HANSEN BAILEY

Integra Underground Mine Longwall Extension Modification

Traffic Impact Assessment

NOVEMBER 2017

CONFIDENTIAL

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1 INTRODUCTION

1.1 BACKGROUND

WSP has been engaged by Hansen Bailey to prepare a Traffic Impact Assessment to be included as part of an Environmental Assessment (EA) for the Modification Application under 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The Modification Application proposes modifications to the Integra Underground Mine (Integra Underground).

HV Coking Coal Pty Limited (HVCC) operates the Integra Underground Mine (Integra Underground) in the Upper Hunter Valley of New South Wales (NSW). HVCC is a wholly owned subsidiary of Glencore Coal Pty Limited (Glencore).

Hansen Bailey is currently preparing an application on behalf of HVCC to modify Integra's Project Approval (PA 08_0101). This modification application will be made under Section 75W of the Environmental Planning and Assessment Act 1979 (EP&A Act). HVCC is seeking approval to continue longwall mining of the Middle Liddell Seam further to the north of the currently approved longwall panels (the Modification). The Modification also involves the construction and operation of ancillary surface infrastructure.

The Modification includes the following components:

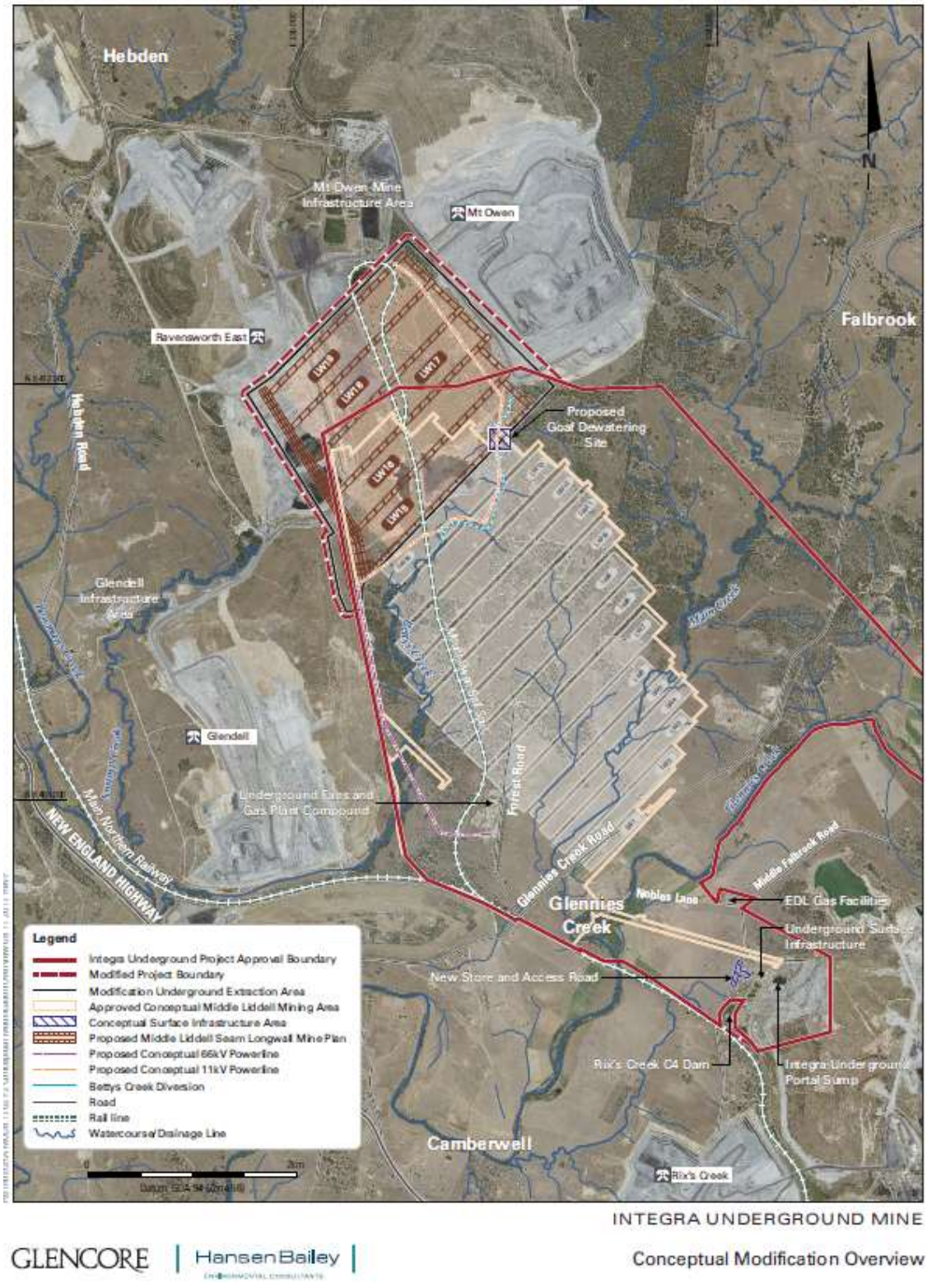
- Adjustments to the approved mine plan for the Middle Liddell Seam including:
  - Realignment and extension of the main headings further to the north-west
  - Increases to the lengths and widths of the approved LWs 15–17; and
  - Mining of additional longwall panels (LWs 18–19 or LWs 18–20).

Construction and use of additional surface infrastructure including:

- Auxiliary fans in the maingate of each longwall panel to assist in the efficient ventilation of the longwall mining area
- Additional electricity transmission lines and distribution lines
- Additional dewatering boreholes and associated infrastructure
- Additional gas drainage boreholes to ensure the safety of underground operations
- Increased usage of the currently approved gas flares
- Relocation of the existing store facility and the construction and use of an additional access road off Middle Falbrook Road
- Use of the C4 Dam to store raw water from Glennies Creek.

The proposed mining activities and ancillary surface infrastructure associated with the Modification are conceptually illustrated in Figure 1.1.

Integra Underground is located adjacent to the Mount Owen Complex (MOC) which is also owned and operated by Glencore. The Modification does not involve any alterations to the Development Consent for the MOC. Some of the proposed mining activities and infrastructure development will be undertaken within the approved boundary of MOC but not all.



Source: *Hansen Bailey (2017)*

Figure 1.1 Integra Underground Mine Conceptual Modification Overview

1.2 OBJECTIVES

The scope of this study is as follows:

- Review and assess existing road and traffic conditions in the assessment study area
- Determine the traffic generation and distribution of the Project traffic during construction and operation
- Review and assess future road and traffic conditions (with the inclusion of Project traffic)
- Identify any potential traffic or road safety issues along the routes that are likely to be used by Project related traffic during construction and at access points to the site
- Identify any impacts to all road users
- Identify any impacts to the local community including property access
- Review and identify any cumulative traffic impacts from neighbouring mines
- Identify relevant mitigation measures to minimise or avoid potential impacts.

1.3 STRUCTURE OF THE REPORT

This report has the following structure:

- Section 2 describes the existing conditions of the road network in the assessment study area
- Section 3 details the proposed Modification
- Section 4 investigates the cumulative traffic generation of other mines and non-mine traffic in the region
- Section 5 identifies and assesses the traffic and road safety impacts in relation to the Modification
- Section 6 provides suggested mitigation measures to remove or ameliorate any traffic and road safety impacts
- Section 7 provides a conclusion to the study.

2 EXISTING CONDITIONS

2.1 ROAD NETWORK

The road network that will carry traffic to and from Integra Underground includes several major arterial and minor local roads. These roads are described in the following section.

New England Highway:

The New England Highway is the State's inland north-south highway corridor. It connects the Hunter region at its southern end to the Queensland border at its northern end and is managed by NSW Roads and Maritime Services (Roads and Maritime). The New England Highway passes through several regional population centres including Maitland, Singleton, Muswellbrook and Tamworth.

It is typically constructed to a rural highway standard, a single lane two-way, with additional turning lanes at key intersections or junctions. The posted speed limit along the Highway is generally 100 km/h, but reduces to 80 and 90 km/h outside of villages/towns and 50 km/h within Singleton.

Bridgman Road

Bridgman Road is a local road connecting the New England Highway at Singleton with Goorangoola Road/ Carrowbrook Road. It bypasses east of Singleton Heights and Integra Underground.

