carrolls Road PM Proposed (Site Folder: General)]

PM Peak Hour (16:30-17:30)
Site Category: (None)
Stop (Two-Way)

**Vehicle Movement Performance**

| Mov ID | Turn | INPUT VOLUMES [ Total veh/h | HV ] veh/h | DEMAND FLOWS [ Total veh/h | HV ] % | Deg. Satn v/c | Aver. Delay sec | Level of Service | 95% BACK OF QUEUE [ Veh. veh | Dist ] m | Prop. Que | Effective Stop Rate | Aver. No. Cycles | Aver. Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SH1 | | | | | | | | | | | | | | |
| 2 | T1 | 203 | 36 | 214 | 17.7 | 0.122 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 99.9 |
| 3 | R2 | 5 | 1 | 5 | 20.0 | 0.005 | 8.9 | LOS A | 0.0 | 0.2 | 0.32 | 0.61 | 0.32 | 60.1 |
| Approach | | 208 | 37 | 219 | 17.8 | 0.122 | 0.2 | NA | 0.0 | 0.2 | 0.01 | 0.01 | 0.01 | 98.4 |
| East: Carrolls Road | | | | | | | | | | | | | | |
| 4 | L2 | 16 | 2 | 17 | 12.5 | 0.128 | 9.7 | LOS A | 0.5 | 3.9 | 0.49 | 0.95 | 0.49 | 53.7 |
| 6 | R2 | 48 | 9 | 51 | 18.8 | 0.128 | 14.1 | LOS B | 0.5 | 3.9 | 0.49 | 0.95 | 0.49 | 52.4 |
| Approach | | 64 | 11 | 67 | 17.2 | 0.128 | 13.0 | LOS B | 0.5 | 3.9 | 0.49 | 0.95 | 0.49 | 52.7 |
| North: SH1 | | | | | | | | | | | | | | |
| 7 | L2 | 18 | 8 | 19 | 44.4 | 0.013 | 9.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.66 | 0.00 | 60.7 |
| 8 | T1 | 167 | 32 | 176 | 19.2 | 0.101 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 100.0 |
| Approach | | 185 | 40 | 195 | 21.6 | 0.101 | 0.9 | NA | 0.0 | 0.0 | 0.00 | 0.06 | 0.00 | 94.0 |
| All Vehicles | | 457 | 88 | 481 | 19.3 | 0.128 | 2.3 | NA | 0.5 | 3.9 | 0.07 | 0.17 | 0.07 | 86.3 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# ATTACHMENT C – LEVEL CROSSING LCSIA REPORT

Project Number: 1-C2277.02

# Carrolls Road Level Crossing ACLAM No. 1017, Glenavy

22 November 2022

CONFIDENTIAL


## Level Crossing Safety Impact Assessment Report

wsp

150 YEARS IN AOTEAROA

## Contact Details

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tim.r.burt@wsp.com

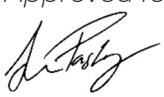
*Document Details:*
Date: 22 November 2022
Reference: 1-C2277.02
Status: Final

*Prepared by*

T. Burt
Senior Road Safety Technician

*Reviewed by*

p.p.
K. Louw
Transport Engineer
*Approved for release by*



S. Pasley
Service Line Lead – Road Safety

## Document History and Status

| Revision | Date | Author | Reviewed by | Approved by | Status |
|---|---|---|---|---|---|
| 1 | 16.09.2022 | T. Burt | K. Louw | S. Pasley | Draft for KiwiRail Comment |
| 2 | 17.10.2022 | T. Burt | S. Pasley | S. Pasley | Draft following KR feedback. |
| 3 | 18.11.2022 | T. Burt | S. Pasley | S. Pasley | Final for KiwiRail Comment |
| 4 | 22.11.2022 | T. Burt | S. Pasley | S. Pasley | Final |

## Revision Details

| Revision | Details |
|---|---|
| 1 | 16.09.2022 - Issued for KiwiRail's feedback |
| 2 | 17.10.2022 – Report updated to reflect KiwiRail's feedback. |
| 3 | 18.11.2022 – Report finalised following KiwiRail's feedback. |
| 4 | 22.11.2022 – Report endorsed by KiwiRail |

# Contents



## Appendices

# Disclaimers and Limitations

This report ('**Report**') has been prepared by WSP exclusively for Babbage Consultants Limited ('**Client**') in relation to the Carrolls Road Level Crossing Safety Impact Assessment Report for Project Kea ('**Purpose**') and in accordance with Short Form Agreement with the Client dated 6 July 2022. The findings in this Report are based on and are subject to the assumptions specified in the Report. WSP accepts no liability whatsoever for any reliance on or use of this Report, in whole or in part, for any use or purpose other than the Purpose or any use or reliance on the Report by any third party.

# Executive Summary

Project Kea is a proposal to develop a facility on Carrolls Roads in Glenavy, which will convert solid waste into energy that will be distributed onto the national power grid. The facility involves redevelopment of rural farmland immediately to the east of Carrolls Road Level Crossing #1017 on the Main South Line in Glenavy.

Access into the proposed site is solely from Carrolls Road via two new accessways to the east of the level crossing. In time, the facility can cater for transporting waste by rail reducing the number of trucks using the level crossing but initially, all movements are proposed to be undertaken by truck. The assessment within this report assumes 100% of waste being delivered to site by truck.

The consensus from the KiwiRail and RCA representatives who met on site to evaluate the crossing was that the crossing was one of the better passively controlled crossing within the jurisdiction. The proposal to provided active controls, delineation, and markings would safely manage the future user volumes resulting from the proposed facility.

No nearby crossings with lower volumes are proposed to be closed by the applicant or the RCA as part of this application.

## 'Top down, hierarchy of controls' assessment

When considering the effects of a proposed activity adjacent to an existing level crossing, a 'top down, hierarchy of controls' assessment should first be considered if the level crossing could be closed, or grade separated. Where the applicant decides not to pursue closure of grade separation the LCSIA is used to document and record the risk.

Grade separation or closure is not being pursued by the applicant. Through the LCSIA process the applicant is pursuing an at-grade solution to achieve Criterion 1.

## LCSS and ALCAM Evaluation

The Level Crossing Safety Score (LCSS) Procedure assesses and scores the risk of a fatality at the crossing for the upgraded existing, proposal and future traffic volume scenarios.

The tables below detail the progression of the LCSS for the level crossing through the stages of this LCSIA while aiming to achieve the KiwiRail LCSIA Criteria.

The existing road and rail volumes were 120vpd with 16% HCV and 9 trains per day and achieves a Medium LCSS. The proposed facility will increase road traffic volumes to 404vpd with 38% HCV at opening and 543vpd with 38% HCV for the future scenario. It is expected that the proposed improvements will increase the 85$^{th}$ percentile operating speed between the intersection of SH1 and the level crossing.

Road infrastructure improvements tested included active controls to achieve Criterion 1 and Criterion 2 for the proposal and future scenarios, along with additional signage and markings to meet TCD 9.

The current S1 sighting from Morven Glenavy will require additional FLBs angles towards the limit line to meet KiwiRail's criterion requirements.

The Proposal and Future LCSS scores were able to meet Criterion 1, a Low or Medium-Low LCSS Risk Band, and Criterion 2, an LCSS number out of 60, equal to the Updated Existing LCSS number.

*Table No. 1:* Summary of change in LCSS at Crossing #1017

| | Updated Existing | Change in Use | Proposal | Future |
|---|---|---|---|---|
| LCSS | 33/60 | 42/60 | 24/60 | 27/60 |
| LCSS Risk Band | Medium | Medium High | Medium-Low | Medium-Low |
| Criterion met | - | None | 1 & 2 | 1 & 2 |
| Control Type | Passive G/Way | Passive G/Way | HABs/FLBs | HABs/FLBs |

The LCSS Risk Band for the Updated Existing is Medium, Change and Use Medium-High, and Proposal and Future is Medium-Low.

A summary of the changes to the ALCAM risk bands are presented in the following table.

*Table No. 2:* Summary of ALCAM change at Crossing #1017

| | Updated Existing | Change in Use | Proposal | Future |
|---|---|---|---|---|
| ALCAM Risk Band | Medium High | High | Medium High | Medium High |
| ALCAM Risk Score Change (%) | - | 199% | -23% | -17% |
| Fatal Return Period in Years | 629 | 210 | 819 | 774 |
| Control Type | Passive G/Way | Passive G/Way | HABs/FLBs | HABs/FLBs |

The Updated Existing ALCAM risk band was Medium High, which stayed Medium high for the Proposal and Future volume and upgraded crossing scenarios. The return period for predicted fatal crashes has improved by 145 years from the Updated Existing to Future Use Scenarios.

There are no red flag scenarios that apply to the crossing.

## Recommended Road Crossing Improvements

The proposed design includes;

1. Half-Arm Barriers (HAB) and Flashing Lights and Bells (FLB)
2. WX1 advance warning signage,
3. Cross-hatched clear zone pavement markings,
4. Rail X pavement markings, and
5. Edge and Centreline pavement markings to meet TCD Part 9.

## Future User Volume Surveys

The applicant is required to conduct additional user volume (including proportion of user type) surveys two years after the opening of the facility. Subsequent surveys and reviews must be completed in three yearly cycles thereafter.

## Recommended Updates in ALCAM

- Update the existing LXM crossing information to reflect the true rail up track direction and associated bearings as detailed in section 3
- Conduct a full ALCAM assessment to update the road and rail infrastructure and operational information when the facility is opened.

