

# Appendix D

## Traffic impact assessment report

# **Singleton Bypass Project**

Traffic Assessment Report for Addendum Review of Environmental Factors  
**Transport for New South Wales**

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# 1 Introduction

## 1.1 Project background

The New England Highway bypass of Singleton project (hereafter referred to as, the Project) involves the design and construction of an approximate 8.4 kilometres of a new two-lane single carriageway west of Singleton, between Newington Lane and re-joining the New England Highway north of McDougalls Hill at Rixs Creek Lane – refer to Figure 1 for project overview plan. The Project is in the Singleton Council local government area, approximately 77 kilometres west of the Newcastle central business district and approximately 200 kilometres north of Sydney.

The New England Highway is a major freight and commuter route forming part of the Sydney to Brisbane Corridor of the National Land Transport Network and the primary route connecting the Upper Hunter with Maitland and Newcastle. The highway currently passes through Singleton forming the main access route through the town. The traffic flow along this route currently experiences delays and congestion, notably for extended morning and afternoon peak periods, with heavy vehicle movements adding further delays and congestion.

A review of environmental factors (REF) was prepared for the Project in December 2019 (hereafter referred to as the project REF (December 2019)). The project REF (December 2019) was placed on public display between Monday 16 December 2019 and Sunday 1 March 2020 for community and stakeholder comment. A submissions report dated 7 August 2020 was prepared to respond to issues raised.

In addition, the following addendum REFs for the Project have been prepared and approved:

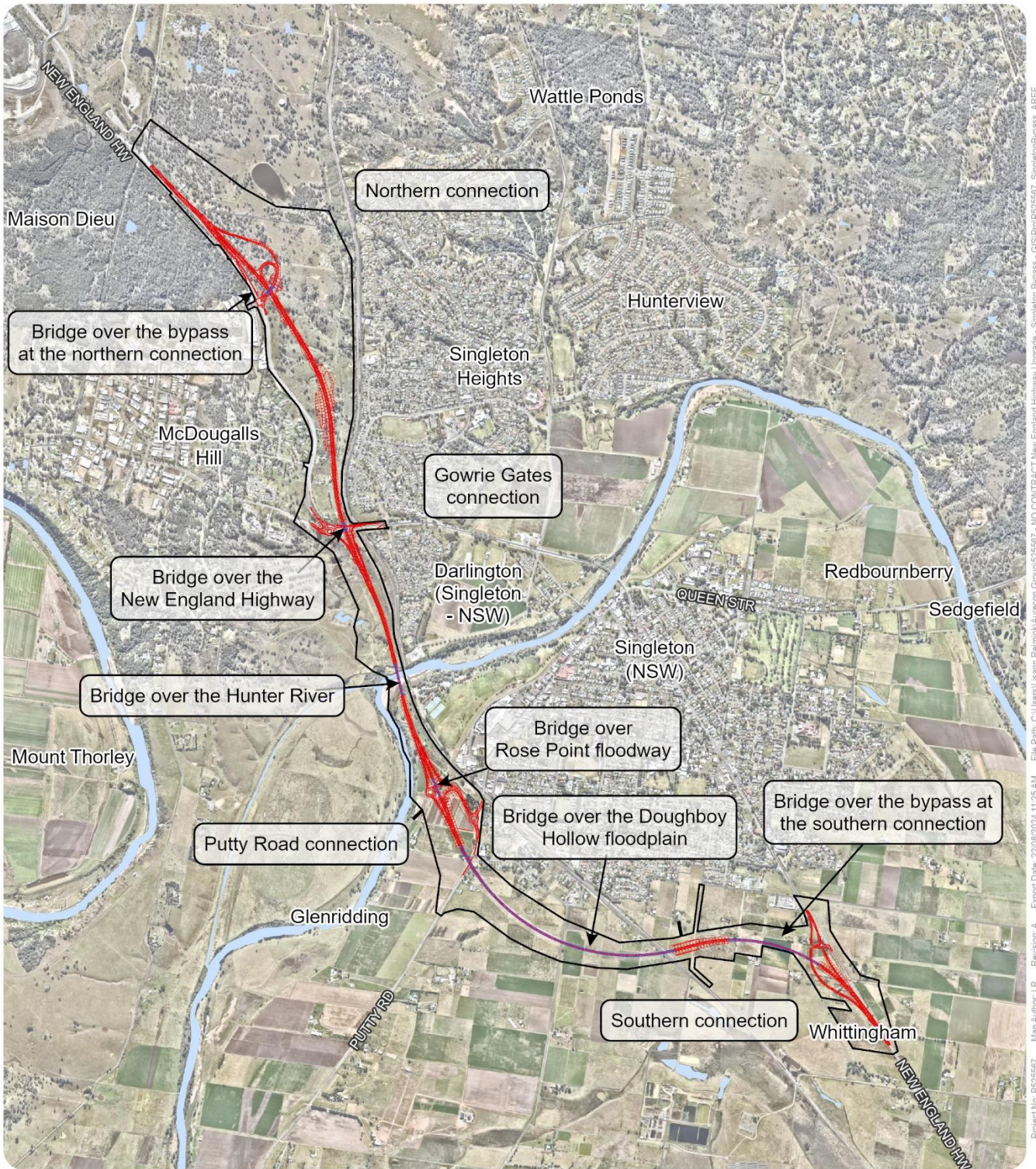
- An addendum REF, determined in May 2023, was prepared to adjust the proposal area after consultation and to facilitate general constructability, hereafter referred to as the addendum REF (May 2023).
- An addendum REF, determined in October 2023, was prepared to provide a full interchange at Putty Road for ease of access to Singleton's town centre from the bypass, extending the bridge over the floodplain and reconfiguring the design at the southern connection, hereafter referred to as the addendum REF (October 2023). The design presented in the addendum REF (October 2023) is hereafter referred to as the approved project.

