

Fingerboards Mineral Sands Project

Traffic and Transport Expert Evidence: Paul Carter

May 2021

Introduction

- Paul Carter – Associate Principal, Arup
 - Bachelor Engineering (Civil), Monash University
 - Masters of Traffic, Monash University
 - 18 years experience in transport planning and traffic engineering
 - Assessed a number of large mining, energy and infrastructure projects across Australia
- Engagement
 - Engaged by Kalbar to prepare a Traffic and Transport Impact Assessment in March 2017
 - Findings outlined in Appendix A012 of the publicly exhibited Environmental Effects Statement dated April 2020 and within my Expert Witness Reports dated 2 February 2021 and 8 February 2021

Overview

- Traffic and transport impact assessment purpose
- Project and assessment outline
- Key findings and mitigation measures
- Response to key issues raised in submissions

Traffic Impact Assessment Purpose

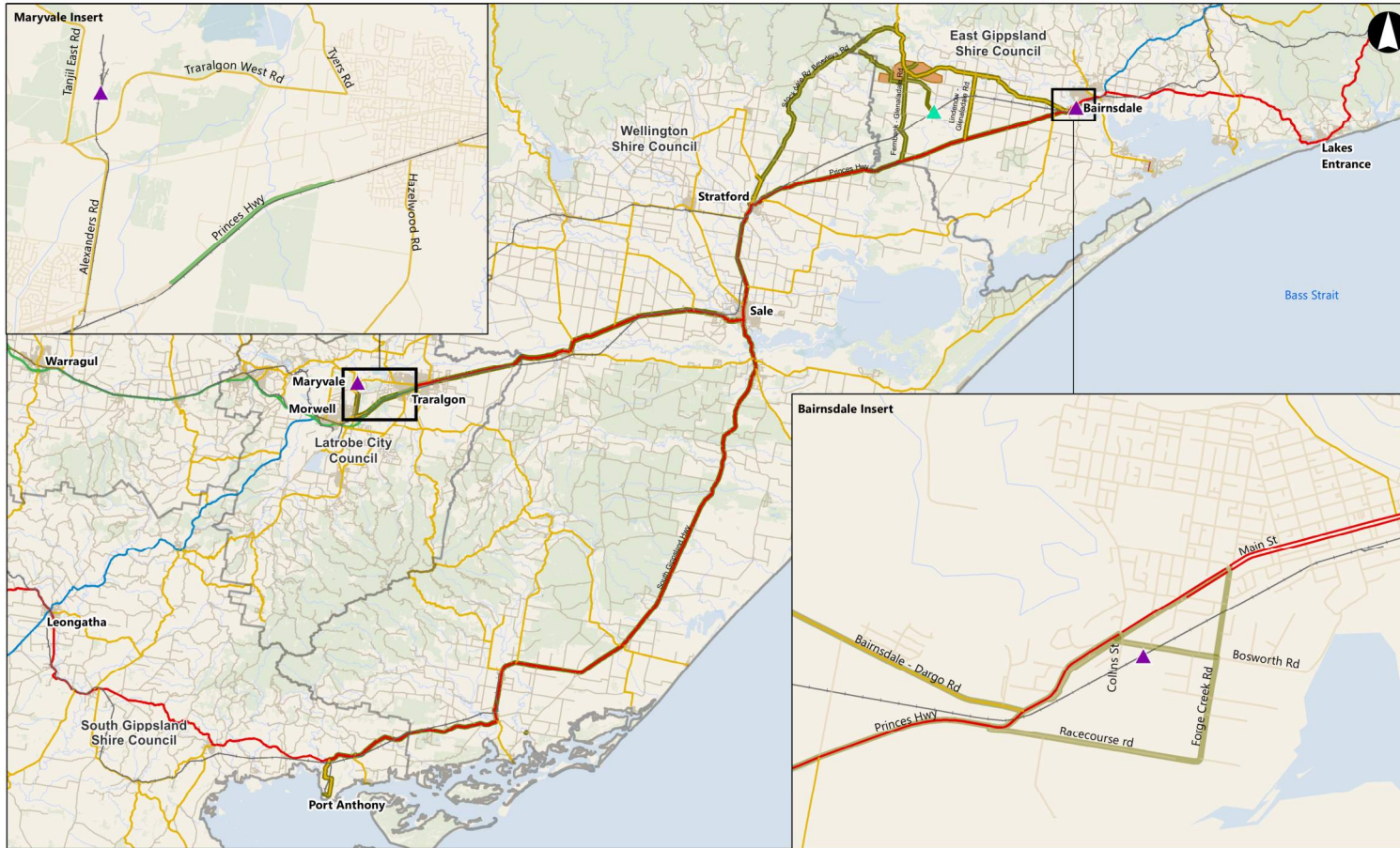
Evaluate existing conditions

- Establish the existing conditions from a transport perspective
- Identify the key elements of project as they relate to transport

Assessment and mitigation

- Identify the safety and performance risks for the transport network
- Outline the recommended transport infrastructure upgrades
- Outline measures to minimise potential adverse effects

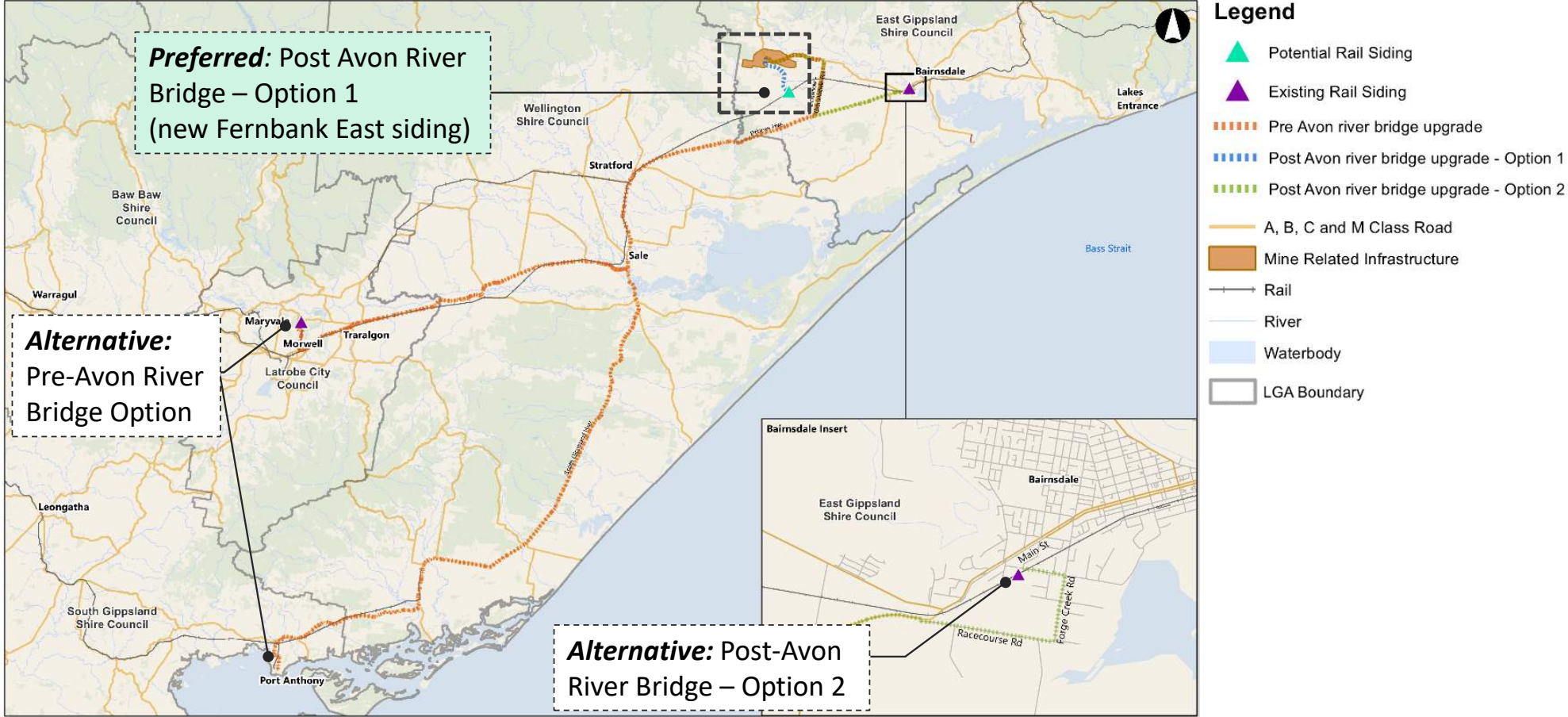
Study Area



Legend

- 'M' Class Roads
- 'A' Class Roads
- 'B' Class Roads
- 'C' Class Roads
- Local Roads
- ▲ Potential Rail Siding
- ▲ Existing Rail Siding
- Study Roads
- Mine Related Infrastructure
- |— Rail
- River
- Waterbody
- LGA Boundary