## So Far As Is Reasonably Practicable (SFAIRP) Statement

The term 'so far as is reasonably practicable' means putting in place the highest level of protection considering what can be done and whether it is reasonable given the circumstances. In the context of reducing risk, it also takes into account the operating environment, the benefits to safety gained and the costs (in money, resources and creating different risks)[1]

The below SRAIRP statement considers the below;

### *Grade separation*

Grade separation was not considered to be reasonably practicable at this location due to the level crossings proximity to Morven Glenavy Road. Grade separation would require extensive construction works and the purchase of private land to achieve the required footprint of a grade separation solution. Further purchase of private land would be required to be purchased to provide a connection to Morven Glenavy Road.

Infrastructure (pump station) located within the grade separation footprint would also require relocation.

The cost associated with grade separation is also considered to be disproportional to the risk identified in the LCSIA process comparative to the low traffic volumes (<550veh/day) expected to use the Carrolls Road Level crossing for the future scenario.

### *Closure*

Consideration was given to the closure of the level crossing and identifying alternative routes to access the proposed facility. Any route to the facility will require traffic to cross the Main South Line (MSL) namely at Mairos Road (ALCAM Level Crossings No. 1016) or Strangers (Te Maihoroa) Road (ALCAM Level Crossing No. 1018).

A high level review of these level crossings found that both crossings are passively controlled and will likely carry an equivalent or higher risk than the updated existing Carrolls Road crossing. The infrastructure and road quality of these alternative local roads are generally in a worse condition than Carrolls Road which will require a higher level of investment to bring these roads up required standard.

The local road intersections connecting to the State Highway were also considered to be in locations where there is a higher risk of conflict than Carrolls Road i.e. conflicting heavy vehicle usage (Oceania Dairy) or on a horizontal curve with deficient sightlines (Strangers Road).

Closure of the Carrolls Road level crossing is an option and the direct cost of the closure would be relatively minor. However, the closure will require traffic accessing the facility to be re-routed away from the facility and onto adjacent roads of a lesser standard than Carrolls Road. A higher level of investment would be required to bring these additional routes up required standard and users accessing the facility will still be required to cross the MSL.

Closure of the crossing was not considered to be reasonably practicable.

### *SFAIRP Statement Findings*

Overall, it is considered that the recommended at-grade solution and proposed roading improvement to Carrolls Road provides an appropriate level of risk / hazard management as the crossing can achieve Criterion 1 with active level crossing controls, and is a 'so far as and is a reasonably practicable' solution.

[1] https://www.nzta.govt.nz/roads-and-rail/rail/operating-a-railway/risk-management/so-far-as-is-reasonably-practicable/

# 1 Background

This Level Crossing Safety Impact Assessment is for a proposed development that result in a change in use of the existing ALCAM Level Crossing 1017 Carrolls Road, Glenavy. The crossing is located at km 229.010 of the Main South Line (MSL) and 1.255 kilometres east of the intersection of SH1 and Carrolls Road.

Project Kea proposes to develop a facility on Carrolls Roads which will convert solid waste into energy that will be distributed onto the national power grid. The proposed site for the development is on rural farmland immediately to the northeast of Carrols Road Level Crossing. Access into the proposed site has been modelled with traffic solely from Carrolls Road via an upgraded intersection with State Highway 1 west of the level crossing, with entry point for heavy vehicles to the site via a new crossing place constructed 90m east of the level crossing, the light vehicle accessway will be constructed further east.

In time, the facility could cater for transporting waste by rail but initially, but at this time all waste is proposed to be undertaken by truck. The assessment within this report assumes 100% of waste being delivered to site by truck.

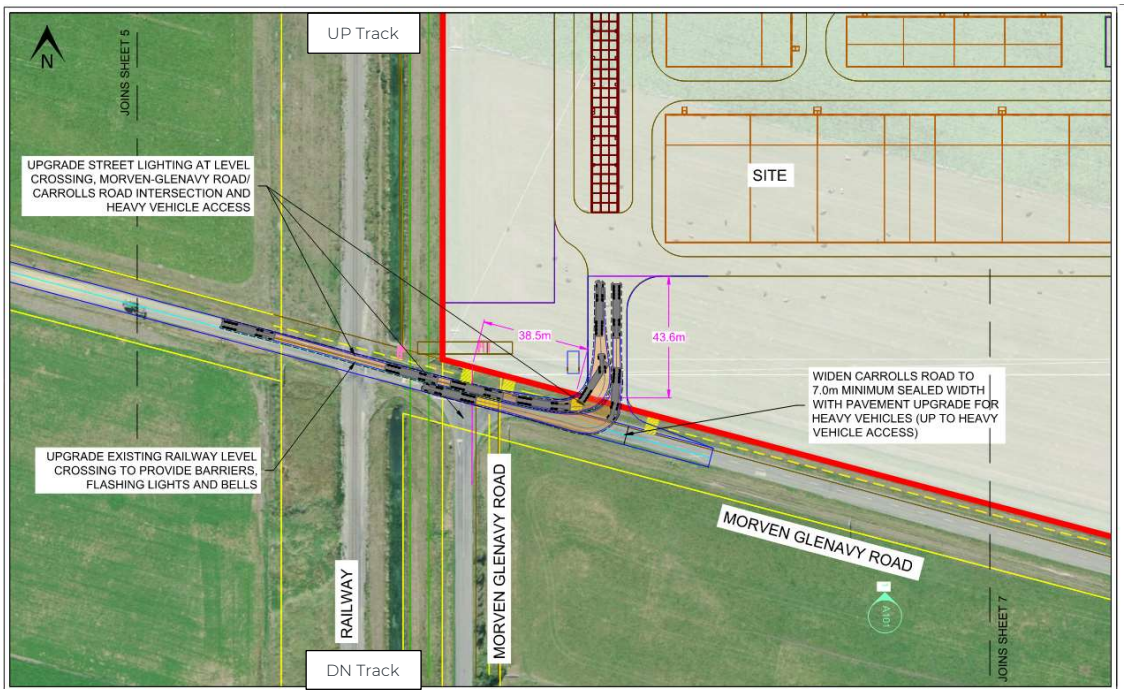



*Figure 1:* Extract – Overview of the Proposed Access to the Facility

# 2 Existing Crossing

The existing level crossing is passively controlled by RPX-3 Give-Way sign assembly. The December 2019 sighting record entered LXM has the up-track direction pointing south towards Invercargill. The signalling and interlocking diagrams show the up-track direction should be pointing north towards Christchurch. The LCSIA evaluation has corrected the up-track orientation.

The existing road ADT listed in Mobile Road (sourced from RAMM) shows that in November 2017 the ADT was estimated to be 52vpd with 10% HCV. Observations from site identified much higher traffic volumes in the order of 120vpd with 16% HCV.

The current train speed at the crossing is up to 80km/h for freight services and 100km/h for passenger service if these are being run, there are 9 trains per day.

## 2.1 General Safety Review

The crossing is a rural crossing with a 100km/h road posted speed limit, however vehicle operating speeds are lower and observed to be in the order of 70km/h. There is an 80-100km/h rail line speed. The crossing RPX-1 Give-Way signs and markings met TCD 9 requirements. There is Level Crossing Ahead Steam Train (WX1L) signs in advance of the crossing, the western approach also has a Level Crossing Alignment (WX41) Right Angles crossing advance warning sign with a supplementary 'Look For Trains' (WX8). There are yellow no-overtaking markings, vehicle limit lines and give-way symbols on both approaches, and 'Rail X' markings on eastern approaches.

At the site visit KiwiRail staff rated the crossing as one of the better passively controlled level crossings in their jurisdiction due to the clear sightlines between trains and vehicles due to the level approaches, slightly elevated rail line, and lack of vegetation along adjacent property boundaries.

The Locomotive Engineer mention that if Signals 22951, which are located approximately 500m down track, were operating trains may briefly be required to stop and sit across the level crossing prior to proceeding. KiwiRail have advised that 22951 is a station intermediate signal therefore it is unusual for a train to stop at this signal, and would only occur in a fault scenario, and not during the normal operating mode

KiwiRail's site representatives only concerns were minor vegetation growth was starting to encroach on sight lines at the intersection, particularly at the western limit line - both attendees from KiwiRail and Waimate District Council were going to raise this with their maintenance contactors. If planting or other obstructions i.e. bailage is added to the environment in the future then it would affect visibility for train drivers and safety rating for the updating existing and change in use scenario.

No nearby crossings with lower volumes are proposed to be closed by the applicant as part of this application. Waimate District Council was contacted to discuss the potential closure of any adjacent level crossing. The council advised they had previously considered closing Mairos Road and Strangers Road however decided at the time to retain access. The Strangers Road Level Crossing is used to provided access during flood conditions when the fords on Morven Glenavy Road are closed.

# 3 Updated Existing

The updated existing scenario reflects the current crossing condition. The Existing Scenario (base case) 2020 road volumes are 120 vpd and 16% HCV (06/02/2017) and the current rail volumes: 9 trains per day.

The existing LXM data has been updated to reflect that:

- The UP-track direction and bearings were corrected to reflect true up track direction
- The crossing has an asphalt panel and approach surfacing
- The crossing is on a minor hump or no hump, dip or rough surface (crossing is level)

# 4 Proposal and Change in Use

The purpose of this LCSIA is to inform the design process going forward to address any changes in risk from the proposed facility on Carrolls Road.