Bridgman Road is one-lane in either direction and has a speed limit of 60 km/h when passing Singleton and Singleton Heights. There are also sections posted at both 80 km/h and 100 km/h north of Singleton Heights.

Hebden Road

Hebden Road is a two-way local road that runs east from its intersection with the New England Highway at Ravensworth. It crosses a level railway crossing and single lane bridge across Bowmans Creek before turning sharply to the north.

The road services Glendell Mine and the Mount Owen Mining Complex, in addition to a number of scattered farm dwellings. The signposted speed for Hebden Road is 80 km/h with a reduction to 60 km/h as it approaches the intersection with the New England Highway.

Glennies Creek Road

Glennies Creek Road is a local road with one-lane in either direction that connects the New England Highway and Middle Falbrook/Falbrook areas. Glennies Creek Road becomes Falbrook Road north of the Middle Falbrook Road intersection. The posted speeds along Glennies Creek Road are 80 km/h and 100 km/h. Glennies Creek Road provides access to Forest Road. A level rail crossing is located just south of the Forest Road intersection.

Stoney Creek/Middle Falbrook Road

Stoney Creek Road is a local road with one lane in either direction connecting Bridgman Road to properties on Middle Falbrook Road. Stoney Creek Road intersects with Middle Falbrook Road to the west. Middle Falbrook Road provides direct access to Integra Underground with connection to Glennies Creek Road. A level rail crossing is provided on Middle Falbrook Road.

Forest Road

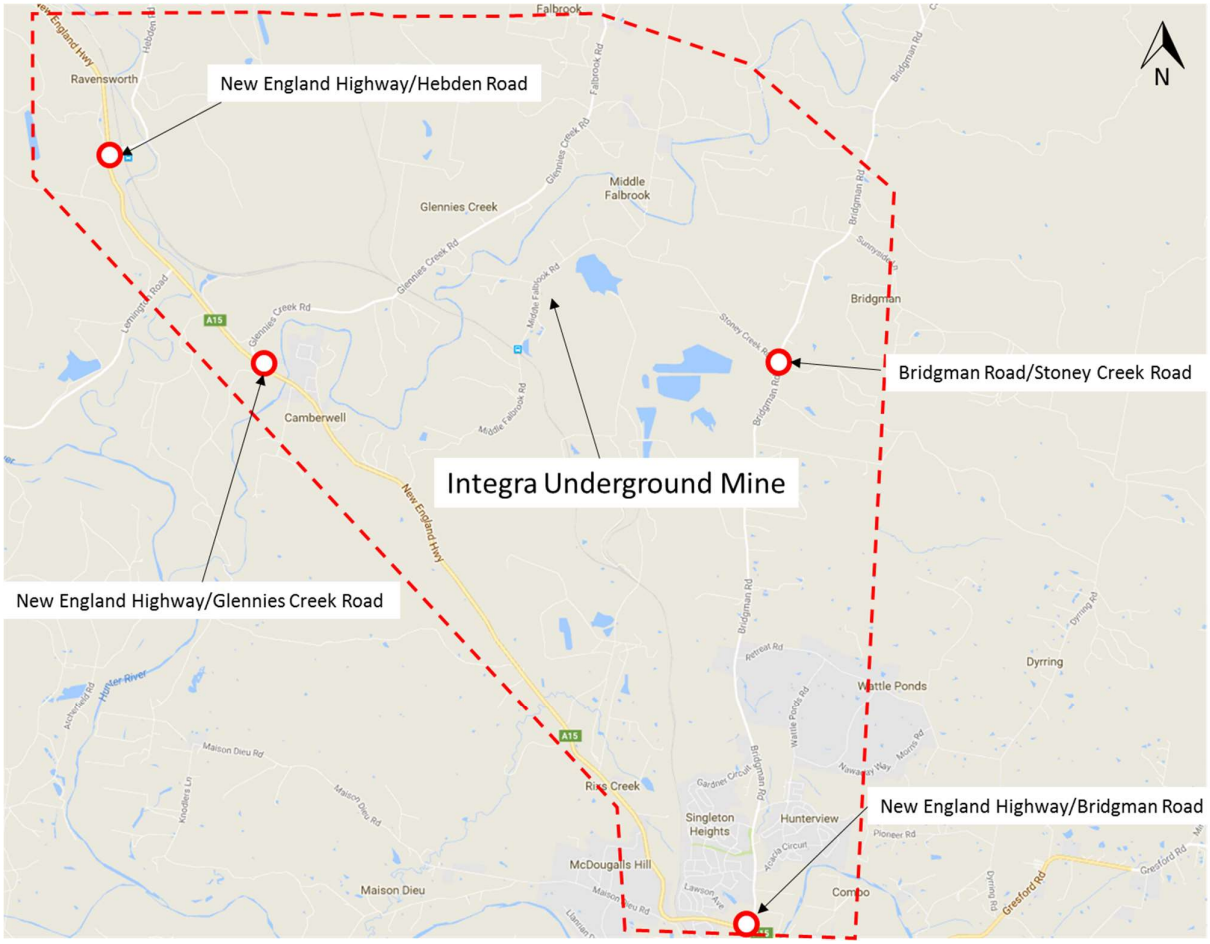
Forest Road is a local road with one lane in either direction connecting Glennies Creek Road to the Glencore–Mount Owen mine. Forest Road is within 20 metres of the level railway crossing on Glennies Creek Road.

2.2 KEY INTERSECTIONS

The study area is bounded by the New England Highway to the south, Hebden Road to the west, Bridgman Road to the east, Stoney Creek Road and Middle Falbrook Road to the north. The following key intersections in the study area include:

- The New England Highway and Bridgman Road – this is a four-leg signalised intersection.
- The New England Highway and Hebden Road – this is a priority controlled T junction with left and right turn auxiliary lane located in a 90 km/h zone.
- Bridgman Road and Stoney Creek Road – this is a priority controlled T junction with left auxiliary lane located in a 100 km/h zone.
- The New England Highway and Glennies Creek Road – this is a priority controlled T-junction with left auxiliary lane and channelised right turn.

The study area and key intersections are presented in Figure 2.1.



Source: *Google Maps (2017)*

Figure 2.1 **Study area and key intersections**

2.3 TRAFFIC SURVEY DATA

Intersection traffic surveys were undertaken by Austraffic on Wednesday 28 June 2017 for 24 hours in fine and dry weather conditions at the following intersections:

- The New England Highway and Bridgman Road
- Bridgman Road and Stoney Creek Road
- The New England Highway and Glennies Creek Road.

Further midblock tube surveys were undertaken by Austraffic between 26 June and 02 July 2017 for 24 hours over 7 days at the following locations:

- Middle Falbrook Road between Nobles Lane and the entrance to the Integra Underground surface facilitates area
- Stoney Creek Road near the intersection with Middle Falbrook Road
- Glennies Creek Road north of Nobles Lane.

Intersection counts show the following:

- The intersection of the New England Highway and Bridgman Road has a weekday AM peak between 8:15 am and 9:15 am and a weekday PM peak between 4:30 pm and 5:30 pm
- The intersection of Bridgman Road and Stoney Creek Road has a weekday AM peak between 6:15 am and 7:15 am and a weekday PM peak between 5:45 pm and 6:45 pm
- The intersection of the New England Highway and Glennies Creek Road has a weekday AM peak between 5:45 am and 6:45 am and a weekday PM peak between 3:15 pm and 4:15 pm.

2.4 INTERSECTION PERFORMANCE

The existing intersection performance was assessed using the SIDRA 7 model. The modelling results are presented in Table 2.1 and indicate that, during the weekday AM and PM peaks for each individual intersection, all intersections perform within capacity at satisfactory levels of service.

Table 2.1 Existing (2017) intersection performance

Intersection	Weekday AM peak hour			Weekday PM peak hour		
	Average Delay (s)	Level of Service	95% back of queue (m)	Average Delay (s)	Level of Service	95% back of queue (m)
I-01 New England Highway/Bridgman Road (6:15–7:15 AM peak, 3:45–4:45 PM peak)	44	D	201	25	B	102
I-02 Stoney Creek Road/Bridgman Road # (6.15–7:15 AM peak, 3:45–4:45 PM peak)	6	A	1	6	A	2
I-03 New England Highway/ Glennies Creek Road # (5:45–6:45 AM peak, 3.15–4.15 PM peak)	41	C	5	24	B	5

Note: The AM and PM peak hour for each intersection is based on the intersection counts discussed in section 2.3. # Level of Service is based upon the most delayed movement for priority controlled intersections.