Product Transport Route Options



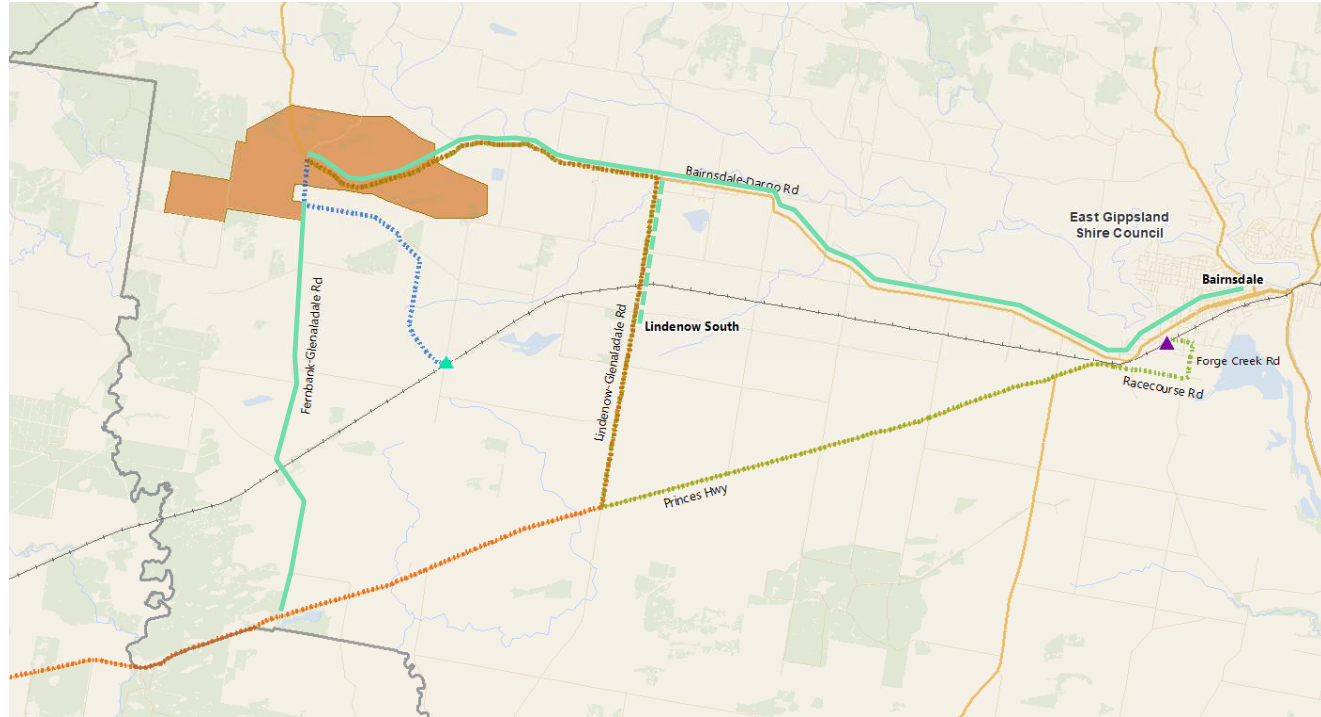
Project Phases and Associated Traffic Generation

Construction phase

- 2 years, 150 return trips/day
- 20 heavy vehicle return trips/day
- 130 light vehicle return trips/day
- 24/7 construction, 6am and 6pm shifts

Operations phase

- 20 years, 160 return trips/day
- 40 heavy vehicle return trips/day
- 120 light vehicle return trips/day
- 24/7 operation, 6am and 6pm shifts
- 90 during day shift, 30 during night shift
- Diversion of some public roads

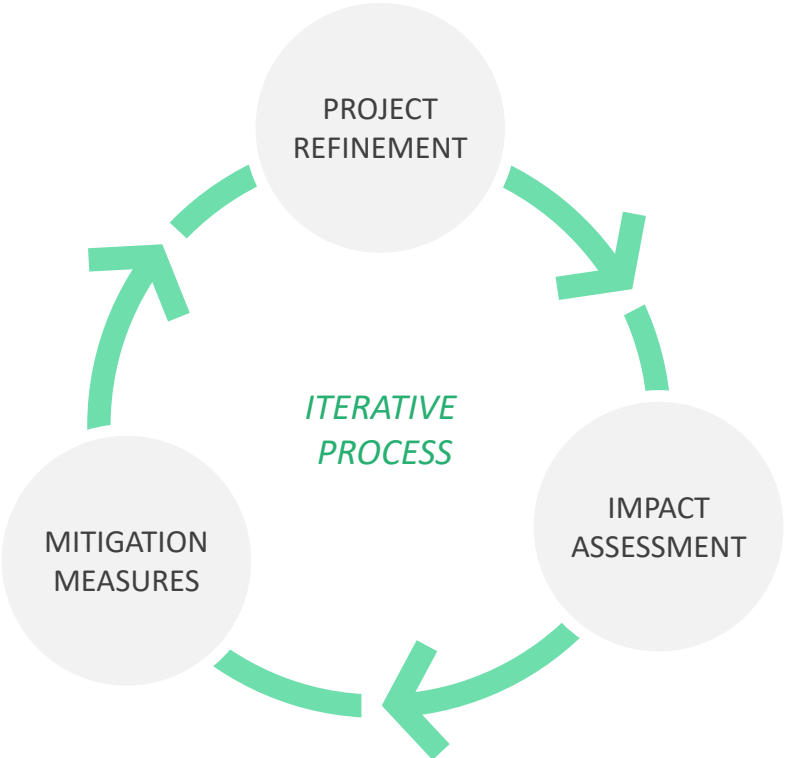


Methodology

Study start: March 2017

- Project briefing
- Background data and desktop review
- Site investigations and consultation
- Establish assessment framework
- Impact assessment
- Develop mitigation measures
- Reporting

Impact assessment
Develop mitigation measures

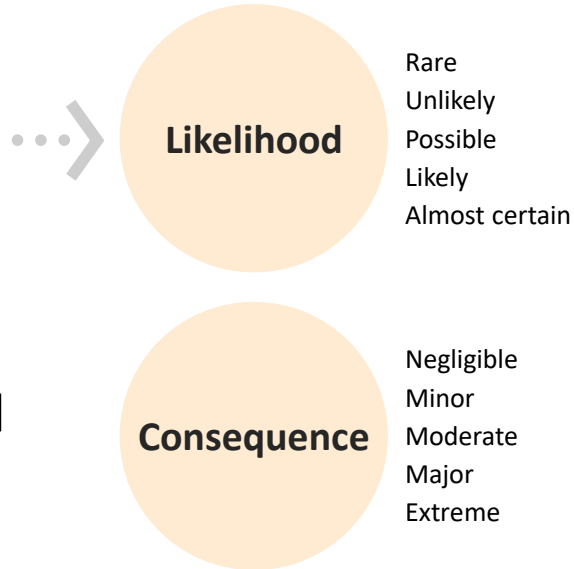


Final report: April 2020

Impact Assessment Framework

Risk based assessment

1. Identify environmental values
2. Identify likelihood
3. Identify consequence
4. Assess with standard mitigation measures
5. Assess with additional mitigation measures

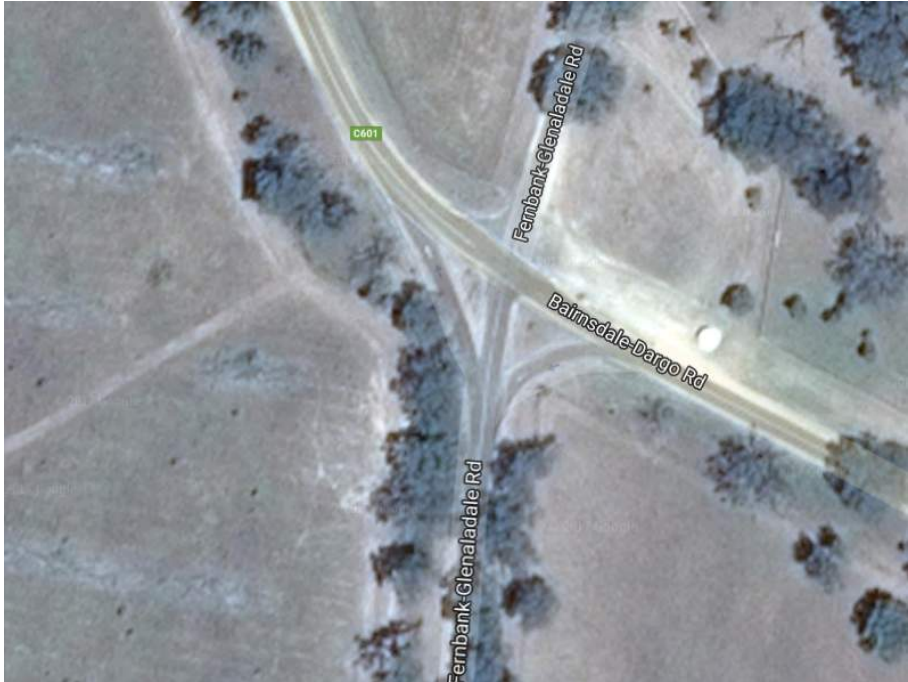


Efficient road network	Transport Safety	Asset performance	Traffic Operations
Likelihood of traffic delays	Infrastructure conformance, crash history, level of traffic increase	Whether route is B-double approved, ESA% impact	Duration of traffic impact
Impact of delays (LoS)	Number and severity of injuries	Extent of pavement damage, reduction of pavement life	Number of people impacted and travel time impacts