## 4.1 Change in Use

The Change in Use Scenario evaluates the existing crossing infrastructure with the forecast 10-year volumes. As per the sections below this is 9 trains per day and 543vpd (38% HCV).

## 4.2 Rail Changes

KiwiRail have confirmed there will not be any changes to sighting, maximum and minimum train speeds, number of tracks, train types and no shunting will occur across the crossing.

## 4.3 Road Changes

The proposal is to upgrade the roading infrastructure along Carrolls Road including pavement widening and sealing of the carriageway. Inclusion of retroreflective delineation along the road length. In addition, the proposal will specifically allow for the installation of:

- Active Level Crossing Controls to meet Criterion 1.
- Upgrade Street lighting within the general area of the level crossing.

Furthermore, improvements to the advanced warning signage and pavement markings to include 'RAIL X' have been allowed for in the modelling.

The proposal for pavement widening and sealing of the carriageway will likely increase the operating speeds above current levels. The modelling completed for the proposal and future scenario account for higher operating speeds.

The site access is located approximately 85m from Carrolls Road Level Crossing, with an additional 40m of storage within site (Figure 1). The design allows space for two articulated trucks to be stored within the site and three articulated vehicles on road prior to level crossing. Given proposed traffic generation (6 inbound trucks per hour), it is considered unlikely the full storage capacity would ever be required resulting in stacking back to the level crossing.

## 4.4 Rail Volumes

LXM Database records the rail traffic volume as 9 trains per day. The LE advised during the site visit that there are currently 8 freight trains movements per day, with an occasional passenger service. The higher value of 9 trains per day has been taken forward in this assessment for the opening day and future rail volumes.

In time, the facility could cater for transporting waste by rail however this assessment only looks at the current proposal to transport all waste by road.

## 4.5 Road Volumes

The 2022 Draft Transport Assessment Report provided the project estimates that the trip generation for the Project Kea Facility when fully open will generate 282 vpd of which 148 are staff/light vehicle trips and 136 commercial/heavy vehicle trips.

An increase in pedestrian usage at the level crossing is not considered likely due to the rural location of the facility, or specific pedestrian facilities warranted.

An increase in cyclists is also not considered likely due to the location of the facility. Any cycle trips generated by the proposal would likely originate in Glenavy and not require users to cross the Carrolls Road level crossing. Any other cyclist usage generated by the proposal and using Carrolls Road is considered to be minor and can be accommodated with the proposed road level crossing traffic volumes.

Table 1: Trip Generation Calculations

| | AM Peak Hour | | PM Peak Hour | | Daily | |
|---|---|---|---|---|---|---|
| | In | Out | In | Out | In | Out |
| Heavy vehicle movements | 6 | 6 | 6 | 6 | 68 | 68 |
| Light vehicle movements | 46 | 14 | 14 | 46 | 74 | 74 |
| **Total** | **52** | **20** | **20** | **52** | **142** | **142** |

*Figure 2:* Transportation Report Extract: Total Trip Generation for Project Kea

The Transport Assessment Report (TAR) the site trip distribution is based on all activity types accessing the facility via the State Highway / Carrolls Road Intersection, and traversing the Carrolls Road Level Crossing. Therefore, 100% of traffic generated by the proposal has been modelled to use the level crossing.

4.6 TRIP DISTRIBUTION

In distributing vehicle movements onto the road network, it is assumed that all heavy vehicle movements, and all light vehicle movements, will travel to and from the site via the SH1/ Carrolls Road intersection.

The origins and destinations of vehicles travelling to and from the site has been comprehensively assessed by the applicant. The following data has been provided for estimating the distribution of traffic movements:

- 85% of heavy vehicle movements travel to/from the north;
- 15% of heavy vehicle movements travel to/from the south;
- 70% of light vehicle movements travel to/from the north, and
- 30% of light vehicle movements travel to/from the south.

Based on the trip generation values in Table 1, and the distribution above, the estimated additional movements at the SH1/ Carrolls Road intersection are summarised in Figure 4. The proposed traffic movements at the intersection (existing plus additional movements) are summarised in Figure 5.

*Figure 3:* Transportation Report Extract: Trip Distribution

The following traffic volumes are the calculated projected daily traffic volumes on Carrolls Road through the crossing due to the proposal and organic future growth.

- Existing Scenario (base case) – 120 vpd and 16% HCV.

The existing scenario represents the current estimated traffic volumes along Carrolls Road as detailed in Section 2.

- Proposal Scenario – 404 vpd (38% HCV)

The proposal scenario provides the calculated traffic volumes on Carrolls Road for when the facility is fully operational. When fully open the facility will generate an additional 148 light vehicle trips and 136 heavy vehicle trips, as determined by the TAR.

- Change in Use and Future Scenarios –543 vpd (38% HCV)

The Change in Use and Future scenarios provides a 10-year horizon incorporating a fully operational site and wider network assumed growth of 3% per annum. Based on this, the future traffic volume is estimated to be 543 vehicles per day of which 38% are heavy vehicles.

The general principle for modifying an existing level crossing is the Proposed Design and Future Score LCSS achieve Criterion 1, however where the modifications required to meet Criterion 1 are

not reasonably practicable for an existing level crossing upgrade the level of treatment must meet or exceed Criterion 2.

*Criterion 1: requires the Proposed Design and Future Score of a level crossing to achieve a 'Low' or 'Medium-Low' level of risk as determined by the LCSS.*

*Criterion 2: requires the Proposed Design and Future Score of a level crossing to achieve an LCSS number (out of 60), lower than or equal to the Updated Existing LCSS number.*

The Level Crossing Safety Score Risk Bands are defined in the following figure:

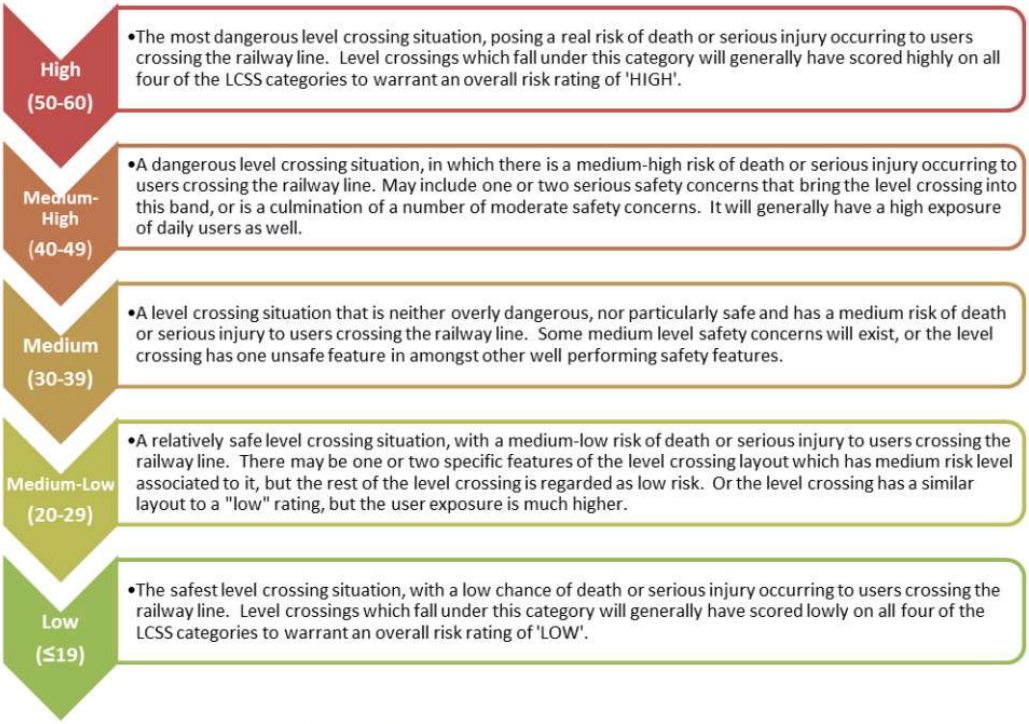



*Figure 8: Level crossing safety score risk bands*

***Figure 4:*** Level Crossing Safety Score Risk Bands

# 5 Level Crossing Safety Score

The level crossing safety score has been calculated for the Updated Existing crossing, an improvement proposal (signs and markings to TCD 9) and a future road volume as follows.

1 Updated Existing Crossing – the existing crossing layout with passive Give-Way Signs, current road volumes of 120 vehicles per day and 16% heavy commercial vehicles and 9 trains per day. Rail maximum speed is 100km/h, road speed limit is 100km/h.
2 Change in Use – the existing crossing layout with forecast 10-year volumes of 543vpd and 38% HCV and 9 trains per day.
3 Proposed Design – Facility is operating. ALCAM and LCSS incorporating all the improvement recommendations for the user volumes shortly after opening of 404 vpd and 38% HCV and 9 trains per day. Due to the proposed improvements to Carrolls Road the LHS 85$^{th}$ percentile approach has been increased to 100km/h. The RHS speeds have been kept at the existing speeds due to the proximity to the facility and adjacent intersections. The improvements aim to achieve Criterion 1 a Low or Medium-Low level of risk.
4 Future Score – Facility is operating as above with the proposed road improvements. 10-year volumes of 543vpd and 32% HCV and 9 trains per day. ALCAM and LCSS ten years post opening with proposed design improvements that aim to achieve Criterion 1.