2.5 MID-BLOCK PERFORMANCE

The Roads and Maritime *Guide to Traffic Generating Developments* presents the performance standards for two-way hourly road capacities for two-lane rural roads for different levels of service in Table 2.2. The performance standard recommends major roads to be performing at Level of Service C and minor roads to be performing at Level of Service C under weekday peak hour flows.

Table 2.2 Peak hour flow on two-lane two-way rural roads (veh/h)

Terrain	Level of service	Percent of heavy vehicles			
		0	5	10	15
Level	B	630	590	560	530
	C	1030	970	920	870
	D	1630	1550	1480	1410
	E	2630	2500	2390	2290

Source: RTA Guide to Traffic Generating Developments Version 2.2 October 2002 – Table 4.5

Based on the two-way weekday average flows from the mid-block survey data, the existing mid-block performance results are presented in Table 2.3. The mid-block performance results indicate that the mid-block road capacity is operating at a good level of service, with ample spare capacity.

Table 2.3 Existing (2017) mid-block performance

Mid-block location	Peak hour two-way flow (veh/h)	Percent of heavy vehicles	Level of service
Bridgman Road south of Stoney Creek Road intersection	141	4%	A
Glennies Creek Road north of Nobles Lane	30	1%	A
Stoney Creek Road south of Middle Falbrook Road intersection	102	3%	A
Middle Falbrook Road between Nobles Lane and entrance to Integra Underground surface facilities area	100	4%	A

Note: The AM and PM peak hour for each intersection is based on the intersection counts discussed in section 2.3.

2.6 CRASH HISTORY

A review of crash data for the lasted five-year period (between October 2011 and September 2016) as provided by the Roads and Maritime was undertaken for the following roads:

— The New England Highway between Hebden Road and Bridgman Road

— Bridgman Road between New England Highway and Stoney Creek Road.

Full crash data reporting is provided in **Appendix A**.

New England Highway

There was a total of 87 reported incidents along the New England Highway between Hebden Road and Bridgman Road, within the five-year period between October 2011 and September 2016.

Analysis of the crash data showed that:

- Of the 87 incidents, 3 (4%) involved a fatality and 84 (96%) involved injury.
- The most common type of incident, with 30 occurrences (35%) was rear-end collisions, where a vehicle crashes into the vehicle in front of it. The next most common incident types were hitting an object after a driver drove off the road on a curve or drove off on a straight, with 11 incidents (13%) in each category.
- Speed was the most common contributing factor with 19 occurrences (22%), followed closely by fatigue with 11 occurrences (13%).
- Sixty six (76%) incidents occurred during the day and 21 (24%) occurred at night. Of the daytime incidents, 48 were in suitable day light whilst 10 and 8 incidents occurred in the dawn and dusk respectively.
- Fifty eight (67%) incidents occurred in fine weather conditions, whereas 29 incidents occurred (33%) in rainy, overcast conditions.
- Seventy two (83%) of accidents took place on weekdays.
- Cars were involved in 69 of the total crashes (79%).

Bridgman Road

There were 26 reported incidents along Bridgman Road between the New England Highway and Stoney Creek Road, within a 5-year period between 2011 and 2016.

Analysis of the crash data showed:

- There were no fatal crashes recorded in the survey period
- The most common type of incident along Bridgman Road was rear-end crashes, with six occurrences (23%), followed closely by collisions with opposing turning vehicles and hitting an object after the driver drove off road on a straight section, with 5 (19%) incidents in each category
- Fifteen (58%) incidents occurred during the day, two (8%) during dusk and nine (34%) at night
- Nineteen (73%) incidents occurred in fine weather conditions, whereas seven (27%) occurred in rainy, overcast or foggy conditions
- 77% of accidents took place on weekdays
- 85% of accidents involved cars.

2.7 PUBLIC TRANSPORT

2.7.1 BUS

Existing bus services to the assessment study area are school bus services only. Hunter Valley Buses provides school bus services to Hebden Road for Singleton Heights Public School, Singleton High School and Singleton Public School. There are no public transport services operating along Bridgman Road, Middle Falbrook Road, Stoney Creek Road, Glennies Creek Road or Hebden Road.

2.7.2 RAIL

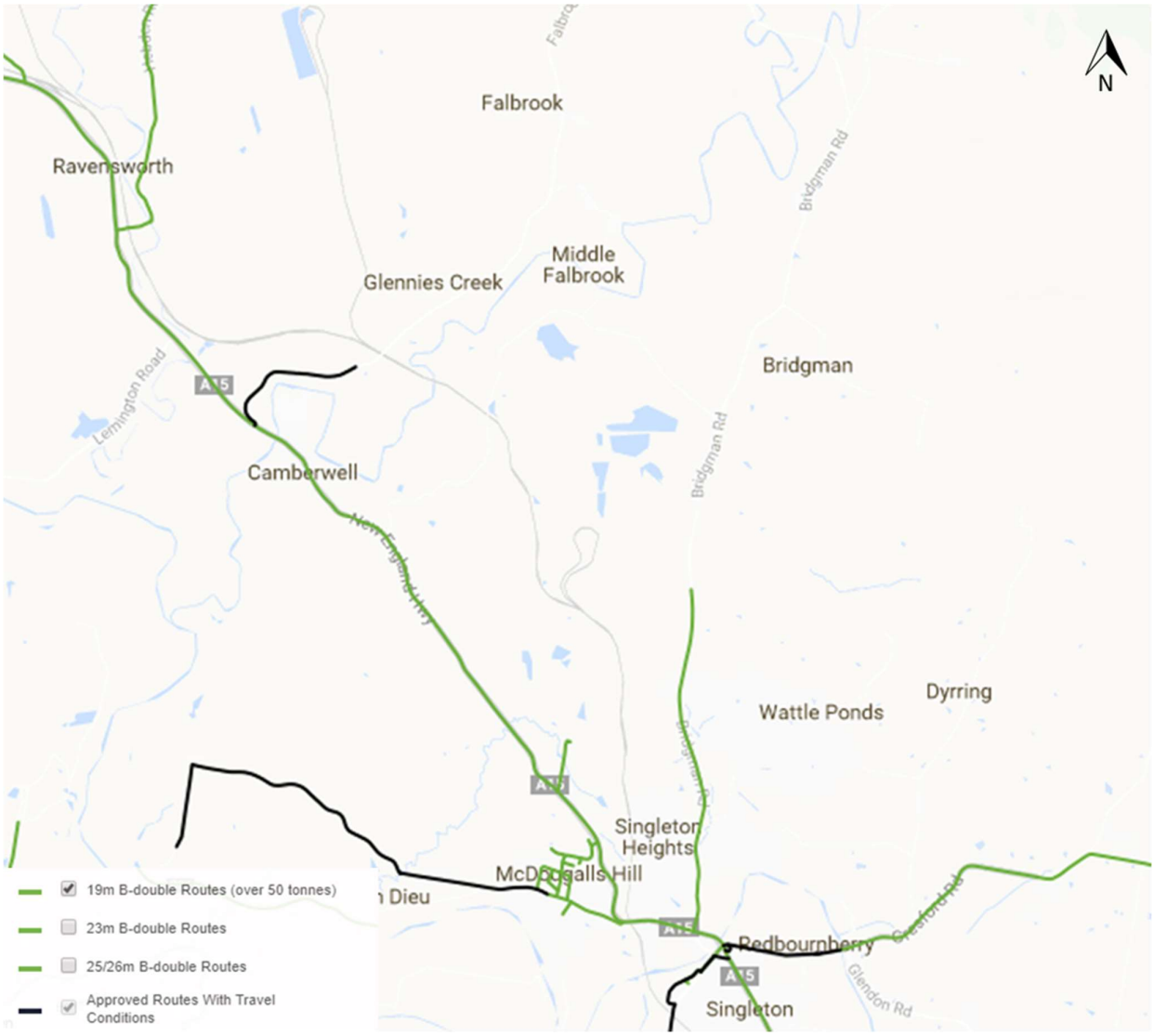
Freight, coal and passenger rail services are provided along the Main Northern Rail Line which crosses Hebden Road, Glennies Creek Road and Middle Falbrook Road as level railway crossings. The level crossings on Hebden Road and Glennies Creek Road have flashing signal and boom barriers to stop road users from crossing the rail tracks during train crossings.