Findings: All Options

Key impacts: all options

<i>Value</i>	<i>Issue</i>	<i>Inherent risk</i>
Transport safety	Increased crash risk at proposed Bairnsdale-Dargo Rd / Fernbank-Glenaladale Rd intersection	Major
	Increased crash risk at intersections with no existing road lighting	High
	General driver crash risk (for product transport with B-doubles)	High
	Safety impacts from movement of Over Size and Over Mass (OSOM) loads	High



Fernbank-Glenaladale Rd / Bairnsdale-Dargo Rd existing intersection (Google maps)

Findings: All Options

Key recommendations: all options

<i>Value</i>	<i>Issue</i>	<i>Inherent risk</i>		<i>Additional mitigation</i>	<i>Residual risk</i>
Transport safety	○ Increased crash risk at proposed Bairnsdale-Dargo Rd / Fernbank-Glenaladale Rd intersection	Major	→	Upgrade to roundabout control	Low
	○ Increased crash risk at intersections with no existing road lighting	High	→	Provide lighting/flag lighting	Moderate
	○ General driver crash risk	High	→	Undertake annual driver surveys Regularly monitor & review the Transport Operational Management Plan (TOMP)	High
	○ Safety impacts from movement of Over Size and Over Mass (OSOM) loads	High	→	Avoid OSOM load movement during peak and school bus hours	Low

Findings: Preferred Option

Key impacts: Preferred Option

Value

Transport safety

Issue

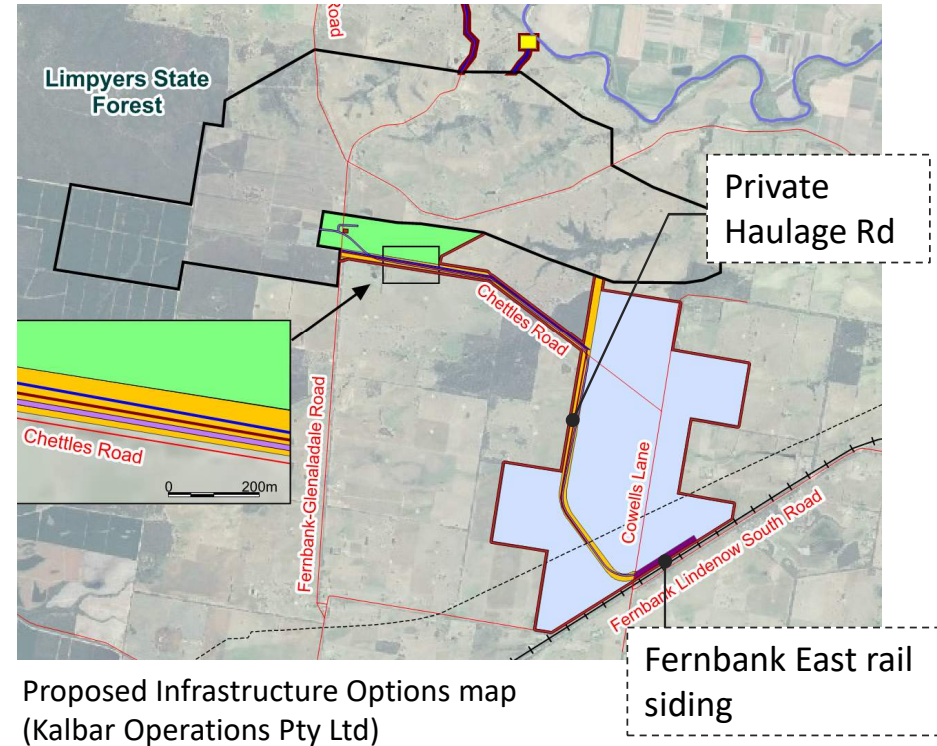
- Increased crash risk at proposed Fernbank-Glenaladale Rd / Private Haulage Rd intersection
- Increased crash risk on Chettles Rd and Cowells La due to B-Doubles crossing the unsealed road
- Increased crash risk with no road lighting and lack of awareness of B-doubles crossing at the Fernbank-Glenaladale Rd / Private Haulage Rd intersection

Inherent risk

Major

High

High



Proposed Infrastructure Options map (Kalbar Operations Pty Ltd)

Findings: Preferred Option

Key recommendations: Preferred Option

<i>Value</i>	<i>Issue</i>	<i>Inherent risk</i>		<i>Additional mitigation</i>	<i>Residual risk</i>
Transport safety	○ Increased crash risk at proposed Fernbank-Glenaladale Rd/ Private Haulage Rd intersection	Major	→	Upgrade to signalised control with advance warning signs and reduce speed to 80km/h	Moderate
	○ Increased crash risk on Chettles Rd and Cowells La due to B-Doubles crossing the unsealed road	High	→	Introduce operational overlay in TOMP with B-doubles stopping before crossing and local sealing	Low
	○ Increased crash risk with no road lighting and lack of awareness of B-doubles crossing at the Fernbank-Glenaladale Rd / Private Haulage Rd intersection	High	→	Provide flag lighting at intersection	Moderate

Findings: Alternative Options

Key impacts: alternative options

<i>Value</i>	<i>Issue</i>	<i>Inherent risk</i>
Transport safety	Increased crash risk at Lindenow-Glenaladale Rd / Bairnsdale-Dargo Rd	High
	Increased crash risk at Lindenow-Glenaladale Rd level crossing	Major
	Potential safety impact to school buses	High
	Increased risk of crashes involving pedestrians	Major
	Increased risk of crashes around schools	Major



Lindenow-Glenaladale Rd / Bairnsdale-Dargo Rd intersection (Google maps)

Findings: Alternative Options

Key recommendations: alternative options

<i>Value</i>	<i>Issue</i>	<i>Inherent risk</i>		<i>Additional mitigation</i>	<i>Residual risk</i>
Transport safety	○ Increased crash risk at Lindenow-Glenaladale Rd / Bairnsdale-Dargo Rd	High	→	Extend no overtaking line marking on the west leg by approx. 300m	Moderate
	○ Increased crash risk at Lindenow-Glenaladale level crossing	Major	→	Upgrade level crossing to incorporate boom gates	Moderate
	○ Potential safety impact to school buses	High	→	B-double movements to avoid school pick-up / drop-off times	Moderate
	○ Increased risk of crashes involving pedestrians	Major	→	Undertake pedestrian surveys Limit truck operating times, revise speed limits, TOMP	High
	○ Increased risk of crashes around schools	Major	→	B-double movements to avoid school pick-up / drop-off times	Moderate

Findings: Alternative Options

Key impacts: alternative options



<i>Value</i>	<i>Issue</i>	<i>Inherent risk</i>
Asset performance	<ul style="list-style-type: none">Pavement deterioration from product transport with B-doubles	High
Traffic operations	<ul style="list-style-type: none">Traffic impacts along Princes Highway during road upgrades	High



Bairnsdale-Dargo Rd

Findings: Alternative Options

Key recommendations: alternative options

<i>Value</i>	<i>Issue</i>	<i>Inherent risk</i>		<i>Additional mitigation</i>	<i>Residual risk</i>
Asset performance	 Pavement deterioration from product transport with B-doubles	High	→	Develop monitoring and asset protection plan, undertake existing conditions survey	Moderate
Traffic operations	 Traffic impacts along Princes Highway for road upgrades	High	→	Avoid construction of road upgrades in peak periods	High

Findings: Alternative Options – Post-Avon River Bridge Option 2

Key impacts: Post-Avon River Bridge Option 2

<i>Value</i>	<i>Issue</i>	<i>Inherent risk</i>
Transport safety	○ Increased crash risk at Princes Hwy / Racecourse Rd	Major
	○ Increased crash risk at Princes Hwy / Lindenow-Glenaladale Rd	Major
	○ Crash risk with oncoming traffic for B-doubles along Racecourse Rd due to alignment	High
	○ Increased crash risk with no existing road lighting at Princes Hwy / Racecourse Rd	High
	○ Increased risk of crashes involving pedestrians	Major
Asset performance	○ Pavement deterioration from product transport with B-doubles	High