## 5.1 ALCAM Level Crossing Safety Score

*Table No. 3:* ALCAM Level Crossing Score

| LCSS | Score | Fatality Return | Risk % Change | Comments |
|---|---|---|---|---|
| Published Score | 21/30 | 728 years | - | This is for the current passive Give-Way (RPX3) controls, road volume of 40vpd and 10% HCV and rail volume of 9.<br><br>**The ALCAM Risk Score is 13.7. The Risk Band Jurisdiction is Medium-High, and the Likelihood Band Jurisdiction is Medium-Low.**<br><br>The LCSS Risk Score is 21 and the Risk Band is Medium-High. |
| Top Rated Characteristics | | | | Safety Risk Flags |
| • Is the crossing on a hump, dip or rough surface?<br>• S2 - approach visibility to train (vehicle approaching crossing)<br>• High train speed<br>• Heavy vehicle proportion | | | | • S2 Sighting (on side road only)<br>• Hump, Dip, Rough Surface<br>• Sun Glare Sighting Crossing on Road |
| Updated Existing | 22/30 | 629 years | - | The existing LXM data has been updated to reflect that the current crossing conditions (including correction to UP track direction in LXM, as noted in Section 3).<br><br>**The ALCAM Risk Score is 15.9. The Risk Band Jurisdiction is Medium-High, and the Likelihood Band Jurisdiction is Medium**.<br><br>The LCSS Risk Score is 22 and the Risk Band is Medium-High. |
| Top Rated Characteristics | | | | Safety Risk Flags |
| • S2 - approach visibility to train (vehicle approaching crossing)<br>• High train speed<br>• Heavy vehicle proportion<br>• Road traffic speed (85th percentile vehicle speed) | | | | • S2 Sighting (on side road only)<br>• Sun Glare Sighting Crossing on Road |
| Change in Use | 28/30 | 210 years | 199% | The change in use scenario is the existing crossing with the forecast 10-year user volumes 543vpd and 38% HCV and 9 trains per day added to the crossing.<br><br>**The ALCAM Risk Score is 47.6. The Risk Band Jurisdiction is High, and the Likelihood Band Jurisdiction is High.**<br><br>The LCSS Risk Score is 28 and the Risk Band is High. |
| Top Rated Characteristics | | | | Safety Risk Flags |

| LCSS | Score | Fatality Return | Risk % Change | Comments |
|---|---|---|---|---|
| • S2 - approach visibility to train (vehicle approaching crossing)<br>• High train speed<br>• Slowest train speed at crossing<br>• Heavy vehicle proportion | | | | • S2 Sighting<br>• Sun Glare Sighting Crossing on Road |
| Proposal | 20/30 | 819 years | -23% | The proposed design uses the opening volumes 404 vpd and 38% HCV and 9 trains per day.<br><br>The improvements include – upgrade to active controls (HAB + FLB), signs and markings to TCD 9.<br><br>**The ALCAM Risk Score is 12.2. The Risk Band Jurisdiction is Medium-High, and the Likelihood Band Jurisdiction is Low**.<br><br>The LCSS Risk Score is 20 and the Risk Band is Medium-High. |
| Top Rated Characteristics | | | | Safety Risk Flags |
| • Slowest train speed at crossing (typical) | | | | • Sun Glare Sighting Crossing on Road |
| Future | 21/30 | 758 years | -17% | The future design uses the 10-year volumes Proposal scenario.<br><br>**The ALCAM Risk Score is 13.2. The Risk Band Jurisdiction is Medium-High, and the Likelihood Band Jurisdiction is Low**.<br><br>The LCSS Risk Score is 21 and the Risk Band is Medium-High. |
| Top Rated Characteristics/Mechanisms | | | | Safety Risk Flags |
| • Slowest train speed at crossing (typical) | | | | • Sun Glare Sighting Crossing on Road |

## 5.2 Crash and Incident History Score

The ORA and CAS database was searched for reported incidents at the level crossing. Where incidents have occurred, a weighting has been applied (per the LCSIA guide) to calculate the Crash and Incident Score (C&IS). The score is capped at a maximum of 10 points.

*Table No. 4:* Crash and Incident Score

| | Updated Existing | Change in Use | Proposal | Future |
|---|---|---|---|---|
| ORA Results | 1/10 | 3/10 | 0/10 | 1/10 |
| CAS Results | 4/10 | 4/10 | 0/10 | 0/10 |
| Total | 5/10 | 7/10 | 0/10 | 1/10 |

### 5.2.1 KiwiRail ORA Data

There has been one incident recorded in the past 10-years in the KiwiRail ORA database at the crossing. It was a Near Collision Light Road Vehicle in 2012 which involved the vehicle towing a trailer crossing in front of a train.

As per table 4 of the LCSIA Risk Guide, we have scored the one ORA incident below as a 1/10 for the Updated Existing Scenario. As the road volumes are significantly increasing and for the current rail infrastructure, we are assuming two further near miss for the change in use, 3/10.

For the Proposal and Future scenarios we are assuming that the upgrade to active FLB & HAB controls would mitigate any near misses, however for the future scenario as there is no median island we have assumed a single near miss related to driving around the controls 1/10.

*Table No. 5:* KiwiRail ORA Data – one incident recorded

| | |
|---|---|
| Incident No | 121508 |
| Incident Date | 12/04/2012 |
| Sub Code | NCLV- Near Collision Light Road Vehicle |
| Line | MSL – Main South Line |
| Meterage | 229.01 |
| ALCAM ID | 1017 |
| ALCAM NAME | Carrolls Road |
| Protection | Give Way Signs |
| Protection Type | |
| Council | Waimate District Council |
| Region | Canterbury |
| Daily Train Traffic | 9 |
| Description | 937 near miss<br><br>937 near miss with van towing trailer across Carrolls Rd LX, MSL at Glenavy. No other information provided |

### 5.2.1 NZTA Crash Analysis System (CAS) Data (10-yr data)

No crashes have been recorded at the crossing or which are related to the operation of the level crossing in the past 10-years.

Historically, there was one crash at the level crossing in 2005. A westbound passenger vehicle overtook a stock truck which was turning left into Morven Glenavy Road. The vehicle has failed to notice a southbound train and has entered the level crossing. The rear of the vehicle has collided with train.

As the crash involved a collision at a passively controlled crossing and no changes to the rail controls and/or infrastructure were made that would have mitigate future occurrence of this risk the crash has been included in the scoring.

*Table No. 6:* Crash and Incident Score

| | Updated Existing | Change in Use | Proposal | Future |
|---|---|---|---|---|
| ORA Results | 1/10 | 1/10 | 0/10 | 1/10 |
| CAS Results | 4/10 | 4/10 | 0/10 | 0/10 |

| | | | | |
|---|---|---|---|---|
| Total | 5/10 | 5/10 | 0/10 | 1/10 |

## 5.3 Site Specific Safety Score

The level crossing is on an Access Road with a posted speed limit of 100km/h. The proposal retains Carrolls Road Speed Limit at 100km/h, so the Rural assessment table has been used for the site-specific safety evaluation. There are no red flag scenarios at this crossing.

*Table No. 7:* Rural Road Site Specific Safety Score – Updated Existing

<table>
<tr><th>Site Specific Safety Score</th><th>Comments</th></tr>
<tr><td>

***A3.1 Red Flag Scenarios***

If any of the following instances apply at the crossing being assessed, then the overall SSSS defaults to a minimum of 24/30 (or 8/10). This better captures the safety risk of the Red Flag scenario and stops it from being minimised if the other SSSS categories score lowly.

| Score | Red Flag Scenario |
|---|---|
| 24 | If grounding out is known to have occurred at the level crossing previously and no changes to the road have occurred since. |
| 24 | If a short stacking HCV was hit by a train at the level crossing previously and no safety improvements have occurred since. |
| 24 | If a queued vehicle was hit by a train at the level crossing previously and no safety improvements have occurred since. |
| 24 | If a level crossing has an accessway located in between the form of control and the railway line. This means the accessway is behind the control measures and has no protection. |

</td><td rowspan="3">No red flag scenarios apply at the crossing.</td></tr>
<tr><td>

**Category 1: Crossing controls (5 points)**

| Score | Scenario |
|---|---|
| 1 | Half-arm barriers with flashing lights and bells and physical median islands that discourage motorists from passing through the level crossing when the half-arm barriers are lowered. |
| 2 | Half-arm barriers with flashing lights and bells. |
| 3 | Flashing lights and bells. |
| 4 | STOP controlled crossing |
| 5 | GIVE WAY controlled crossing |

</td><td>

Existing and Change in Use
Score 5: Give Way Controlled Crossing

Proposal and Future
Score 2: HAB with FLB

</td></tr>
<tr><td>

**Category 2: Side road and intersection proximity (5 points)**

| Score | Scenario |
|---|---|
| 0 | No side road (on the right-hand side of road) or intersection on either side of the level crossing. |
| 1 | There is a side road / intersection on the departure side, with a low chance of queues forming back to level crossing. |
| 2 | There is a side road / intersection on the departure side, with occasional queues forming back to level crossing. |
| 3 | There is a side road / intersection on the departure side, with frequent queues forming back to level crossing. |
| 4 | Where there is a second side road / intersection on both departure sides of the level crossing, with ***only one*** side likely to form occasional / frequent queues over the level crossing. |
| 5 | Where there is a second side road / intersection on both departure sides of the level crossing, with ***both*** sides likely to form occasional / frequent queues over the level crossing. |

</td><td>

Existing and Change in Use
Score 1: Morvan Glenavy Road Intersections is located on the RHS departure. Low potential for queues to form.