Transport for NSW awarded a design and construction contract to ACCIONA Construction Australia Pty Ltd to deliver the Singleton Bypass. As a result of design development, modifications to the approved project were required to further improve road safety, constructability and has resulted in revised interchange arrangements and proposed realigned property accesses. This report will support an addendum REF which captures these design changes, hereafter known as the proposed modification.

Key features of the Project include the following:

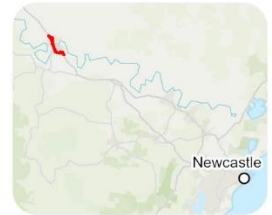
- reconfiguring the southern connection interchange arrangement and realigning the northbound exit ramp
- revising the location of the Putty Road roundabout and northbound entry and exit ramps
- realigning the northbound exit ramp and roundabout, and constructing a large detention basin at the Gowrie Gates connection
- reducing the size of the southbound entry and exit loop ramp at the northern connection
- revising bridge arrangements
- revising property access alignments (subject to ongoing design development and consultation and agreement with relevant property owners)
- retaining maintenance access tracks, about 10 metres wide, for the viaduct at the southern end of the bypass connection with New England Highway
- providing associated road furniture, drainage and earthworks, and landscaping.



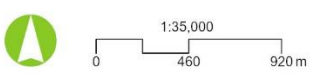


Project No: P525567 Map Author: LR Revision: A Export Date: 22/08/2024 11:25:41 File Path: C:\Users\Usam\Reim\Aurecon\Group\525567 - NO CONTRACT New England Highway Upgrade - Singleton Bypass - GIS\Proj\P525567\_SingletonBypass\_AREF

- Bridge design
- Road design
- Project approval boundary



Sources: Aurecon, Spatial Services (DCS), Esri Basemap, Nearmap



Projection: GDA 1994 MGA Zone 56

**Singleton Bypass Addendum REF**

**Figure 1: Project overview plan**



## 1.2 Purpose and scope of report

The addendum REF (October 2023) considered the Project's approved design, which has subsequently been modified during detailed design of the Project.

This report serves as a specialist operational traffic study, by presenting the traffic performance of the proposed modification, in comparison to the approved project's traffic performance (as reported in the addendum REF (October 2023)).

This traffic performance comparison focusses on the 2046 horizon year, being the worst-case scenario, and only compares areas of the proposed modification which have undergone a functional design change (i.e. road geometry changes which amended the way in which vehicles access the bypass and/or surrounding road network) from the approved project. The only area of the approved project which has been functionally modified is Putty Road interchange, and as such the traffic performance comparison for the proposed modification is limited to the Putty Road interchange under the 2046 horizon year traffic demand.

## 1.3 Report structure

This report is structured into four chapters, as follows:

- 1) An introduction, providing project background information, along with the purpose and scope of this report
- 2) A Putty Road interchange design comparison – proposed modification versus approved project
- 3) A Putty Road interchange traffic performance comparison – proposed modification versus approved project
- 4) Conclusions drawn from the approved project and the proposed modification comparison traffic performance findings.

## 2 Methodology

Following the works from the approved project design, undertaken in September 2021, the traffic modelling relied upon the AIMSUN Singleton Bypass Hybrid Model (SBHM), and included 2046 traffic demands, which were developed by others as part of the reference design and environmental assessment. The same 2046 traffic demands were present for the modelling reported in the approved project design. The traffic modelling methodology applied for the assessment entailed the following:

- The supplied SBHM Aimsun traffic model was adopted along with its inherited assumptions on year 2046 demand and road network changes. No changes were made to the supplied SBHM Aimsun traffic model, other than where the originally modelled approved project design had been modified.
- The SBHM Aimsun traffic model road alignment was changed toward the proposed modification.
- Modelled traffic performance results were extracted for the proposed modification to allow for comparison to the originally modelled design.