Princes Hwy / Racecourse Rd intersection (Google maps)

Findings: Alternative Options – Post-Avon River Bridge Option 2

Key recommendations: Post-Avon River Bridge Option 2

<i>Value</i>	<i>Issue</i>	<i>Inherent risk</i>		<i>Additional mitigation</i>	<i>Residual risk</i>
Transport safety	○ Increased crash risk at Princes Hwy / Racecourse Rd	Major	→	Upgrade to roundabout control	Low
	○ Increased crash risk at Princes Hwy / Lindenow-Glenaladale Rd	Major	→	Upgrade to roundabout control	Low
	○ Crash risk with oncoming traffic for B-doubles along Racecourse Rd due to alignment	High	→	Widen shoulders, reinstate line marking	Low
	○ Increased crash risk with no existing road lighting at Princes Hwy / Racecourse Rd	High	→	Provide lighting at intersection	Moderate
	○ Increased risk of crashes involving pedestrians	Major	→	Undertake pedestrian surveys Limit truck operating times, revise speed limits, TOMP	High
Asset performance	○ Pavement deterioration from product transport with B-doubles	High	→	Develop monitoring and asset protection plan, undertake existing conditions survey, conduct minor works	Moderate

Findings: Alternative Options – Pre-Avon River Bridge

Key impacts: Pre-Avon River Bridge Option

<i>Value</i>	<i>Issue</i>	<i>Inherent risk</i>
Transport safety	○ Increased crash risk at Princes Hwy / Lindenow-Glenaladale Rd	Major
	○ Risk of vehicles queuing onto level crossing given short distance between intersection and level crossing on Princes Dr	Major



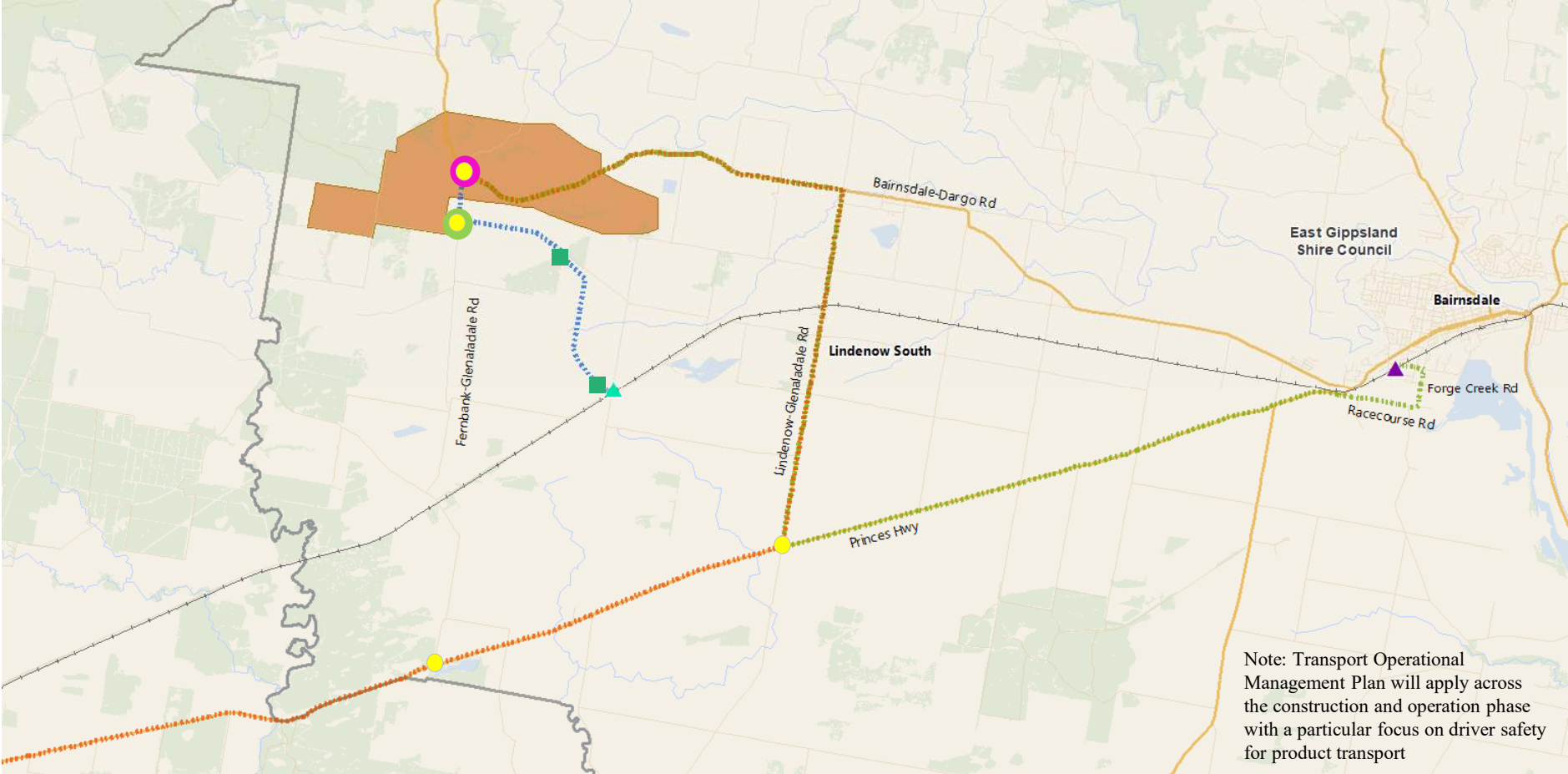
Princes Hwy / Lindenow-Glenaladale (Google maps)

Findings: Alternative Options – Pre-Avon River Bridge

Key recommendations: Pre-Avon River Bridge Option

<i>Value</i>	<i>Issue</i>	<i>Inherent risk</i>		<i>Additional mitigation</i>	<i>Residual risk</i>
Transport safety	○ Increased crash risk at Princes Hwy / Lindenow-Glenaladale Rd	Major	→	Upgrade to roundabout control	Low
	○ Risk of vehicles queuing onto level crossing given short distance between intersection and level crossing on Princes Dr	Major	→	Carry out detailed investigation, and if required, reinstate existing line marking or consider linking rail signals with traffic signals	High

Key Mitigations Summary: Preferred Option



Context

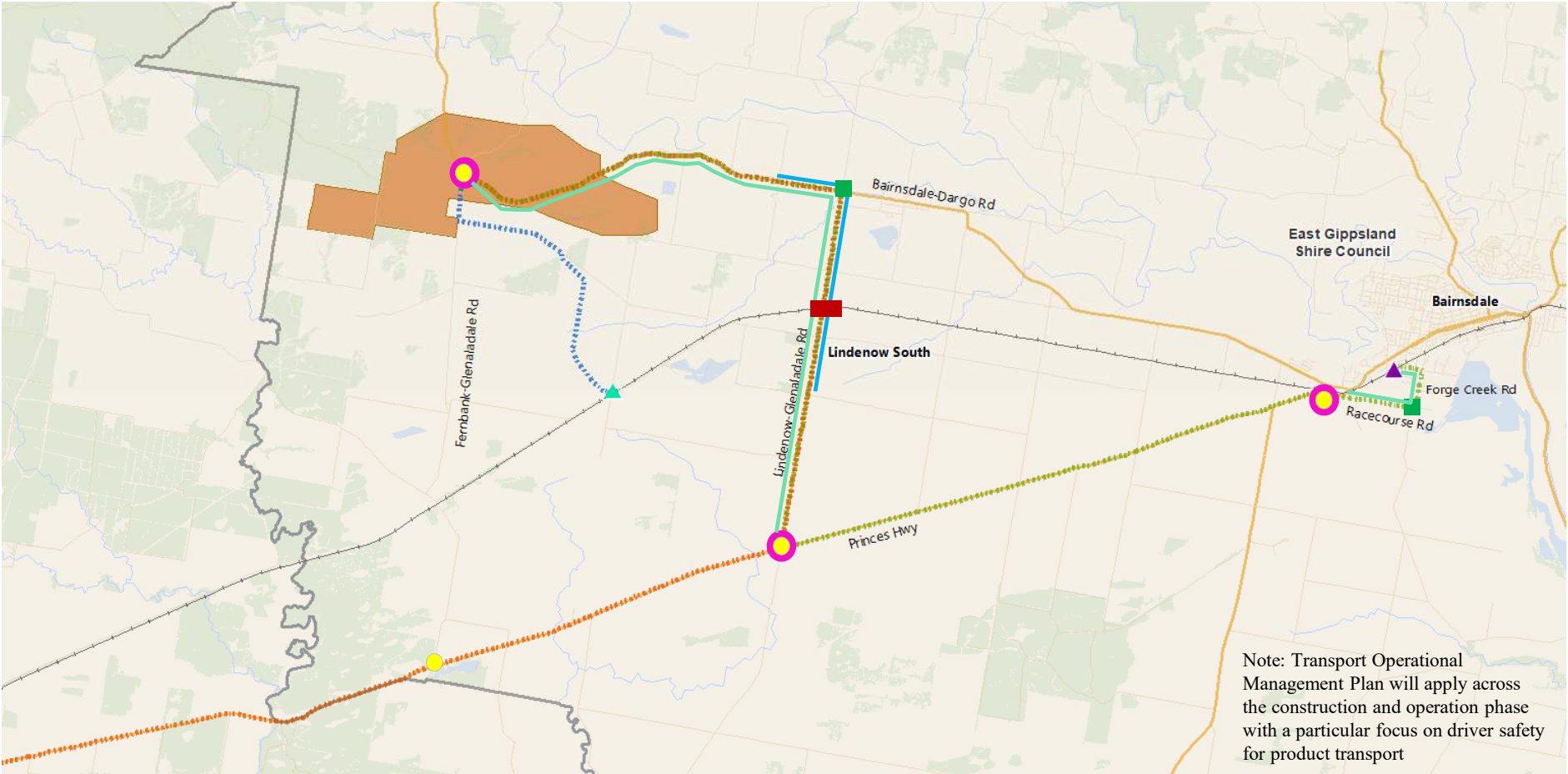
- ▲ Potential Rail Siding
- ▲ Existing Rail Siding
- ⋯ Pre Avon river bridge upgrade
- ⋯ Post Avon river bridge upgrade - Option 1
- ⋯ Post Avon river bridge upgrade - Option 2
- A, B, C and M Class Road
- Mine Related Infrastructure
- Rail
- Local Roads
- River
- Waterbody
- LGA Boundary