Proposal and Future
Score 1 as above. The access to the proposed facility is east of Morvan Glenavy Road (~90m from the railway line).

</td></tr>
<tr><td>

**Category 3: Horizontal and vertical alignment of crossing (5 points)**

| Score | Scenario |
|---|---|
| 1 | The crossing is on a level profile and the road approaches are on a consistent perpendicular alignment, which is good for motorists to check for approaching trains in both directions. |
| 2 | Either the horizontal ***or*** vertical alignment is not on a perpendicular / level approach to the level crossing but is deemed acceptable for motorists to check for trains in both directions. |
| 3 | Both the horizontal ***and*** vertical alignment are not on a perpendicular / level approach to the level crossing but are deemed acceptable for motorists to check for trains in both directions. |
| 4 | Either the horizontal ***or*** vertical approaches are on a poor alignment. This makes checking for trains difficult for motorists, or visibility of the level crossing is compromised on the approach. |
| 5 | Both the horizontal ***and*** vertical approaches are on a poor alignment. This makes checking for trains very difficult for motorists, or visibility of the level crossing is seriously compromised on the approach. |

</td><td>

Existing and Change in Use
Score 2: Carrolls Road is straight and flat. The MSL is slightly elevated but not enough to impact sighting lines. The approach from Morven Glenavy Road is parallel to the MSL resulting in a reduced S2, however S3 is achivable

Proposal and Future
Score: 1 additional FLB angled towards the side road allows for SSD to be achived on Morven Glenavy Road migating any short fall in S2 .

</td></tr>
</table>

**Category 4: Short Stacking / Grounding Out (10 points)**

| Score | Scenario |
|---|---|
| 0 | No intersections near level crossing, and / or no evidence of grounding out visible. |
| 1 | **<26m length:** HCV short stacking over the crossing is a rare occurrence due to low HCV and/or train volumes or signage that bans HCV from using the level crossing is present. |
| 2 | **<26m length:** HCV short stacking can occur, with mitigating reasons that reduce the risk of a train impact, e.g. escape areas (or space in the road shoulder/verge) that can be accessed by the predominant HCV traffic movements. |
| 3 | **<26m length:** HCV short stacking over the crossing at a roundabout intersection with low opposing traffic volumes. |
| 4 | **<26m length:** HCV short stacking over the crossing at a priority controlled intersection with no safety features e.g. linked to traffic lights or escape area and has low opposing traffic volumes. |
| +3 | If a scenario scores in the 3-4 range, add three points for a moderate AADT volume on the opposing road, e.g. a road that can sometimes have platoons of vehicles, but there are generally some gaps to enter traffic stream |
| +6 | If a scenario scores in the 3-4 range, add six points for a high AADT volume on the opposing road e.g. very busy road with few gaps to enter traffic stream. |
| 5 | **GROUNDING OUT:** Evidence of scrape marks on the ***road surface*** where an HCV or trailer has made contact. Use this score when there is no known history of grounding out occurring, but it is suspected due to the scrape marks. |
| 7 | **GROUNDING OUT:** Evidence of scrape/gouge marks on the ***railway tracks*** where an HCV or trailer has made contact. Use this score when there is no known history of grounding out occurring, but it is suspected due to the scrape marks. |

**Existing and Change in Use**
Score 0: No intersections near the level crossing and no evidence of grounding out visible.

**Proposal and Future**
Score: 0 as above.

**Category 5: Road surface condition (5 points)**

| Score | Scenario |
|---|---|
| 1 | Road surface in excellent condition, no deterioration and in near new condition. |
| 2 | Minor issues with the road surface, but not enough to warrant maintenance intervention. |
| 3 | Pavement in average condition, isolated areas require maintenance intervention. |
| 5 | Pavement condition is in a poor state, surface is flushed or breaking up. Heavy maintenance intervention is required to reinstate surface to acceptable condition. |
| -1 | Deduct one point where rubber panels are used across the railway crossing, as these reduce the need for continued maintenance of the sealed surface interface with the rail tracks. |

**Existing**
Score 2: Existing Surface Condition in moderate condition.

**Change in Use**
Score 3: Predicted degradation to the road surface due to increase in HCV%.

**Proposal**
Score 1: Crossing and road approachs upgraded as part of proposal

**Future**
Score: 3 Predicted degradation to the road surface due to increase in HCV%.

| | |
|---|---|
| Existing Crossing: | 10/30, 3/10 – SSSS to take forward |
| Change in Use: | 11/30, 4/10 – SSSS to take forward |
| Proposal: | 5/30, 2/10 – SSSS to take forward |
| Future Score: | 7/30, 3/10 – SSSS to take forward |

## 5.4 Site Evaluation

A site visit was undertaken on Tuesday 16 August 2022 and attended by the following representatives of KiwiRail, the RCA and WSP:

- Peter Duncan – Field Asset Engineer – KiwiRail
- Steve Reeves – Operations Manager – KiwiRail
- Murray Donald Locomotive Engineer - KiwiRail
- Rob Moffat – Roading Engineer – Waimate District Council
- Tim Burt – LCSIA Assessor – WSP

The site visit notes are included in the appendices. Several items were raised in the evaluation:

- The crossing is passively controlled with Give-Way signs and markings. Improvements could be made to reinforce advanced warning on the crossing approaches, no "RAIL X" where present on the western approach.
- Vegetation is starting to encroach on sight lines at the level crossing – both KiwiRail and WDC were both advising their prospective maintenance contractors.

- Stock (cattle) were observed being crossed at the level crossing during the site visit.
- Trains can be required to stand over the crossing for up to 10 seconds if the signal (GVY - 22905) down track is operating as stop and proceed.
- The panel is constructed from Epi-flex. The Capacity of the panel will need to be assess as part of the upgrade works.

## 5.5 Engineers Risk Score

The risk score and comments are in the sections below.

The weighted risk scores are:

*Table No. 1:* Engineers Risk Scores

| Crossing | LE Score | RCA Score | Calculation | Existing | Proposed and Future |
|---|---|---|---|---|---|
| Carrolls Road Public Road Level Crossing 1017 | 4/10 | 2/5 | 4 + 2 = 6 = 6/1.5 = 4/10 | 4/10 | |
| | 2/10 | 1/5 | 2 + 1 = 3 = 3/1.5 = 2/10 | | 2/10 |

### 5.5.1 *KiwiRail LE/Signalling Engineer - Level Crossing Risk Score*

This risk score reflects the level of crash risk that KiwiRail Locomotive Engineers and/or signalling staff would give to the level crossing compared with other crossings they encounter regularly within their jurisdiction. The view of the KiwiRail representatives was that the level crossing was one of the better passively controlled level crossings within their jurisdiction.

| Crossing Score – Carrolls Road Level Crossing 1017 | | Worst | | compared with other crossings you encounter regularly within your jurisdiction | | Best |
|---|---|---|---|---|---|---|
| KiwiRail | Existing crossing | 5 | 4 | 3 | 2 | 1 |
| | Future Crossing | 5 | 4 | 3 | 2 | 1 |
| Comments: | What changes would make the crossing worse and how would your score alter?<br><br>Vegetation growth impeding sight lines. Stacking of bailage – these were observed to be placed along fence line stack at single height.<br><br>Increase in vehicles<br><br>What changes would make the crossing better and how would your score alter?<br><br>Active controls | | | | | |

### 5.5.2 *Questions for KiwiRail Engineer*

| Questions regarding crossing history | | Carrolls Road |
|---|---|---|
| 1 | Current train speed at crossing for both directions. | *80km/h but passenger trains can travel up to 100km/h on this section.* |

| Questions regarding crossing history | | Carrolls Road |
|---|---|---|
| 2 | Number of likely train movements per day. | *8 freight, passenger trains can operate on this section from time to time.* |
| 3 | Does shunting occur at this crossing, if so, how many movements per day? | *No.* |
| 4 | Are there whistle boards present? | *No.* |
| 5 | Any near miss episodes not reported in IRIS? | *No.* |
| 6 | Any vandalism of signs or controls? | *Yes – WX-8 advanced warning sign was upside down (this was corrected onsite by the RCA)* |
| 7 | Any vehicle incidents which have hit KiwiRail infrastructure? | *No.* |
| 8 | Does reverse tracking occur? | *N/A* |
| 9 | General view on the level of safety of the crossing. | *One of the better passively controlled crossings in the area but vegetation growth along the rail corridor is starting to impede on sight lines.*<br><br>*Vehicles tend to focus on looking for traffic on the intersection on the right-hand side of the crossing rather than the level crossing. New pump shed has added further distraction.*<br><br>*Panel is made from Epi-flex and the capacity should be reassessed to ensure that the panel can handle future tonnages.*<br><br>*Trains may be required to stand over the crossing for up to 10 seconds if the signal (GVY - 22905) down track is operating as stop and proceed.* |
| 10 | Future Rail Line changes – are any changes to the rail line, infrastructure and train volumes proposed? | *There is the potential for more freight to be transport by rail, however any impact on rail services is unknown.*<br><br>*Passenger Services are not currently running but if this service recommences then there could be an increase in rail traffic* |

### *5.5.3 Road Controlling Authority – Crossing Risk Score*

This risk score reflects the level of crash risk that RCA staff would give to the level crossing compared with other crossings they encounter regularly within their jurisdiction.