2.8 PEDESTRIAN AND CYCLIST ACTIVITIES

There is no pedestrian or cyclist infrastructure within the assessment study area. This is expected based on the land use in the assessment study area being primarily for mining and rural properties.

2.9 RESTRICTED ACCESS VEHICLES

The Roads and Maritime *Restricted Access Vehicle (RAV)* maps indicate that the New England Highway, Hebden Road, a section of Bridgman Road and Glennies Creek Road are 25 metre B-double approved roads as shown on Figure 2.2.



Source: *Roads and Maritime Services (2017)*

Figure 2.2 **Roads and Maritime *Restricted Access Vehicle (RAV)* routes within proximity of the Modification site**

2.10 SCHOOLS

The schools closest to Integra Underground are located approximately 8 km to the south and include Singleton Heights Pre-School and Public school. School peak periods are 8:00 am to 9:30 am and 2:30 pm to 4:00 pm. The Modification will have negligible impact on the operation of the schools since the peak trip generation periods of the Modification are before and after the school peak drop off and pick up periods.

3 PROPOSED DEVELOPMENT

3.1 DESCRIPTION OF THE MODIFICATION

The proposed Modification will facilitate greater recovery of coal from the Middle Liddell Seam within the mining tenements held by HVCC and neighbouring mines (also owned by Glencore).

The proposed longwall panels will extend beyond the Integra Underground Project Boundary as current approved under PA 08_0101. The proposed extension to longwall mining areas will not increase the currently approved ROM coal production rates of up to 4.5 Mtpa, nor the currently approved mine life (until the end of 2035). The proposed modification does not seek to change the currently approved workforce of 280 personnel.

In support of the proposed mining activities, the Modification also includes the following ancillary infrastructure and operational changes:

Adjustments to the approved mine plan for the Middle Liddell Seam including:

- Realignment and extension of the main headings further to the north-west
- Increases to the lengths and widths of the approved LWs 15-17
- Mining of additional longwall panels (LWs 18-19 or LWs 18-20)

Construction and use of additional surface infrastructure including:

- Auxiliary fans in the maingate of each longwall panel to assist in the efficient ventilation of the longwall mining area
- Additional electricity transmission lines and distribution lines
- Additional dewatering boreholes and associated infrastructure
- Additional gas drainage boreholes to ensure the safety of underground operations
- Increased usage of the currently approved gas flares
- Relocation of the existing store facility and the construction and use of an additional access road off Middle Falbrook Road.
- Use of the C4 Dam to store raw water from Glennies Creek.

The land overlying the proposed longwall panels has either been previously disturbed by surface mining activities or will be subject to approved surface mining activities. It is anticipated that the additional surface infrastructure will generally be constructed on land that has either been previously disturbed by MOC's open cut mining operations or is approved to be disturbed because of the Mount Owen Continued Operations Project which was approved in November 2016. The proposed transmission lines will be constructed on land that has been disturbed by previous agricultural activities.

3.2 STAGING OF THE MODIFICATION

The Modification will be staged as follows:

Construction

— Dewatering infrastructure from April 2018 to March 2019.

— Electricity transmission infrastructure from April 2018 to March 2019.

Operation

— First workings (main headings and gate roads) from April 2018 to November 2019.

— Longwall extraction from November 2018 to March 2022.

3.3 OPERATIONAL HOURS

The indicative staff shift schedule at the Integra Underground is as follows:

Existing Indicative Mine Shift Hours

Monday to Friday

Day shift 6:30 am–4:15 pm

Afternoon shift 2:30 pm–12:15 am

Night shift 10:30 pm–8:15 am

Friday (overlap on Fridays with weekday crew) to Sunday

Day shift 6:30 am–6:30 pm

Night shift 6:30 pm–6:30 am

Proposed Indicative Construction Shift Hours

Underground Mining Shifts

As per hours above for mining shift.

Construction work

Construction hours will be limited to 7:00am–6:00pm on weekdays and 8:00 am–1:00 pm on Saturdays except for blindboring used for the construction of auxiliary fans, which will be 24 hours per day.

3.4 TRAFFIC GENERATION

The predicted traffic generation during both construction and operational stages of the Modification are discussed below.

3.4.1 CONSTRUCTION

The following traffic anticipated during the construction phase of the Modification is shown in Table 3.1.

Table 3.1 Anticipated traffic generation during construction

Construction stage	Vehicle type	Size	Volume No.	AM peak trips	PM peak trips	Daily movements	Period of use (Weeks)
Earthworks	Bulldozer	D10	2	1	1	4	1
	Grader	30 t	1	1	1	2	1
	Excavator	30 t	1	1	1	2	1
	Light vehicle		8	1	1	16	20
	Water cart	20 t	1	1	1	2	20
	Diesel Supply		1	1	1	2	20
	Concrete	10 m	6	1	1	12	6
	Steel Deliveries + Ancillary		2	1	1	4	4
	Crane	100 t	1	1	1	2	2
Service Boreholes	Light Vehicle		4	2	2	16	20
	Semi- Trailer		2	1	1	4	1
	Crew Cabs	e.g. 4x4 Isuzu	1	1	1	2	20
	Drill on Prime Mover	Prime Mover	1	1	1	2	1
	Tilt tray		1	1	1	2	20
	Water cart	20 t	1	1	1	2	20
	Diesel Supply		1	1	1	2	20
Underground in Seam Riser Boreholes and Goaf dewatering borehole	Light Vehicle		4	2	2	16	12
	Semi- Trailer		2	1	1	4	1
	Crew Cabs	e.g. 4x4 Isuzu	2	1	1	4	12
	Drill (on flat top semi)	Prime Mover	1	1	1	2	1
	Tilt tray		1	1	1	2	12
	Water cart		1	1	1	2	12
	Diesel Supply		1	1	1	2	12
Overhead Powerlines	Excavator	30 t	1	1	1	2	11
	Semi-trailer		2	2	2	8	12
	Crane	55 t	2	1	1	4	11
	Elevated Work Platform		2	1	1	4	11

Construction stage	Vehicle type	Size	Volume No.	AM peak trips	PM peak trips	Daily movements	Period of use (Weeks)
	Concrete truck	10 m	4	1	1	8	11
	Light Vehicle		2	2	2	8	12
Substation Civils	Excavator	30 t	1	1	1	2	4
	Semi-trailer		1	1	1	2	1
	Crane	25 t	1	1	1	2	1
	Concrete truck		4	1	1	8	2
	Light Vehicle		4	2	2	16	4
Goaf Dewatering Installation + Underground in Seam Installation	Excavator	30 t	1	1	1	2	4
	Bulldozer		2	1	1	4	4
	Grader	18 t	1	1	1	2	4
	Semi-trailer		2	1	1	4	4
	Crane	55 t	1	1	1	2	2
	Concrete truck	10 m	4	1	1	8	1
	Light Vehicle		4	2	2	16	12
Run water supply to the shaft site	Excavator	30 t	2	1	1	4	11
	Semi-trailer		2	2	2	8	12
	Crane		2	2	2	8	11
	Concrete truck	10 m	4	1	1	8	2
Access Roads	Excavator	30 t	2	2	2	8	20
	Semi-trailer		2	2	2	8	10
	Light Vehicle		4	2	2	16	20
	Grader	18 t	1	1	1	2	20
	Roller		1	1	1	2	20
	Light Vehicle		4	2	2	16	20
Bleeder Shafts	Light Vehicle		4	2	2	16	20
	Semi-Trailer		2	1	1	4	1
	Excavator	20 t	1	1	1	2	5
	Tilt tray		1	1	1	2	10
	Water cart		1	1	1	2	10
	Diesel Supply		1	1	1	2	10
	Ancillary + Deliveries		1	1	1	2	6

Construction stage	Vehicle type	Size	Volume No.	AM peak trips	PM peak trips	Daily movements	Period of use (Weeks)
TOTALS (for the duration of the project – 15 months)				**71**	**71**	**320 (160in/160 out)**	**20**
TOTALS (for the peak of construction – 3 months)				**14**	**14**	**68 (34in/34out)**	**4**

As discussed in Table 3.1, the traffic generated during construction at its peak will be 14 vehicles per hour during peak hours. This traffic peak will occur over a period of 1 month (4 weeks), when the following work activities occur simultaneously that being service borehole and substation civil works. These two overlapping work tasks will generate 14 vehicles peak hourly (both for weekday AM and PM) and 68 vehicles daily (34 in and 34 out).