Key Mitigations

- Roundabout
- Boom gates
- Lighting
- Traffic Signals
- Minor road/intersection improvements
- Limit operation during school hours
- Asset protection plan

Note: Transport Operational Management Plan will apply across the construction and operation phase with a particular focus on driver safety for product transport

Key Mitigations Summary: Post-Avon River Bridge – Option 2

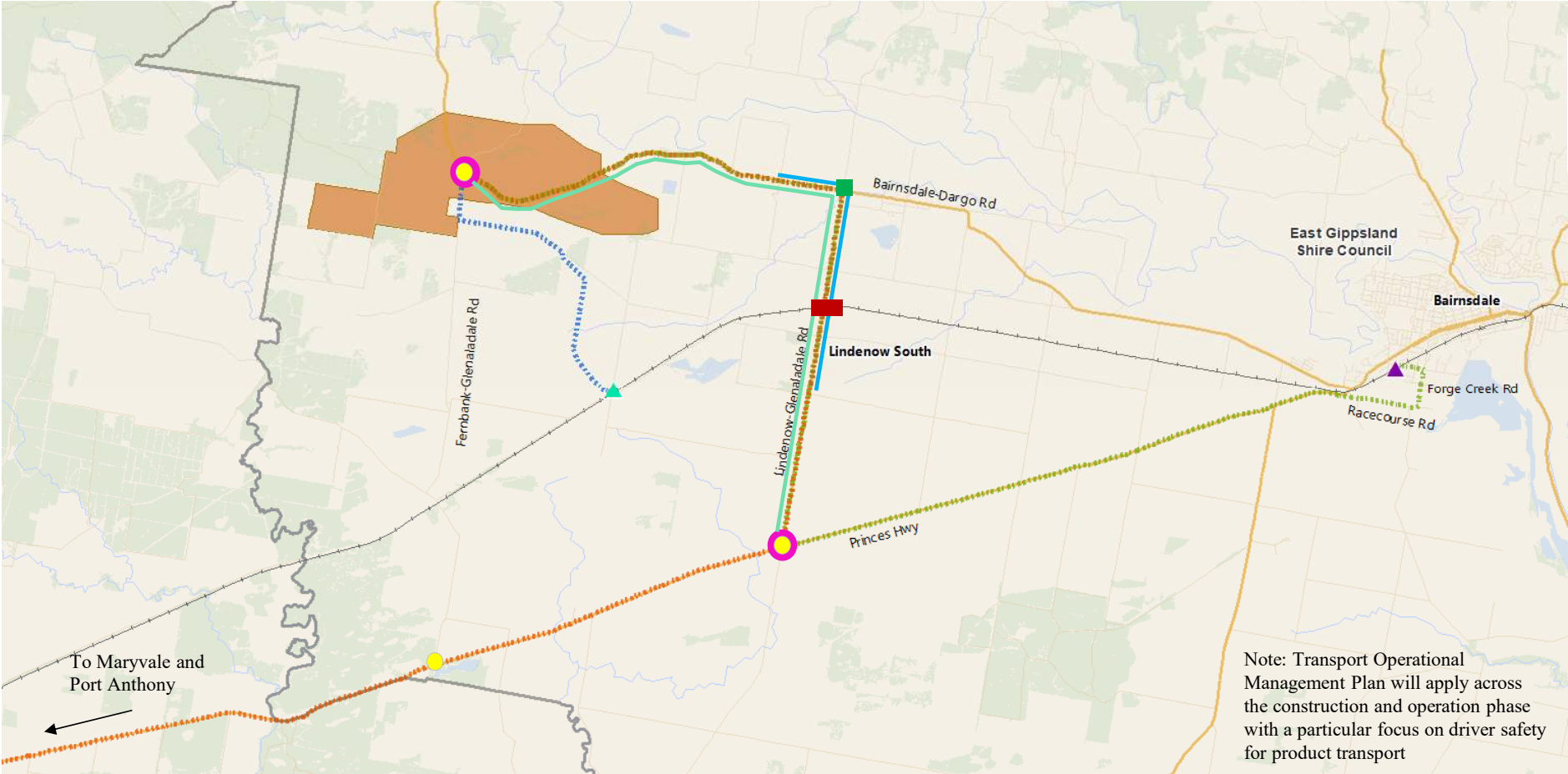


- Context**
- ▲ Potential Rail Siding
 - ▲ Existing Rail Siding
 - ⋯ Pre Avon river bridge upgrade
 - ⋯ Post Avon river bridge upgrade - Option 1
 - ⋯ Post Avon river bridge upgrade - Option 2
 - A, B, C and M Class Road
 - Mine Related Infrastructure
 - Rail
 - Local Roads
 - River
 - Waterbody
 - LGA Boundary

- Key Mitigations**
- Roundabout
 - Boom gates
 - Lighting
 - Traffic Signals
 - Minor road/intersection improvements
 - Limit operation during school hours
 - Asset protection plan

Note: Transport Operational Management Plan will apply across the construction and operation phase with a particular focus on driver safety for product transport

Key Mitigations Summary: Pre-Avon River Bridge



- Context**
- ▲ Potential Rail Siding
 - ▲ Existing Rail Siding
 - ⋯ Pre Avon river bridge upgrade
 - ⋯ Post Avon river bridge upgrade - Option 1
 - ⋯ Post Avon river bridge upgrade - Option 2
 - A, B, C and M Class Road
 - Mine Related Infrastructure
 - Rail
 - Local Roads
 - River
 - Waterbody
 - LGA Boundary

- Key Mitigations**
- Roundabout
 - Boom gates
 - Lighting
 - Traffic Signals
 - Minor road/intersection improvements
 - Limit operation during school hours
 - Asset protection plan

Note: Transport Operational Management Plan will apply across the construction and operation phase with a particular focus on driver safety for product transport

Additional Work Undertaken Post EES

- Traffic counts in November 2020
 - Lindenow-Glenaladale Road, Lindenow South
 - Bairnsdale-Dargo Road, Walpa
- Identification of typical interventions as part of the Transport Operations Management Plan
- Review of additional information on train and vehicle movements during operations and construction
- Review of road diversion designs prepared by Kalbar and provided in January 2021