| Crossing Score – Carrolls Road Level Crossing No. 1017 | | Worst | compared with other crossings you encounter regularly within your jurisdiction | | | Best |
|---|---|---|---|---|---|---|
| KiwiRail | Existing crossing | 5 | 4 | 3 | 2 | 1 |
| | Proposed and Future Crossing | 5 | 4 | 3 | 2 | 1 |

| | |
|---|---|
| Comments: | What changes would make the crossing worse and how would your score alter?<br>Not maintaining sight distance requirements to both level crossing controls and rail.<br>What changes would make the crossing better and how would your score alter?<br>Increase advanced warnings<br>Active crossing controls |

### *5.5.4 Questions for RCA Engineer*

| Questions regarding crossing history | | Grey Street (road) |
|---|---|---|
| 1 | Are there any known public concerns about the crossing? | No. |
| 2 | Are there any incidents or crash history at the crossing you are aware of? | No. |
| 3 | Are there any other changes nearby that may influence this level crossing, i.e. a new subdivision consent, a new walking or cycling facility that will change traffic patterns or volumes? | No. |
| 4 | General view on the level of safety of the crossing. | Good sight lines and crossing on a slight crest allow good sightlines of markings and signage. One of the better passively controlled crossing in the district. |
| 5 | What are the current traffic, pedestrian and cycle volumes through the crossing? | Vehicle volumes not high - Approx. 100vp. |
| 6 | What are the future (+10 years) estimated traffic, pedestrian and cycle volumes through the crossing? | No cycle or pedestrian usage. |

## 5.6 LCSS Results

The combined risk scores are tabulated below:

(a) Updated Existing Crossing – Passive Give Way Signs, current road volumes of 120 vehicles per day and 16% heavy commercial vehicles and 9 trains per day. Rail maximum speed is 100km/h, road speed limit is 100km/h.
(b) Change in Use – the existing crossing layout with forecast 10-year volumes of 543vpd and 38% HCV and 9 trains per day.
(c) Proposed Design – Facility is operating, and the scoring reflects all the improvement recommendations for the proposed road and rail changes shortly after opening, of 404 vpd and 38% HCV and 9 trains per day.
(d) Future Score – Facility is operating with the proposed road improvements. 10-year volumes of 543vpd and 38% HCV and 9 trains per day.

The proposed and future crossing scenarios meet Criterion 1 or 2.

***Table No. 8:*** Level Crossing Safety Score Results

| Scored Items | Updated Existing | Change in Use | Proposal | Future Score | Comments |
|---|---|---|---|---|---|
| ALCAM | 22/30 | 28/30 | 20/30 | 21/30 | Proposed design score is for an upgrade to active level crossing controls and signs and markings improvements for met TCD 9. |
| Crash & Incident History | 5/10 | 7/10 | 0/10 | 1/10 | One NCLV is recorded in ORA – van towing trailer crossed in from of 937.<br><br>*One Non-Injury Collision recorded in CAS. The crash occurred in 2005.<br><br>For the proposal with upgrades, we have assumed that there will be no incidents, so a score of 0/10. For the Future we have assumed a single vehicle driving around the controls 1/10. |
| Site Specific Safety | 3/10 | 4/10 | 2/10 | 3/10 | Site specific score reduces with the inclusion of active controls. In the future assessment due to the HCV % the pavement condition has been assumed to have isolated areas requiring maintenance intervention. |
| Engineer Risk | 3/10 | 3/10 | 2/10 | 2/10 | Engineer risk score reduce with the inclusion of active controls. |
| LCSS Score | 33/60 | 42/60 | 24/60 | 27/60 | The Proposed Design and Future Score meet Criterion 1 or 2. |
| LCSS Risk Band | Medium | Medium-High | Medium-Low | Medium - Low | |
| Criterion Met | - | None | 1 & 2 | 1 & 2 | |

# Appendix A
# Site Evaluation

| Features Reviewed at the Road Crossing | | Comments |
|---|---|---|
| 1 | Is there suitable lighting at the crossing point and is it of good quality? | This is a rural road with no streetlighting on the approaches or the crossing. However, streetlighting upgrade is proposed as part of the application |
| 2 | Does vegetation restrict sight lines at the crossing point or on the approach to the crossing? | Yes, low growing broom and gorse is growing along the rail corridor and adjacent to the level crossing.<br><br>The vegetation is impeding sight lines at the LHS Limit Line |
| 3 | Is there any rail infrastructure in the rail corridor that restricts visibility for all users? | No – rural setting so pedestrian and cyclists do not use the crossing.<br><br>Livestock use the road crossing |
| 4 | Does the signage meet TCD Part 9 standards? Do any signs need to be replaced due to age or damage? | No, but a new pump shed on Morven Glenavy Road impedes sight lines |
| 5 | What is the quality of the road surfacing in the near vicinity of the level crossing? | Good – both approaches are sealed for at least 100m. |
| 6 | What is the quality of the panel between the tracks (and on the outside) at the level crossing, is it badly deformed? | Good. Panel is Epi-flex therefore the capacity would need to be reassessed against future tonnage |
| 7 | What is the line marking condition? Is 'Rail X' marked on the approaches (if it should be)? | RHS only |
| 8 | Are LX1 (steam train) signs present for all approaches, including nearby side roads? | LHS Approach – Yes<br><br>RHS Approach - Yes<br><br>Morven Glenavy Road Approach - No |
| 9 | Is the LX1 sign pointing in the right direction (to the road centreline)? | Yes |
| 10 | Is the LX1 sign gated on approaches when the volume is greater than 2,000 AADT? | N/A <100 AADT |
| 11 | Are other advanced warning signs present? | LHS Approach - WX41+WX8 (side road not shown on sign)<br><br>RHS Approach – Nil<br><br>Morven Glenavy Road Approach – WXL4 |
| 12 | Are there side roads or accessways nearby and how do they interact with the level crossing? | Not of the controls but low growing scrub is along the corridor boundary. |

| Features Reviewed at the Road Crossing | | Comments |
|---|---|---|
| | | Bailage is currently positioned along the road boundary. |
| 13 | Should flashing lights and bells be facing the side roads, if they are not already present? | Yes – Morven Glenavy Road is located on the right side of the crossing. Low volume roads with very low risk of stacking |
| 14 | Is there a short stacking or grounding out risk? Is there anything in place to mitigate that, i.e. signs for heavy vehicles or escape areas? | Right Hand Approach - RPX3 signs only installed on the LHS of the Level Crossing – a second sign should be installed on the RHS facing the side road |

## 5.7 Questions for KiwiRail Engineer

| Questions regarding crossing history | | Level Crossing |
|---|---|---|
| 1 | Current train speed at crossing for both directions. | *80km/h but passenger trains can travel up to 100km/h on this section.* |
| 2 | Number of likely train movements per day. | *8 freight, passenger trains can operate on this section from time to time.* |
| 3 | Does shunting occur at this crossing, if so, how many movements per day? | *No.* |
| 4 | Are there whistle boards present? | *No.* |
| 5 | Any near miss episodes not reported in IRIS? | *No.* |
| 6 | Any vandalism of signs or controls? | *Yes – WX-8 advanced warning sign was upside down (this was corrected onsite by the RCA)* |
| 7 | Any vehicle incidents which have hit KiwiRail infrastructure? | *No.* |
| 8 | Does reverse tracking occur? | *N/A* |
| 9 | General view on the level of safety of the crossing. | *Vegetation growth along the rail corridor is starting to impede on sight lines.*<br><br>*Vehicles tend to focus on looking for traffic on the intersection on the right-hand side of the crossing.*<br><br>*Trains may be required to stand over the crossing for up to 10 seconds if the signal (GVY - 22905) down track is operating as stop and proceed.* |

| Questions regarding crossing history | | Level Crossing |
|---|---|---|
| 10 | Future Rail Line changes – are any changes to the rail line, infrastructure and train volumes proposed? | *Potential to increase freight.*<br><br>*Coastal Pacific is not currently running but if this service recommences then there could be an increase in rail traffic* |

## 5.8 Questions for RCA Engineer

| Questions regarding crossing history | | Answer |
|---|---|---|
| 1 | Are there any known public concerns about the crossing? | *No.* |
| 2 | Are there any incidents or crash history at the crossing you are aware of? | *No.* |
| 3 | Are there any other changes nearby that may influence this level crossing, i.e. a new subdivision consent, a new walking or cycling facility that will change traffic patterns or volumes? | *No.* |
| 4 | General view on the level of safety of the crossing. | *Good sight lines and crossing on a slight crest allow good sightlines of markings and signage. One of the better passively controlled crossing in the district.* |
| 5 | What are the current traffic, pedestrian and cycle volumes through the crossing? | *Vehicle volumes not high - Approx. 100vp.*<br><br>*No cycle or pedestrian usage.*<br><br>*Livestock can be driven down the road and were observed crossing at the site visit.* |
| 6 | What are the future (+10 years) estimated traffic, pedestrian and cycle volumes through the crossing? | *With the proposed upgrades to the intersection with SH1 and the widening of Carrolls Road this might become the favoured route into Glenavy.*<br><br>*If route becomes favoured then Waimate DC may consider reducing the posted speed limit.* |