3.4.2 OPERATION

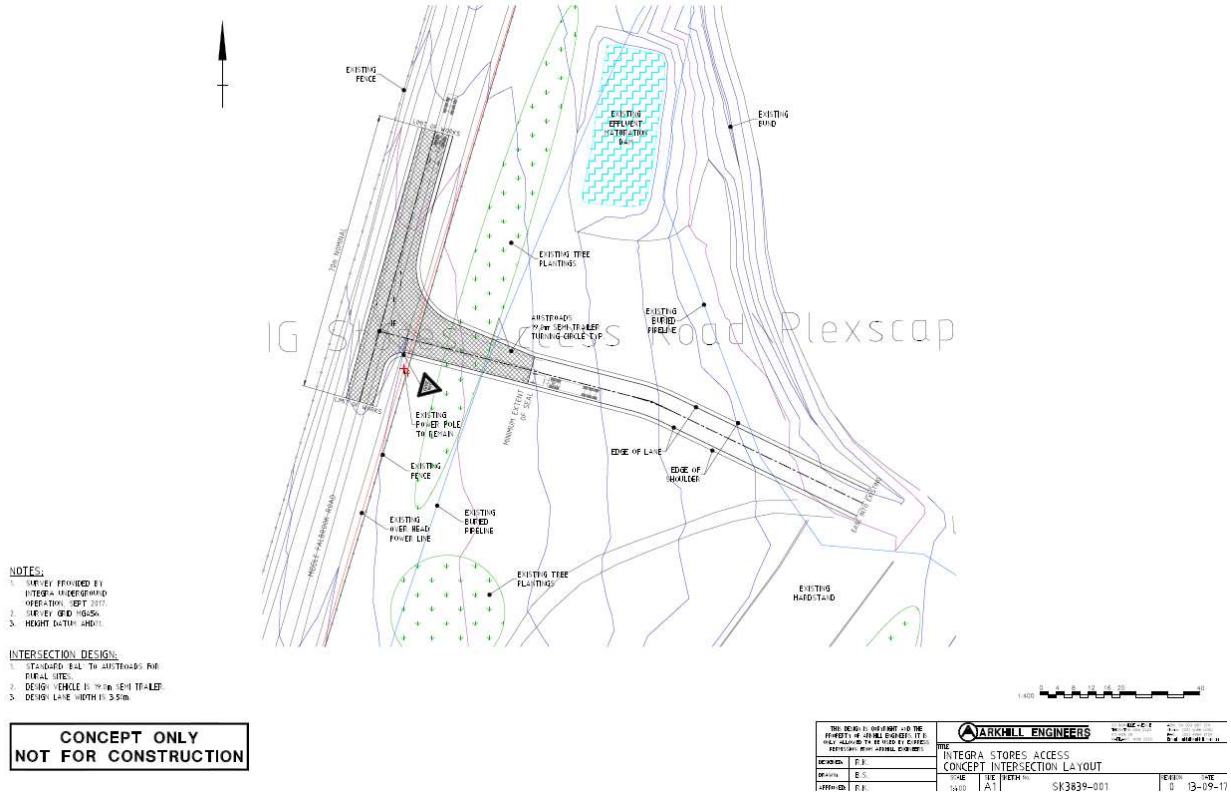
No additional traffic is anticipated to be generated during the operational stage of the Modification as the number of personnel remains unchanged.

3.5 SITE ACCESS

The Integra Underground is currently accessed via an entry point off Middle Falbrook Road. This access will be retained and an additional access road will be constructed for the Modification. During construction, access would also be via Hebden Road (via Glendell mine), Glennies Creek Road and Forest Road (off Glennies Creek Road).

3.6 PROPOSED INTERSECTION UPGRADE

A new intersection is proposed for the implementation of the modification works on Middle Falbrook Road. Figure 3.1 below shows the proposed intersection location and its layout. The proposed intersection layout will improve safety and traffic operation.



Source: *Hansen Bailey*

Figure 3.1 **Proposed intersection upgrade location and layout for Integra Mine access**

3.7 PROPOSED PARKING PROVISION

The proposed intersection will create a new private access road. Sufficient parking will be established for personnel during both the construction and operational stages of the Modification.

4 FUTURE CONDITIONS

4.1 ROAD NETWORK

There is a bypass planned for the New England Highway around the town of Singleton. It is proposed the preferred bypass route departs the New England Highway near Newington Lane, heads west over the Main Northern Railway and then across the floodplain, over Putty Road. It continues over the Hunter River, west of the Singleton township, before crossing the New England Highway west of Gowrie Gates and re-joining the highway north of McDougalls Hill. The Roads and Maritime New England Highway Singleton Bypass – December 2016 Project update indicated that project timing and staging are subject to approval and funding availability.

4.2 BACKGROUND TRAFFIC GROWTH

Background traffic growth would consist of both mine and non-mine related traffic within the study area. The construction works for the modification are anticipated over a 12 month period within 2018 and 2019. Traffic growth from both mine and non-mine related it is not anticipated to grow more than 2% per annum in this period and therefore traffic volumes would be slightly increased to existing 2017 traffic count data.

4.3 CUMULATIVE BACKGROUND TRAFFIC

Modifications to neighbouring mines were considered as part of this study. The review of relevant traffic assessments for neighbouring mines indicated that the only nearby mines likely to result in cumulative traffic impacts were the Ashton Mine located off Glennies Creek Road and the Rix's Creek Mine off Middle Falbrook Road.

There is currently a proposed extension of mining at the Mount Owen Mine off Hebden Road, however this does not involve any increase in the workforce. Hence, there will be no increase in traffic during our construction phase on Hebden Road. There are no proposals for any modifications to Glendell Mine.

5 IMPACT ASSESSMENT

5.1 INTERSECTION PERFORMANCE

Due to there being several construction site access routes available, via Hebden Road, Glennies Creek Road or Middle Falbrook Road, for conservative purposes, anticipated peak construction traffic has been assigned through key intersections during peak periods to determine the impact to intersection performance and operation. This has been assessed as the proportion of construction traffic to the overall intersection traffic during peak periods.

The New England Highway and Bridgman Road currently carries 2,468 vehicles during the weekday AM peak (08:15–09:15 am) and 3,001 vehicles in the weekday PM peak (16.30–17.30 pm). 14 vehicles during the peak periods through this intersection equates to 0.6% of total intersection traffic during the weekday AM peak and 0.5% of total intersection traffic during the weekday PM peak.

Stoney Creek Road and Bridgman Road currently carries 132 vehicles during the weekday AM peak (06:15–7:15 am) and 146 vehicles in the weekday PM peak (15:45–16:45 pm). 14 vehicles during the peak periods through this intersection equates to 11% of total intersection traffic during the weekday AM peak and 10% of total intersection traffic during the weekday PM peak noting the very low volumes at this intersection.

The New England Highway and Glennies Creek Road currently carries 1,579 vehicles during the weekday AM peak (05:45–06:45 am) and 1,217 vehicles in the weekday PM peak (15:15–16:15 pm). 14 vehicles during the peak periods through this intersection equates to 0.9% of total intersection traffic during the weekday AM peak and 1.2% of total intersection traffic during the weekday PM peak.

Intersection traffic counts were not undertaken at the New England Highway and Hebden Road intersection. The addition of 14 vehicles during the peak periods through this intersection is likely to have negligible impact to the performance and operation of this intersection.

Impacts to the performance of key intersections are anticipated to be negligible during the construction period (over a period of 12 months). Construction traffic generated by the Modification is anticipated to be approximately 14 vehicles (during peak periods) which will not alter intersection operation and these intersections are anticipated to continue to operate similarly to existing conditions.