Submissions: Overview

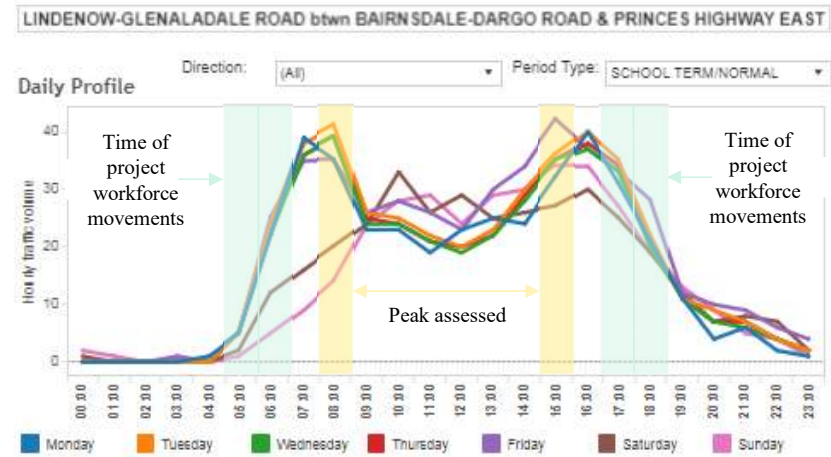
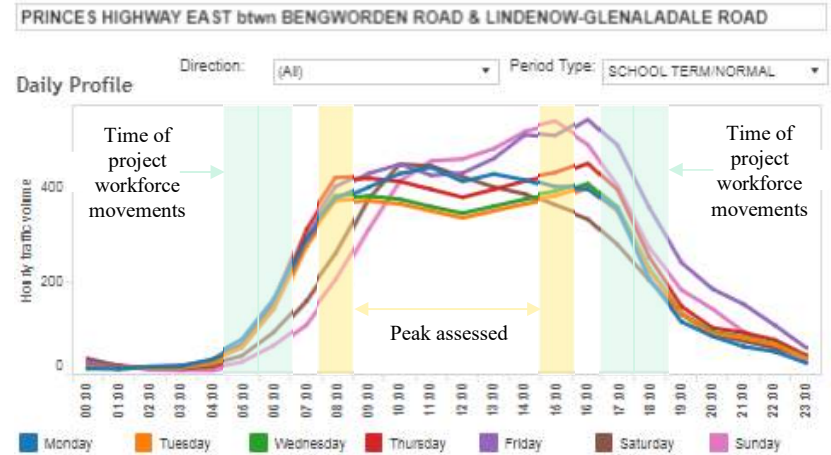
- Total of 85 submissions relating to Traffic and Transport
- Traffic and Transport Conclave 12 April 2021 and 15 April 2021
- Themes of key issues:
 - Existing conditions data
 - Intersection assessment and performance
 - Road designs and diversions
 - Private haul road crossing treatment
 - Roundabouts on Princes Highway
 - Racecourse Road for Product Transport (Option 2)
 - Road asset management
 - Amenity and environmental capacity

Submissions: Existing Conditions Data

Category	Location	TTIA Data Used	Conclave Report
Declared Roads (Link counts)	Princes Highway (west of Lindenow-Glenaladale Road)	VicRoads public data	No comment
	Princes Highway (east of Lindenow-Glenaladale Road)	VicRoads public data	No comment
	Bairnsdale-Dargo Road (east of Lindenow-Glenaladale Road)	VicRoads public data	No comment
	Bairnsdale-Dargo Road (west of Lindenow-Glenaladale Road)	7 day classified counts	7 day classified counts
	Lindenow-Glenaladale Road	7 day classified counts	7 day classified counts
Local Roads (Link counts)	Fernbank-Glenaladale Road, south of Bairnsdale-Dargo Road	Daily data provided by local government authorities and growth applied to represent 2017 volumes	7 day classified counts at all locations
	Racecourse Road east of Princes Highway		
	Forge Creek Road, north of Racecourse Road		
	Collins Street, south of Main Street		
	Bosworth Road at entry to rail siding		
Intersections (Turning movement counts)	Princes Highway / Bairnsdale-Dargo Road	15min TMC & link counts	Two-hour turning movement counts (TMC) during AM and PM weekday at all locations
	Main Street / Collins Street	15min TMC & link counts	
	Princes Highway / Racecourse Road	15min TMC & link counts	
	Bairnsdale-Dargo Road / Lindenow-Glenaladale Road	Assumptions & link counts	
	Fernbank-Glenaladale Road / Bairnsdale-Dargo Road	Assumptions & link counts	
	Princes Highway / Lindenow-Glenaladale Road	Assumptions & link counts	

Submissions: Existing Conditions Data

- Conservative approach to assessment
 - Assumes ~34% growth in existing volumes (2.5% compound growth until 10 years after opening)
 - Assumes project traffic and existing network peak coincide (except for near Bairnsdale):
 - Project traffic peak project traffic (5am-7am and 5pm-7pm)
 - Existing network peak time (8am-9am and 3pm-4pm)
- All intersections operate well within their capacity limits
- More detailed data collection would likely result in reduced traffic volumes from those assessed



Submissions: Intersection Assessment and Performance

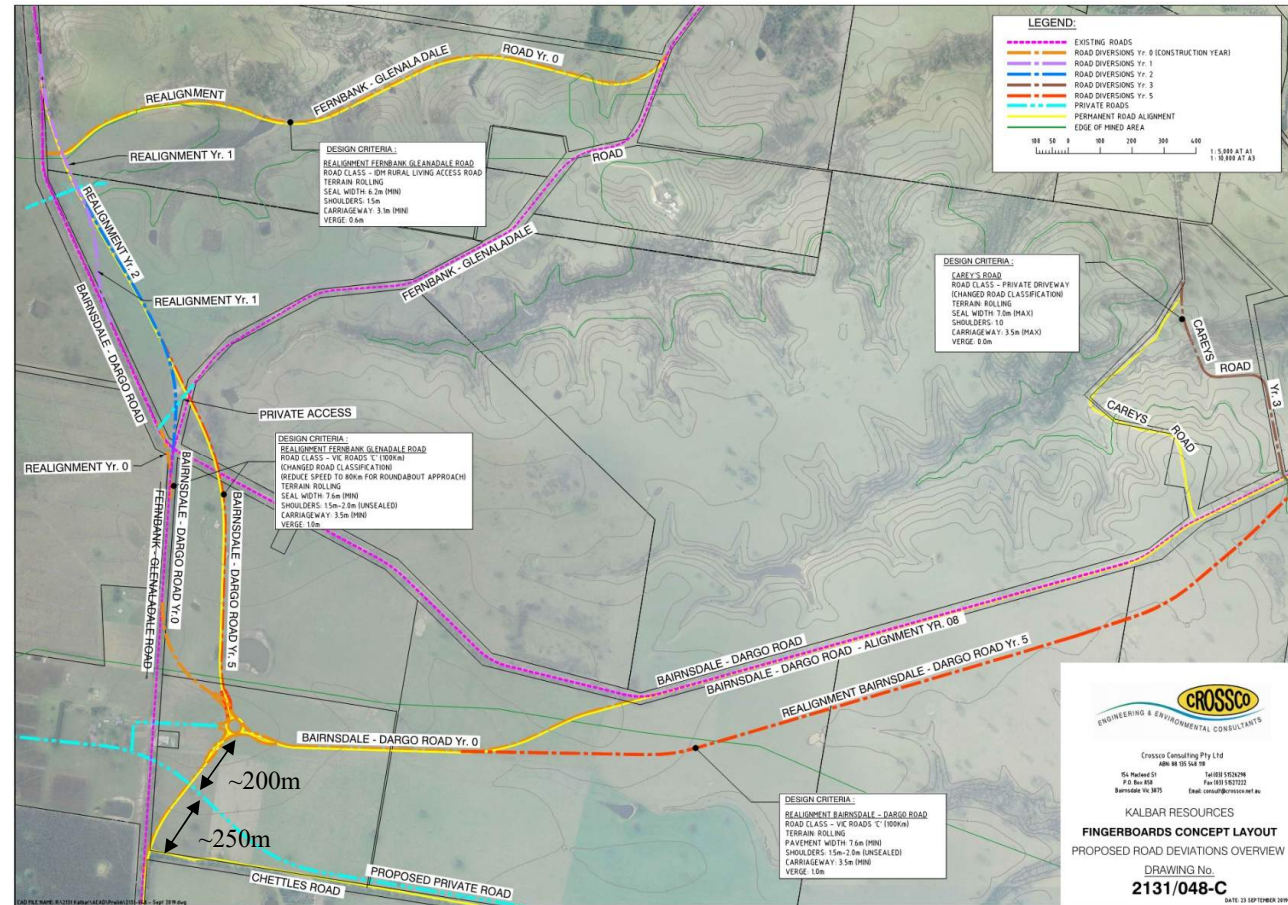
- All intersections expected to operate within capacity:
 - Level of Service of all intersections LOS A
 - Volume to capacity ratio for intersections varies between 0.09 and 0.53
 - Intersections will operate at approximately half of their practical capacity
- Simplified assessment (Cap-X) for rural environments and SIDRA in built up areas
- Validation of Cap-X and SIDRA:

Location	Volume/Capacity (Cap-x)	Volume/Capacity (SIDRA)
Fernbank-Glenaladale Road / Princes Highway (AM peak)	0.34	0.16
Racecourse Road / Princes Highway (AM peak)	0.54	0.31

- Detailed analysis may be appropriate for further design phases but would not change the outcomes of the assessment in the EES and would likely show improved intersection performance