# Appendix B
# Crossing Characteristics

## Crossing Characteristics

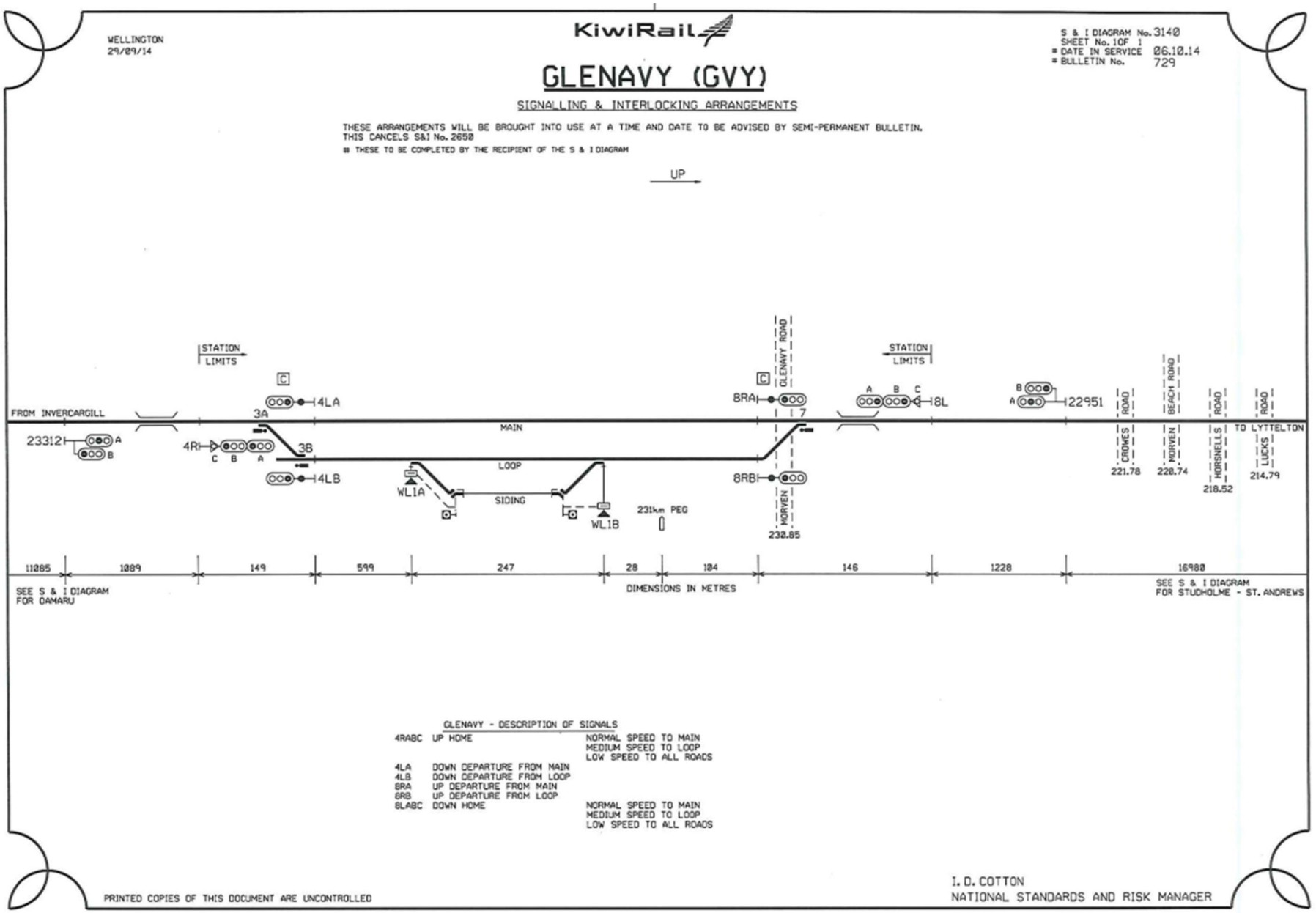
| | Existing Crossing |
|---|---|
| **ALCAM Number** | **1017** |
| Jurisdiction | NZ |
| Street | Carrolls Road |
| Suburb | Glenavy |
| Line Section | Main South Line - from MID |
| Rail Km | 229.01 |
| Primary Control | Give Way Signs |
| Location | Non Metro |
| Primary Rail Manager | KiwiRail |
| Secondary Rail Manager(s) | |
| Primary Road Manager | |
| Secondary Road Manager(s) | |
| Rail Status | Active |
| Road Access | Public |
| Legal Status | Public |
| Crossing Class | Public road / path - Public access |
| Daily Train Numbers | 9 |
| Road Vehicle Numbers (AADT) | 40 |
| Raw Infrastructure Factor | 336.356 |
| Exposure Factor | 0.00747841 |
| Infrastructure Factor | 1.023678 |
| Likelihood Factor | 0.007655484 |
| Consequence Factor | 0.179512927 |
| Risk Factor | 0.001374258 |
| Risk Score Status | Current |
| Years Between Collisions | 130.6253101 |
| Years Between Fatalities | 727.6651987 |
| Last Calculated Date | 9/12/2019 11:59 |
| Org Asset ID | PUB673 |
| Street Directory Ref | |
| Route ID | NZ-MSL_3 |
| Rail Traffic Type | FREIGHT |
| Pass RD | |
| Number Of Tracks | 1 |
| Road Status | Open |
| Left Extended Approach Surface Material | CHIP-SEAL |
| Left Immediate Approach Surface Material | CHIP-SEAL |
| Panel Surface Material | CHIP-SEAL |
| Right Immediate Approach Surface Material | CHIP-SEAL |
| Right Extended Approach Surface Material | CHIP-SEAL |
| Council Region | Waimate District Council |
| Main Roads Region | Canterbury |

| | Existing Crossing |
|---|---|
| Road Angle (R) | 90 |
| Road Angle (L) | 90 |
| Max Train Speed Up | 100 |
| Max Train Speed Down | 100 |
| Road Width | 5.5 |
| Road Clearance Width | 5.5 |
| Number Of Attached Peds | 0 |
| Last ALCAM Survey Date | 9/12/2019 0:00 |
| Last Sighting Date | 9/12/2019 0:00 |
| Sighting Description | |
| High Speed Train | - |
| Multiple Tracks | - |
| Non-Compliance to Standard | - |
| Queueing | - |
| Short Stacking | - |
| Sighting S1 | - |
| Sighting S2 | Rating (5) |
| Sighting S3 | - |
| Road Condition | - |
| Hump, Dip or Rough Surface | Rating (5) |
| Sun Glare Sighting Crossing on Road | Rating (5) |
| Sun Glare Sighting Train | - |
| Extreme S3 Required Sighting | - |
| Sighting Model | AS1742_7_2016 |
| Number Of Left Approaches | 2 |
| Number Of Right Approaches | 1 |
| Left S1 - Available | 27 |
| Left S1 - Required | 22.54 |
| Right S1 - Available | 251 |
| Right S1 - Required | 131.51 |
| Left S2 Up - Measured | 51 |
| Left S2 Up - Required | 337.34 |
| Left S2 Down - Measured | 156 |
| Left S2 Down - Required | 337.34 |
| Left S2 Up - Distance | |
| Left S2 Down - Distance | |
| Right S2 Up - Measured | 235 |
| Right S2 Up - Required | 227.97 |
| Right S2 Down - Measured | 235 |
| Right S2 Down - Required | 227.97 |
| Right S2 Up - Distance | 235 |
| Right S2 Down - Distance | 235 |
| Left S3 - Up Required | 407.59 |
| Left S3 - Down Required | 407.59 |
| Left S3 - Up Measured | 525 |
| Left S3 - Down Measured | 808 |
| Right S3 - Up Required | 407.59 |

| | Existing Crossing |
|---|---|
| Right S3 - Down Required | 407.59 |
| Right S3 - Up Measured | 527 |
| Right S3 - Down Measured | 811 |
| Highest Road Speed Limit | 100 |
| Left - 85th Percentile Vehicle Speed | 70 |
| Right - 85th Percentile Vehicle Speed | 70 |
| Track Width | 1.07 |
| Left Control Point Distance | 201 |
| Right Control Point Distance | 201 |
| True Bearing Up | 184.66 |
| Left Exit True Bearing | 230.73 |
| Right Exit True Bearing | 50.73 |
| Left - True Bearing Road | 230.73 |
| Right - True Bearing Road | 50.73 |
| Left - Stop Line Clearance | 3.5 |
| Right - Stop Line Clearance | 3.5 |
| Left - Average Grade On Approach (S1) | |
| Right - Average Grade On Approach (S1) | 3 |
| Left - Average Grade (S3) | 3 |
| Right - Average Grade (S3) | 3 |
| Left Vehicle Length | 20 |
| Right Vehicle Length | 20 |
| Top Rated Characteristics | Is the crossing on a hump, dip or rough surface?,S2 - approach visibility to train (vehicle approaching crossing),High train speed, Heavy vehicle proportion |
| Comments (sighting) | |
| Left Road Vehicle Type | Level 1 - Semi Trailer |
| Right Road Vehicle Type | Level 1 - Semi Trailer |
| % Commercial Vehicles | 10 |
| Control Class | Give Way |
| Jurisdiction Likelihood Band (Control Class) | Medium Low |
| Jurisdiction Likelihood Band | Medium Low |
| Global Likelihood Band (Control Class) | Medium High |
| Global Likelihood Band | Medium High |
| Jurisdiction Risk Band (Control Class) | Medium High |
| Jurisdiction Risk Band | Medium High |
| Global Risk Band (Control Class) | High |
| Global Risk Band | Medium High |