5.2 ROAD MID-BLOCK PERFORMANCE

Due to there being several construction site access routes available, via Hebden Road, Glennies Creek Road or Middle Falbrook Road, for conservative purposes, anticipated peak construction traffic has been assigned on key road sections mid-block during peak periods to determine the impact to road operation. This has been assessed as the proportion of construction traffic to the overall mid-block road traffic during peak periods.

The New England Highway east of Bridgman Road currently carries 809 vehicles (travelling westbound) during the weekday AM peak and 1,172 vehicles (travelling eastbound) in the weekday PM peak.

The New England Highway west of Bridgman Road currently carries 623 vehicles (travelling eastbound) during the weekday AM peak and 630 vehicles (travelling westbound) in the weekday PM peak.

Bridgman Road south of Stoney Creek Road currently carries 126 vehicles during the weekday AM peak and 141 vehicles in the weekday PM peak.

Stoney Creek Road south of Middle Fallbrook Road currently carries 102 vehicles during the weekday AM peak and 83 vehicles in the weekday PM peak.

Mid-block traffic counts were not undertaken on Hebden Road between the New England Highway and Glendell Mine site entry.

Impacts to the performance of key road sections are anticipated to be negligible during the construction period (over a period of 12 months). Construction traffic generated by the Modification is anticipated to be approximately 14 vehicles (during peak periods) which will not alter road mid-block operation and the road sections will continue to operate similarly to existing conditions.

5.3 ROAD SAFETY

Road safety impacts due to the temporary construction traffic are anticipated to be negligible. Increased construction traffic along Hebden Road and Glennies Creek Road, although minor, will need to cross existing level railway crossings. There is potential for increased vehicle queuing at level rail crossings at these locations. In addition to this, the proposed Forest Road access off Glennies Creek Road is near the level rail crossing, with potential for increased vehicle queuing and construction vehicle drivers not being aware of the facility and need to stop on either Glennies Creek Road or Forest Road.

5.4 PUBLIC TRANSPORT

5.4.1 BUS

Impacts to school bus services are anticipated to be negligible. Increased construction traffic along Hebden Road, although minor, will need to consider existing school bus services along this road.

5.4.2 RAIL

No impacts to rail services on the Main Northern Rail Line are envisaged.

6 MITIGATION MEASURES

The following mitigation measures are proposed due to construction traffic for the modification works:

- Special consideration and planning of construction traffic to not coincide with rail movements at level crossings on Hebden Road and Glennies Creek Road.
- Information package to be provided to drivers operating construction traffic to be aware of the level railway crossing proximity and operation to the proposed Forest Road access off Glennies Creek Road. Additional road warning signage may reinforce this message.
- Construction traffic is to be scheduled where possible outside of school pick and drop off times on Hebden Road where school bus services are provided.

7 CONCLUSIONS

The proposed Modification is predicted to have negligible traffic impacts on the road network during the construction period. Construction traffic generated by the Modification will be temporary in nature and will not impact upon the performance of the adjacent road network and key intersections. No additional traffic is anticipated during operation, as the operational workforce will remain unchanged. The current operational workforce is already included in the background traffic on the road network. Mitigation measures suggested are to be implemented to remove or ameliorate any construction traffic related impacts.

REFERENCES

— Roads and Maritime Services *Traffic Volume Viewer* website.

— Roads and Maritime Services *Restricted Access Vehicle (RAV) Maps* website.

— Roads and Maritime Services *Crash Data.*

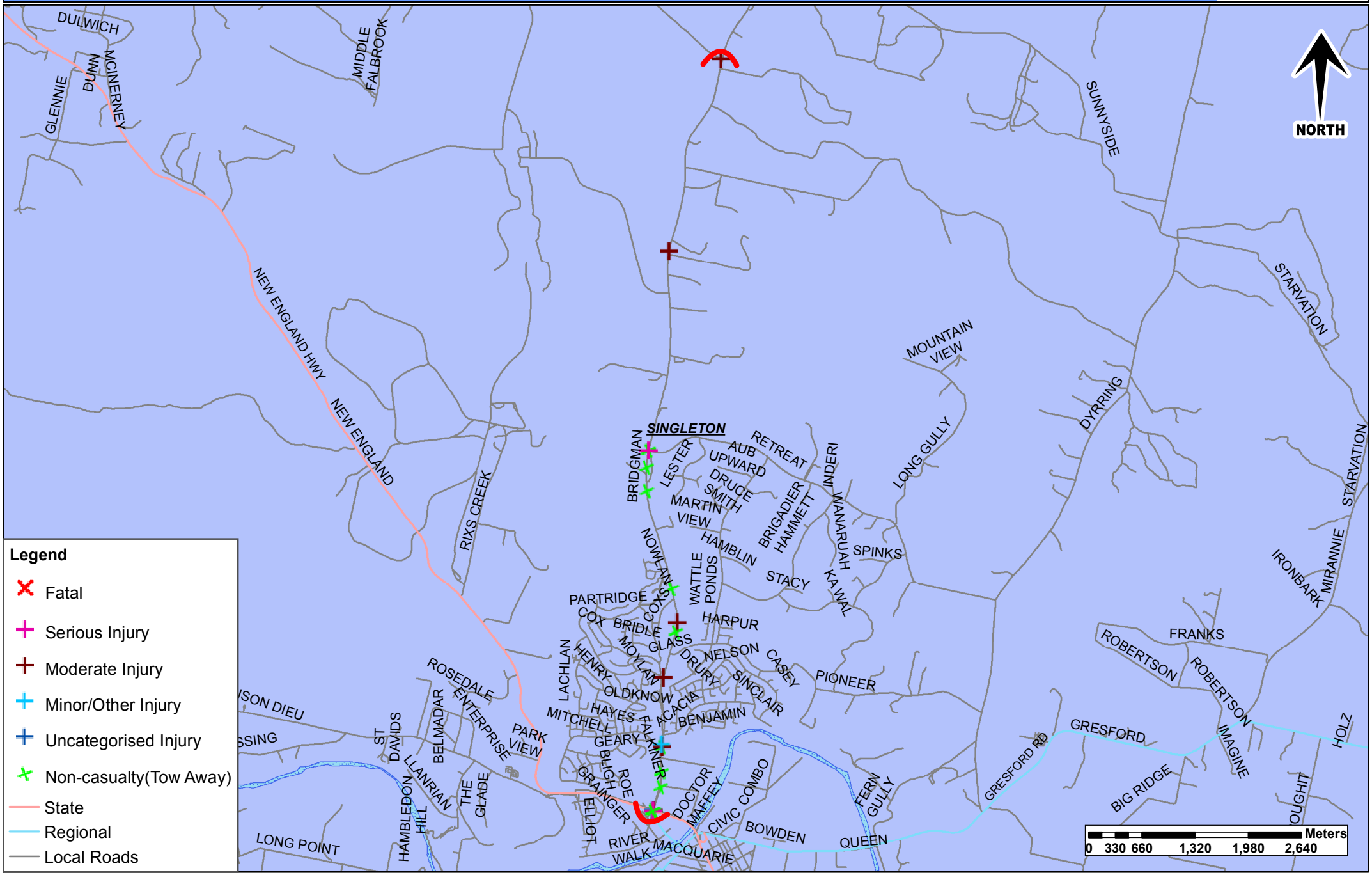
APPENDIX A

ROADS AND MARITIME CRASH DATA

Bridgman Rd, between NEH & Stoney Creek Rd, Singleton

Crash Period: 01/10/2011 to 30/09/2016 (Finalised Data)

Roads & Maritime



Legend

- Fatal
- Serious Injury
- Moderate Injury
- Minor/Other Injury
- Uncategorised Injury
- Non-casualty(Tow Away)
- State
- Regional
- Local Roads

Nicholas Hagan July 2017

Summary Crash Report

Transport for NSW — Centre for Road Safety

# Crash Type		
Car Crash	22	84.6%
Light Truck Crash	7	26.9%
Rigid Truck Crash	2	7.7%
Articulated Truck Crash	0	0.0%
'Heavy Truck Crash	*(2)*	*(7.7%)*
Bus Crash	1	3.8%
"Heavy Vehicle Crash	*(2)*	*(7.7%)*
Emergency Vehicle Crash	0	0.0%
Motorcycle Crash	2	7.7%
Pedal Cycle Crash	0	0.0%
Pedestrian Crash	0	0.0%