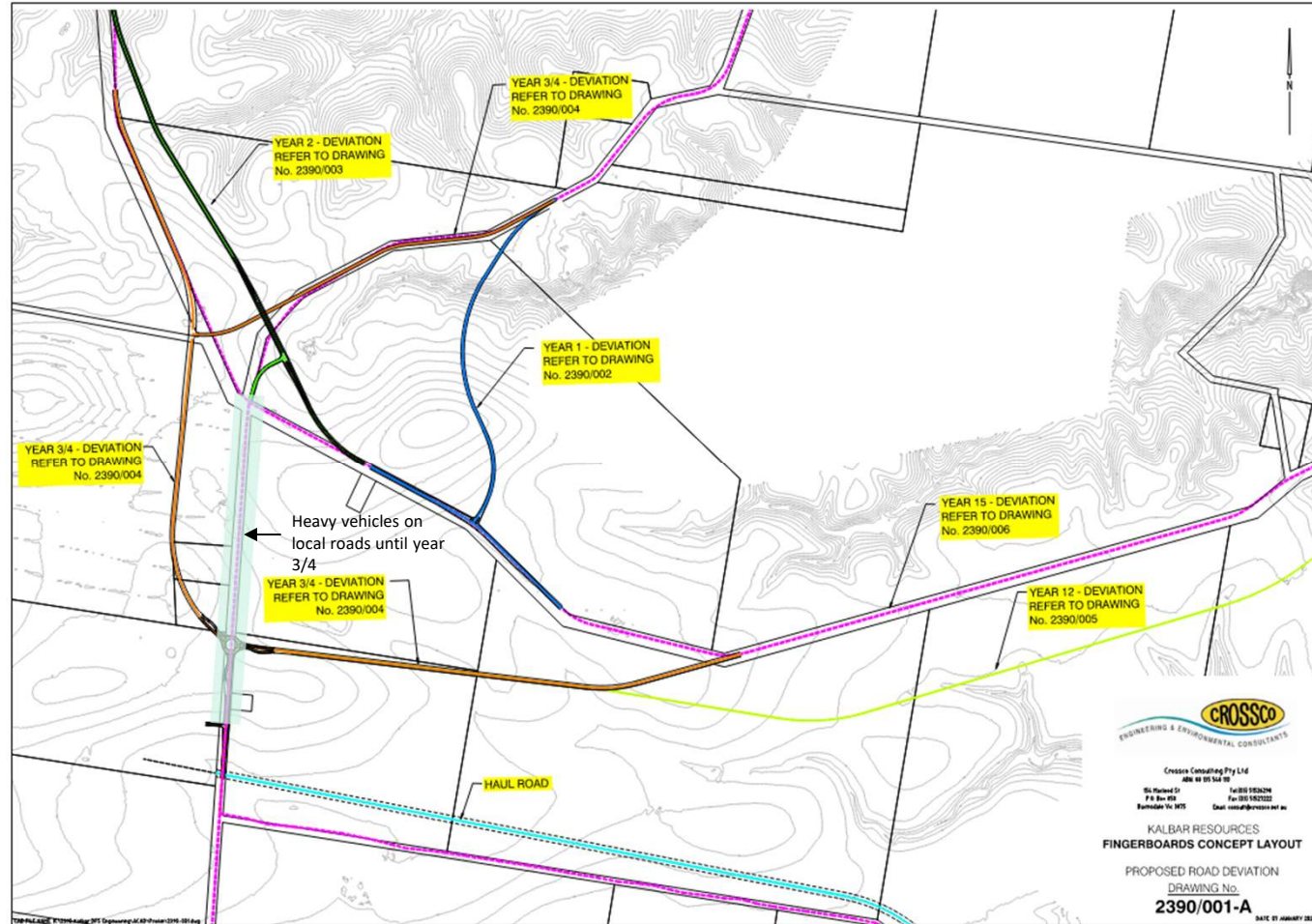
Submissions: Road Designs and Diversions

- EES road designs developed separately by Kalbar
- Spacing of 150m – 200m recommended between intersections
- The design to aim for angles between each leg be to evenly distributed (approximately 90 degrees between legs)
- Agreement required from relevant road authorities (DoT, Council) including further design, review, road safety audit and consultation



Submissions: Road Designs and Diversions

- Updated road designs developed separately by Kalbar and provided to IAC on 18 January 2021
- Use of local roads between year 0 and year 3/4 will require East Gippsland Shire Council approval if B-Doubles are utilised for diesel transport
- Roundabout a suitable treatment for new intersection based on Austroads hierarchy of controls (GTM 6, GRS 5)



Submissions: Road Designs and Diversions

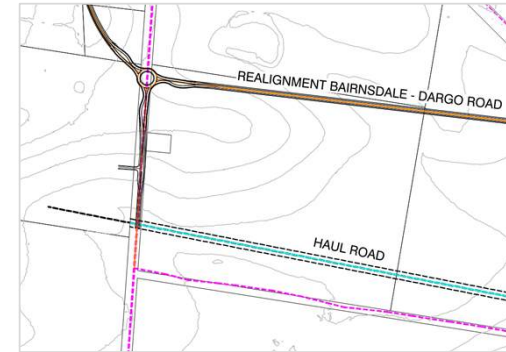
- Horizontal geometry is broadly reasonable but will require refinement
- Vertical alignment will require review for intersections and realigned roads outside the mined area
- Site inspections suggest the Site Access intersection will need to be moved north or a change to vertical alignment of Fernbank-Glenaladale Road



Haul Road Intersection – View North



Site Access – View North



Haul Road Intersection – View South



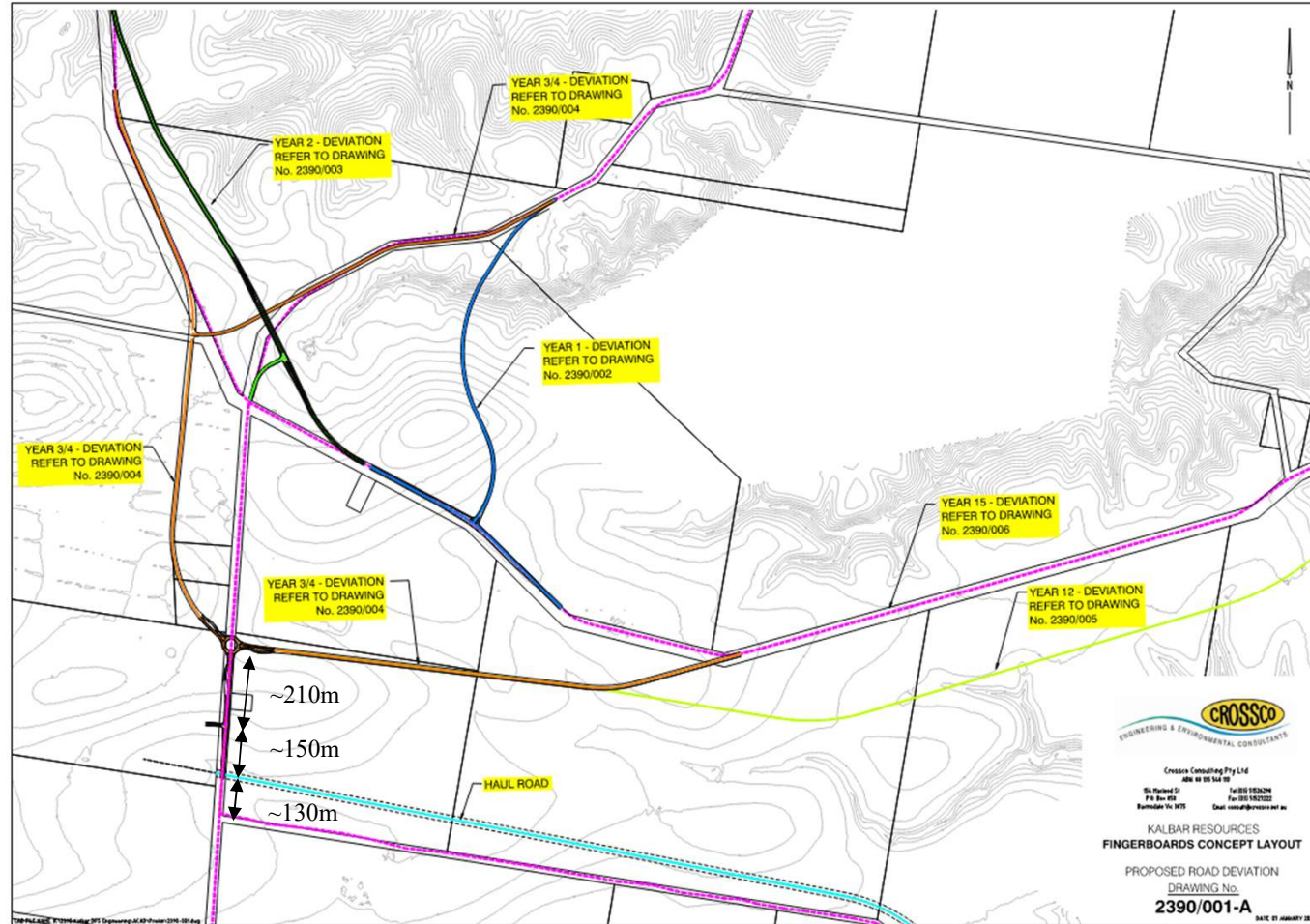
Site Access – View South



Roundabout – View South

Submissions: Road Designs and Diversions

- Spacing of 150m–200m recommended between intersections
- Haul road intersection and Site Access intersection will need to be shifted north
- Agreement required from relevant road authorities (DoT, Council) including further design, review, road safety audit and consultation