# Appendix C
# Signalling and Interlocking Plan

*Figure 5:* Signalling and interlocking plan



# Appendix D
# Site Photos

*Figure 6:* East Approach Carrolls Road looking west from Advanced Warning Sign

*Figure 7:* East Approach – looking south (Down Track) from 1.5m back from limit line

*Figure 8:* East Approach – looking north (Up Track) from 1.5m back from limit line

*Figure 9:* Looking North (Up Track)

*Figure 10:* Looking South (Down Track)

*Figure 11:* Panel Condition and approach surfacing

*Figure 12:* West Approach Carrolls Road – looking east from Outer Advanced Warning Sign


*Figure 13:* West Approach Carrolls Road – looking east from Inner Advanced Warning Sign


*Figure 14:* West Approach – looking south (Down Track) from 1.5m back from limit line

*Figure 15:* West Approach – looking east from 35m back from limit line


*Figure 16:* West Approach – RPX-3 Signage

*Figure 17:* Morven Glenavy Road (Side Road) Advanced Warning

*Figure 18:* Morven Glenavy Road – looking south (Down Track) from limit line

*Figure 19:* Morven Glenavy Road (Side Road) – looking north (Up Track) from limit line

# Appendix E
# ALCAM Risk Rating

***Controls***

| | |
|---|---|
| Controls at Crossing | Give Way Signs |
| Additional Crossing Controls | RX-9 Railway Crossing Width Marker Assembly |
| Advance Warning | SINGLE Standard Advance Warning (W7-4, W7-7, NZ WX1 OR NZ WX3) |
| Train Related | Whistle board / location board for train |
| Crossing Environment | Maintenance programme for vegetation etc (Road) |

*Crossing Volume (AADT)* Road: 40 Rail: 9

**Outputs**

| | | | |
|---|---|---|---|
| Raw Infrastructure Factor: | **336** | | |
| Infrastructure Factor: | **1.02368** | | |
| Exposure Factor: | **0.00748** | | |
| Likelihood Factor: | **0.00766** | Years Between Collisions: | **131** |
| Consequence Factor: | **0.17951** | | |
| Risk Score: | **0.00137** | Years Between Fatalities: | **728** |

**Risk / Likelihood Bands**

**Across Control Classes**

| | | | |
|---|---|---|---|
| Risk Band All: | **Medium High** | Likelihood Band All: | **Medium High** |
| Risk Band Jur. | **Medium High** | Likelihood Band Jur: | **Medium High** |

**Within Give Way Control Class**

| | | | |
|---|---|---|---|
| Risk Band All: | **High** | Likelihood Band All: | **Medium High** |
| Risk Band Jurisdiction: | **Medium High** | Likelihood Band Jurisdiction : | **Medium Low** |

***Flags:***

Sighting S2
Hump, Dip or Rough Surface

Sun Glare Sighting Crossing on Road

*Figure 20:* Existing Crossing – ALCAM Risk Rating

***Controls***

| | |
|---|---|
| Controls at Crossing | Give Way Signs |
| Additional Crossing Controls | RX-9 Railway Crossing Width Marker Assembly |
| Advance Warning | SINGLE Standard Advance Warning (W7-4, W7-7, NZ WX1 OR NZ WX3) |
| Train Related | Whistle board / location board for train |
| Crossing Environment | Maintenance programme for vegetation etc (Road) |

*Crossing Volume (AADT)* Road: 120 Rail: 9

**Outputs**

| | | | |
|---|---|---|---|
| Raw Infrastructure Factor: | **194** | | |
| Infrastructure Factor: | **0.95243** | | |
| Exposure Factor: | **0.01011** | | |
| Likelihood Factor: | **0.00963** | Years Between Collisions: | **104** |
| Consequence Factor: | **0.16518** | | |
| Risk Score: | **0.00159** | Years Between Fatalities: | **629** |

**Risk / Likelihood Bands**

**Across Control Classes**

| | | | |
|---|---|---|---|
| Risk Band All: | **High** | Likelihood Band All: | **Medium High** |
| Risk Band Jur. | **Medium High** | Likelihood Band Jur: | **Medium High** |

**Within Give Way Control Class**

| | | | |
|---|---|---|---|
| Risk Band All: | **High** | Likelihood Band All: | **High** |
| Risk Band Jurisdiction: | **High** | Likelihood Band Jurisdiction : | **Medium** |

***Flags:***

Sighting S2

Sun Glare Sighting Crossing on Road

*Figure 21:* Updated Existing – ALCAM Risk Rating

***Controls***

| | |
|---|---|
| Controls at Crossing | Give Way Signs |
| Additional Crossing Controls | RX-9 Railway Crossing Width Marker Assembly |
| Advance Warning | SINGLE Standard Advance Warning (W7-4, W7-7, NZ WX1 OR NZ WX3) |
| Train Related | Whistle board / location board for train |
| Crossing Environment | Maintenance programme for vegetation etc (Road) |

*Crossing Volume (AADT)* Road: 543 Rail: 9

**Outputs**

| | | | |
|---|---|---|---|
| Raw Infrastructure Factor: | **201** | | |
| Infrastructure Factor: | **0.95623** | | |
| Exposure Factor: | **0.0178** | | |
| Likelihood Factor: | **0.01702** | Years Between Collisions: | **59** |
| Consequence Factor: | **0.27981** | | |
| Risk Score: | **0.00476** | Years Between Fatalities: | **210** |

**Risk / Likelihood Bands**

**Across Control Classes**

| | | | |
|---|---|---|---|
| Risk Band All: | **High** | Likelihood Band All: | **High** |
| Risk Band Jur. | **High** | Likelihood Band Jur: | **High** |

**Within Give Way Control Class**

| | | | |
|---|---|---|---|
| Risk Band All: | **High** | Likelihood Band All: | **High** |
| Risk Band Jurisdiction: | **High** | Likelihood Band Jurisdiction : | **High** |

***Flags:***

Sighting S2

Sun Glare Sighting Crossing on Road

*Figure 22:* Change in Use – ALCAM Risk Rating

0

***Controls***

| | |
|---|---|
| Controls at Crossing | Half Boom Flashing Lights |
| Additional Crossing Controls | Bells/Audible Warning Devices |
| Additional Crossing Controls | RX-9 Railway Crossing Width Marker Assembly |
| Advance Warning | SINGLE Standard Advance Warning (W7-4, W7-7, NZ WX1 OR NZ WX3) |
| Advance Warning | Rail-X Pavement Marking |
| Crossing Environment | Maintenance programme for vegetation etc (Road) |
| Signalling / Detection Systems | Healthy state monitoring |

*Crossing Volume (AADT)* Road: 404 Rail: 9

**Outputs**

| | | | |
|---|---|---|---|
| Raw Infrastructure Factor: | **26** | | |
| Infrastructure Factor: | **0.9084** | | |
| Exposure Factor: | **0.00471** | | |
| Likelihood Factor: | **0.00428** | Years Between Collisions: | **234** |
| Consequence Factor: | **0.28533** | | |
| Risk Score: | **0.00122** | Years Between Fatalities: | **819** |

**Risk / Likelihood Bands**

**Across Control Classes**

| | | | |
|---|---|---|---|
| Risk Band All: | **Medium High** | Likelihood Band All: | **Medium Low** |
| Risk Band Jur. | **Medium High** | Likelihood Band Jur: | **Medium High** |

**Within Boom Barrier Control Class**

| | | | |
|---|---|---|---|
| Risk Band All: | **Medium** | Likelihood Band All: | **Medium Low** |
| Risk Band Jurisdiction: | **Medium** | Likelihood Band Jurisdiction : | **Low** |

***Flags:***

Sun Glare Sighting Crossing on Road

*Figure 23:* Proposal - ALCAM Risk Rating

***Controls***

| | |
|---|---|
| Controls at Crossing | Half Boom Flashing Lights |
| Additional Crossing Controls | Bells/Audible Warning Devices |
| Additional Crossing Controls | RX-9 Railway Crossing Width Marker Assembly |
| Advance Warning | SINGLE Standard Advance Warning (W7-4, W7-7, NZ WX1 OR NZ WX3) |
| Advance Warning | Rail-X Pavement Marking |
| Crossing Environment | Maintenance programme for vegetation etc (Road) |
| Signalling / Detection Systems | Healthy state monitoring |

*Crossing Volume (AADT)* Road: 543 Rail: 9

**Outputs**

| | | | |
|---|---|---|---|
| Raw Infrastructure Factor: | **26** | | |
| Infrastructure Factor: | **0.9084** | | |
| Exposure Factor: | **0.00509** | | |
| Likelihood Factor: | **0.00462** | Years Between Collisions: | **216** |
| Consequence Factor: | **0.28533** | | |
| Risk Score: | **0.00132** | Years Between Fatalities: | **758** |

**Risk / Likelihood Bands**

**Across Control Classes**

| | | | |
|---|---|---|---|
| Risk Band All: | **Medium High** | Likelihood Band All: | **Medium Low** |
| Risk Band Jur. | **Medium High** | Likelihood Band Jur: | **Medium High** |

**Within Boom Barrier Control Class**

| | | | |
|---|---|---|---|
| Risk Band All: | **Medium High** | Likelihood Band All: | **Medium Low** |
| Risk Band Jurisdiction: | **Medium** | Likelihood Band Jurisdiction : | **Low** |

***Flags:***

Sun Glare Sighting Crossing on Road

*Figure 24:* Future - ALCAM Risk Rating

wsp

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