' Rigid or Artic. Truck " Heavy Truck or Heavy Bus
These categories are NOT mutually exclusive

Location Type		
*Intersection	16	61.5%
Non intersection	10	38.5%

* Up to 10 metres from an intersection

Collision Type		
Single Vehicle	11	42.3%
Multi Vehicle	15	57.7%

Road Classification		
Freeway/Motorway	0	0.0%
State Highway	8	30.8%
Other Classified Road	0	0.0%
Unclassified Road	18	69.2%

Contributing Factors		
Speeding	3	11.5%
Fatigue	1	3.8%

Weather		
Fine	19	73.1%
Rain	5	19.2%
Overcast	1	3.8%
Fog or mist	1	3.8%
Other	0	0.0%

Road Surface Condition		
Wet	6	23.1%
Dry	20	76.9%
Snow or ice	0	0.0%

Natural Lighting		
Dawn	3	11.5%
Daylight	12	46.2%
Dusk	2	7.7%
Darkness	9	34.6%

Crash Movement		
Intersection, adjacent approaches	3	11.5%
Head-on (not overtaking)	0	0.0%
Opposing vehicles; turning	5	19.2%
U-turn	1	3.8%
Rear-end	6	23.1%
Lane change	0	0.0%
Parallel lanes; turning	0	0.0%
Vehicle leaving driveway	0	0.0%
Overtaking; same direction	0	0.0%
Hit parked vehicle	0	0.0%
Hit railway train	0	0.0%
Hit pedestrian	0	0.0%
Permanent obstruction on road	0	0.0%
Hit animal	0	0.0%
Off road, on straight	0	0.0%
Off road on straight, hit object	5	19.2%
Out of control on straight	1	3.8%
Off road, on curve	0	0.0%
Off road on curve, hit object	2	7.7%
Out of control on curve	0	0.0%
Other crash type	3	11.5%

Speed Limit					
40 km/h or less	0	0.0%	80 km/h zone	5	19.2%
50 km/h zone	4	15.4%	90 km/h zone	0	0.0%
60 km/h zone	15	57.7%	100 km/h zone	2	7.7%
70 km/h zone	0	0.0%	110 km/h zone	0	0.0%

~ 07:30-09:30 or 14:30-17:00 on school days	~ 40km/h or less	0	0.0%	~ School Travel Time Involvement	4	15.4%

Day of the Week												
Monday	1	3.8%	Wednesday	3	11.5%	Friday	4	15.4%	Sunday	4	15.4%	WEEKEND	6	23.1%
Tuesday	4	15.4%	Thursday	8	30.8%	Saturday	2	7.7%	WEEKDAY	20	76.9%			

#Holiday Periods																		
New Year	0	0.0%	Easter	0	0.0%	Queen's BD	0	0.0%	Christmas	1	3.8%	Easter SH	0	0.0%	Sept./Oct. SH	1	3.8%	
Aust. Day	0	0.0%	Anzac Day	0	0.0%	Labour Day	0	0.0%	January SH	0	0.0%	June/July SH	0	0.0%	December SH	1	3.8%	

CRASHES	26	
Fatal	0	0.0%
Serious inj.	2	7.7%
Moderate inj.	8	30.8%
Minor/Other inj.	2	7.7%
Uncategorised inj.	0	0.0%
Non-casualty	14	53.8%

Self Reported Crash	1	3.85%

Time Group		% of Day	
00:01 - 02:59	2	7.7%	12.5%
03:00 - 04:59	0	0.0%	8.3%
05:00 - 05:59	1	3.8%	4.2%
06:00 - 06:59	3	11.5%	4.2%
07:00 - 07:59	0	0.0%	4.2%
08:00 - 08:59	1	3.8%	4.2%
09:00 - 09:59	1	3.8%	4.2%
10:00 - 10:59	1	3.8%	4.2%
11:00 - 11:59	2	7.7%	4.2%
12:00 - 12:59	0	0.0%	4.2%
13:00 - 13:59	3	11.5%	4.2%
14:00 - 14:59	2	7.7%	4.2%
15:00 - 15:59	1	3.8%	4.2%
16:00 - 16:59	1	3.8%	4.2%
17:00 - 17:59	2	7.7%	4.2%
18:00 - 18:59	2	7.7%	4.2%
19:00 - 19:59	1	3.8%	4.2%
20:00 - 21:59	3	11.5%	8.3%
22:00 - 24:00	0	0.0%	8.3%

Street Lighting Off/Nil		% of Dark
2 of	9 in Dark	22.2%

CASUALTIES	15	
Killed	0	0.0%
Seriously inj.	2	13.3%
Moderately inj.	11	73.3%
Minor/Other inj.	2	13.3%
Uncategorised inj.	0	0.0%
^ Unrestrained	0	0.0%

^ Belt fitted but not worn, No restraint fitted to position OR No helmet worn

Crashes		Casualties
4	2015	4
6	2014	2
6	2013	3
8	2012	3
2	2011	3

McLean Periods		% Week	
A	4	15.4%	17.9%
B	1	3.8%	7.1%
C	9	34.6%	17.9%
D	0	0.0%	3.5%
E	0	0.0%	3.6%
F	2	7.7%	10.7%
G	4	15.4%	7.1%
H	2	7.7%	7.1%
I	1	3.8%	12.5%
J	3	11.5%	10.7%

Crashid dataset Bridgman Rd, between NEH & Stoney Creek Rd, Singleton - Crash Data from 01/10/11 to 30/09/2016

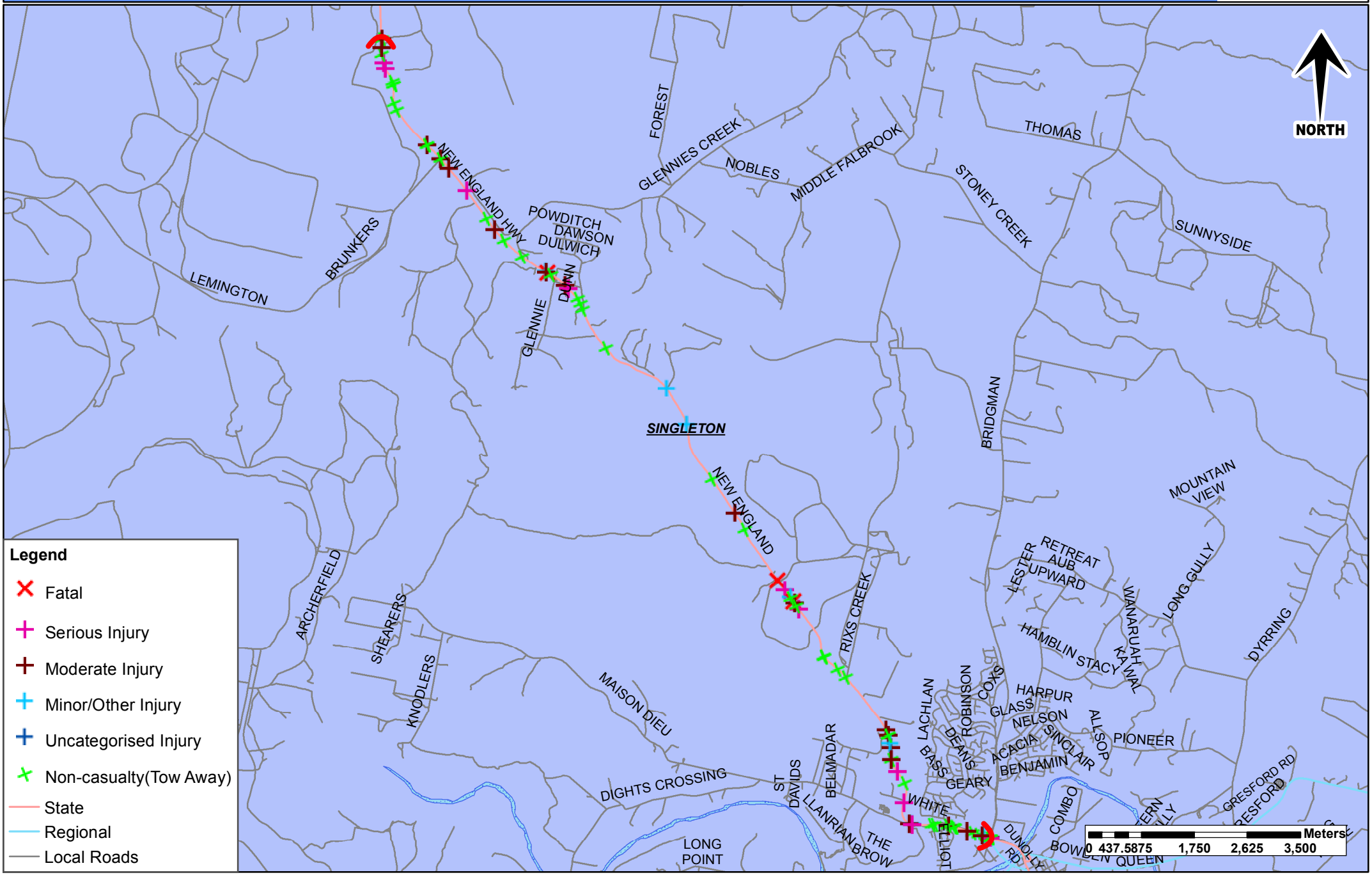
Note: Crash self reporting, including self reported injuries began Oct 2014. Trends from 2014 are expected to vary from previous yrs. More unknowns are expected in self reported data. Reporting yrs 1996-2004 and 2017 onwards contain uncategorised inj crashes.