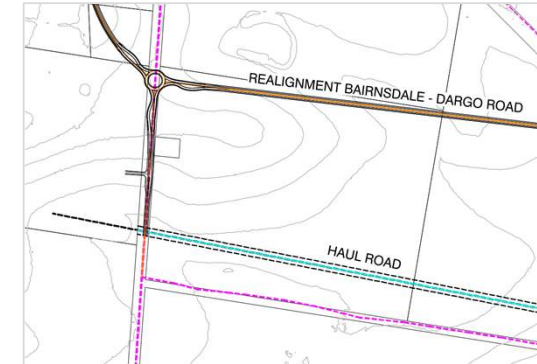


Submissions: Haul Road Crossing of Fernbank-Glenaladale Road

- Design considerations:
 - Existing traffic volumes: ~340 vehicles/day
 - Geometry: Mostly flat and straight
 - Speeds: 100km/h
 - Delays: Minimal (6-8 movements per hour)
 - Vehicles: B-double trucks
- Recommended mitigations
 - Traffic signals and flashing advanced warning signs
 - Reduce speed limit 80km/h and lighting
 - Internal road boom gates and operational overlay
- Mitigations are appropriate for the risk and grade separation isn't necessary



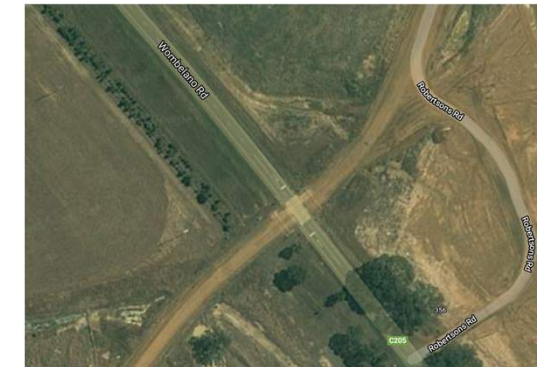
Haul Road Intersection – View North



Proposed Roads



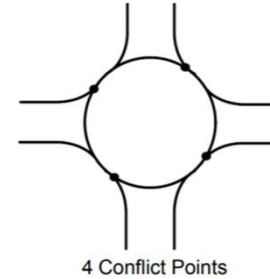
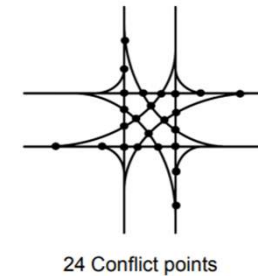
Haul Road Intersection – View South



Wombelano Road – Dump truck crossing with boom gates and traffic signals

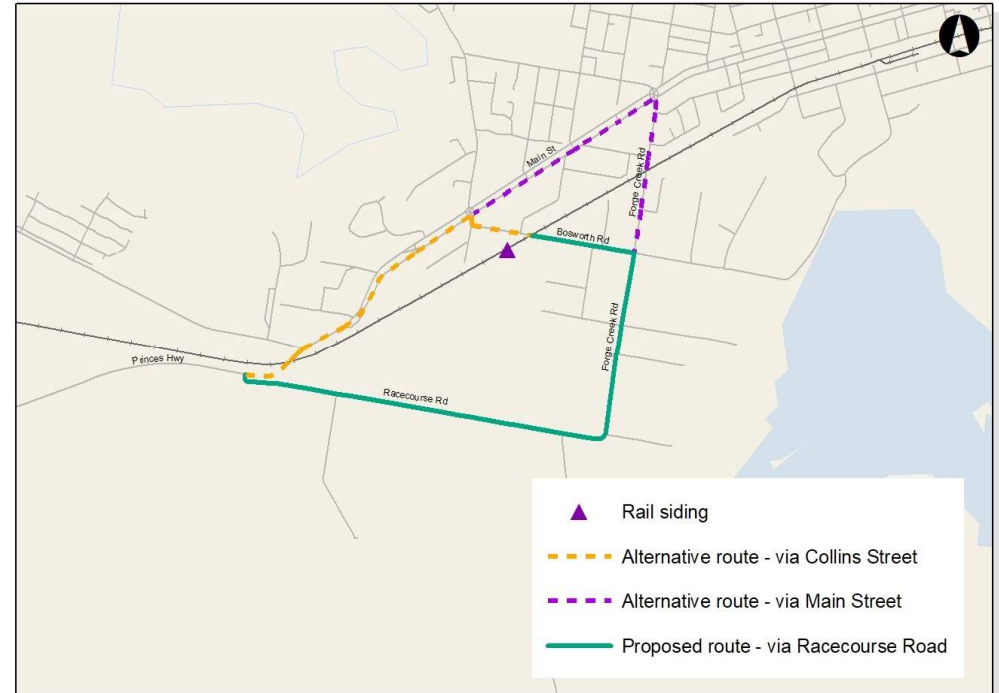
Submissions: Roundabouts on Princes Highway

- Roundabouts recommended to manage the safety risk of B-doubles turning at:
 - Princes Highway / Lindenow-Glenaladale Road
 - Princes Highway / Racecourse Road
- Prioritisation of safety and reduce crash risk by reducing vehicle speeds at the point of conflict to align with safe system principles
- Austroads GTMP Part 6 notes the following hierarchy of controls
 - 1. Roundabouts
 - 2. Signalised intersections
 - 3. Unsignalised intersections



Submissions: Racecourse Road for Product Transport

- Route discussed with East Gippsland Shire Council and Technical Reference Group in November and December 2018
- Alternatives assessed, however Racecourse Road is preferred route over Collins Street given:
 - Avoids built up area of west Bairnsdale
 - Avoids the out of hours activity surrounding the busy schools precinct in Bairnsdale
 - Avoids level crossings on Bosworth Road and Princes Highway
- Collins Street remains a viable alternative with appropriate mitigations if preferred by Council and should Option 2 proceed



Submission: Management of Pavement Impacts

- Monitoring and asset protection plan recommended
- Plan would be agreed between Kalbar and the responsible authority
- Includes agreed responsibility for maintenance, intervention levels, reimbursement
- Survey of existing conditions including initial structural pavement evaluation
- Routine testing in future to determine B-double impact from project and the need for earlier intervention

Amenity and Environmental Capacity

- Environmental capacity: *‘the volume of moving vehicles which can be accommodated in a street or area, having regard to the need to maintain environmental standards’* (RTA, 2002)
- Factors include traffic characteristics (volume, speed, composition), road characteristics (road reserve widths, number of lanes, gradient etc) and locality characteristics (property setbacks, building design)
- Thresholds in residential streets are noted as difficult to define and there is limited information for rural settings. Adopting low order classifications for built up areas:

Source	Classification	Env. Capacity
Planning Scheme	Access Street – Level 2	2,000 to 3,000 vehicles per day
RTA Guide to Traffic Generating Developments	Local access street	1,000 to 2,000 vehicles per day
Planning Scheme	Connector Street – Level 2	3,000 to 7,000 vehicles per day
RTA Guide to Traffic Generating Developments	Trunk collector street	6,000 vehicles per day

Amenity and Environmental Capacity

Road	Existing Volume	Env. Capacity	Source
Fernbank-Glenaladale Road	340	1,000-3,000 v/d	Local access (RTA), Access Street L2 (Planning Scheme)
Racecourse Road	430	1,000-3,000 v/d	Local access (RTA), Access Street L2 (Planning Scheme)
Lindenow-Glenaladale Road	410	1,000-3,000 v/d	Local access (RTA), Access Street L2 (Planning Scheme)
Bairnsdale-Dargo Road (west)	994	3,000-7,000 v/d	Trunk collector (RTA), Connector L2 (Planning Scheme)
Bairnsdale-Dargo Road (east)	3,200	3,000-7,000 v/d	Trunk collector (RTA), Connector L2 (Planning Scheme)

- Roads are within the nominal thresholds but there are increases in heavy vehicle movements
- The amenity impact of these movements (e.g. noise and vibration) that may approach or exceed these limits are best addressed with specialist investigations (i.e. specialist studies forming part of the EES)

Questions?