Percentages are percentages of all crashes. Unknown values for each category are not shown on this report.

NEH between Hebden Road & Bridgman Road

Crash Period: 01/10/2011 to 30/09/2016 (Finalised Data)

Roads & Maritime



Nicholas Hagan July 2017

Summary Crash Report

# Crash Type		
Car Crash	69	79.3%
Light Truck Crash	35	40.2%
Rigid Truck Crash	4	4.6%
Articulated Truck Crash	8	9.2%
'Heavy Truck Crash	(10)	(11.5%)
Bus Crash	1	1.1%
"Heavy Vehicle Crash	(10)	(11.5%)
Emergency Vehicle Crash	1	1.1%
Motorcycle Crash	3	3.4%
Pedal Cycle Crash	0	0.0%
Pedestrian Crash	1	1.1%

' Rigid or Artic. Truck " Heavy Truck or Heavy Bus
These categories are NOT mutually exclusive

Location Type		
*Intersection	24	27.6%
Non intersection	63	72.4%

* Up to 10 metres from an intersection

Collision Type		
Single Vehicle	30	34.5%
Multi Vehicle	57	65.5%

Road Classification		
Freeway/Motorway	0	0.0%
State Highway	86	98.9%
Other Classified Road	0	0.0%
Unclassified Road	1	1.1%

Contributing Factors		
Speeding	19	21.8%
Fatigue	11	12.6%

Weather		
Fine	58	66.7%
Rain	23	26.4%
Overcast	6	6.9%
Fog or mist	0	0.0%
Other	0	0.0%

Road Surface Condition		
Wet	24	27.6%
Dry	63	72.4%
Snow or ice	0	0.0%

Natural Lighting		
Dawn	10	11.5%
Daylight	48	55.2%
Dusk	8	9.2%
Darkness	21	24.1%

Crash Movement		
Intersection, adjacent approaches	5	5.7%
Head-on (not overtaking)	8	9.2%
Opposing vehicles; turning	8	9.2%
U-turn	1	1.1%
Rear-end	30	34.5%
Lane change	1	1.1%
Parallel lanes; turning	0	0.0%
Vehicle leaving driveway	1	1.1%
Overtaking; same direction	0	0.0%
Hit parked vehicle	0	0.0%
Hit railway train	0	0.0%
Hit pedestrian	0	0.0%
Permanent obstruction on road	0	0.0%
Hit animal	2	2.3%
Off road, on straight	4	4.6%
Off road on straight, hit object	11	12.6%
Out of control on straight	1	1.1%
Off road, on curve	2	2.3%
Off road on curve, hit object	11	12.6%
Out of control on curve	0	0.0%
Other crash type	2	2.3%

CRASHES	87	
Fatal	3	3.4%
Serious inj.	11	12.6%
Moderate inj.	22	25.3%
Minor/Other inj.	8	9.2%
Uncategorised inj.	0	0.0%
Non-casualty	43	49.4%

Self Reported Crash	12	13.79%

CASUALTIES	71	
Killed	4	5.6%
Seriously inj.	18	25.4%
Moderately inj.	34	47.9%
Minor/Other inj.	15	21.1%
Uncategorised inj.	0	0.0%
^ Unrestrained	0	0.0%

^ Belt fitted but not worn, No restraint fitted to position OR No helmet worn

Time Group		% of Day	
00:01 - 02:59	4	4.6%	12.5%
03:00 - 04:59	4	4.6%	8.3%
05:00 - 05:59	5	5.7%	4.2%
06:00 - 06:59	10	11.5%	4.2%
07:00 - 07:59	2	2.3%	4.2%
08:00 - 08:59	3	3.4%	4.2%
09:00 - 09:59	4	4.6%	4.2%
10:00 - 10:59	1	1.1%	4.2%
11:00 - 11:59	4	4.6%	4.2%
12:00 - 12:59	2	2.3%	4.2%
13:00 - 13:59	6	6.9%	4.2%
14:00 - 14:59	7	8.0%	4.2%
15:00 - 15:59	9	10.3%	4.2%
16:00 - 16:59	5	5.7%	4.2%
17:00 - 17:59	7	8.0%	4.2%
18:00 - 18:59	7	8.0%	4.2%
19:00 - 19:59	2	2.3%	4.2%
20:00 - 21:59	4	4.6%	8.3%
22:00 - 24:00	1	1.1%	8.3%

Crashes		Casualties
9	2016	12
13	2015	14
16	2014	5
11	2013	8
29	2012	24
9	2011	8

McLean Periods		% Week	
A	22	25.3%	17.9%
B	2	2.3%	7.1%
C	17	19.5%	17.9%
D	2	2.3%	3.5%
E	5	5.7%	3.6%
F	15	17.2%	10.7%
G	14	16.1%	7.1%
H	4	4.6%	7.1%
I	2	2.3%	12.5%
J	4	4.6%	10.7%

Speed Limit					
40 km/h or less	0	0.0%	80 km/h zone	16	18.4%
50 km/h zone	3	3.4%	90 km/h zone	9	10.3%
60 km/h zone	25	28.7%	100 km/h zone	34	39.1%
70 km/h zone	0	0.0%	110 km/h zone	0	0.0%

~ 07:30-09:30 or 14:30-17:00 on school days	~ 40km/h or less	0	0.0%	~ School Travel Time Involvement	17	19.5%

Day of the Week												
Monday	9	10.3%	Wednesday	20	23.0%	Friday	17	19.5%	Sunday	7	8.0%	WEEKEND	15	17.2%
Tuesday	12	13.8%	Thursday	14	16.1%	Saturday	8	9.2%	WEEKDAY	72	82.8%			

Street Lighting Off/Nil		% of Dark
10 of	21 in Dark	47.6%

#Holiday Periods																		
New Year	0	0.0%	Easter	1	1.1%	Queen's BD	0	0.0%	Christmas	2	2.3%	Easter SH	5	5.7%	Sept./Oct. SH	3	3.4%	
Aust. Day	1	1.1%	Anzac Day	0	0.0%	Labour Day	0	0.0%	January SH	5	5.7%	June/July SH	2	2.3%	December SH	3	3.4%	

Crashid dataset NEH between Hebden Road & Bridgman Road - Crash Data from 01/10/11 to 30/09/2016

Note: *Data for the 9 month period prior to the generated date of this report are incomplete and are subject to change.*
Crash self reporting, including self reported injuries began Oct 2014. Trends from 2014 are expected to vary from previous yrs. More unknowns are expected in self reported data.
Reporting yrs 1996-2004 and 2017 onwards contain uncategorised inj crashes.

Percentages are percentages of all crashes. Unknown values for each category are not shown on this report.