### 3 Putty Road Interchange Design Comparison

The subsections that follow present the respective Putty Road interchange designs that were considered for the proposed modification, as well as for the approved project.

#### 3.1 Putty Road interchange approved project

The approved project considered the provision of a full interchange at the Putty Road connection. The approved project provided the interchange between the Singleton bypass and Putty Road through a single lane four-legged roundabout intersection on Putty Road (to the north-east of the Singleton bypass), with the north-west and south-west legs respectively providing access to the eastern (southbound entry and exit) and western (northbound entry and exit) Singleton bypass ramps – refer to Figure 2 for the Putty Road connection approved project.

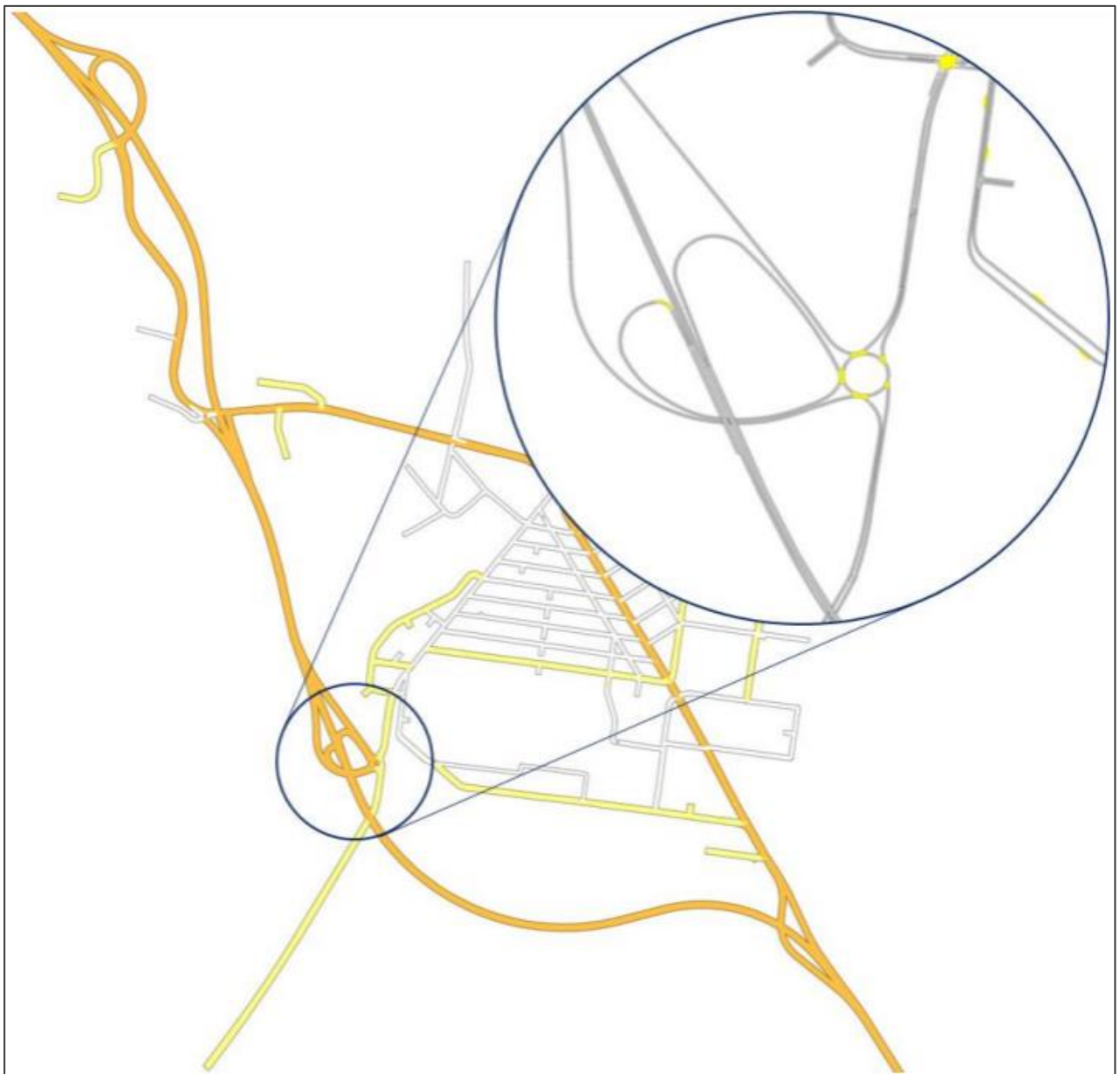


Figure 2 Putty Road interchange approved project (Source: Singleton bypass Concept Design and Environmental Assessment, Traffic Assessment Report – Addendum, Revision 2, 08-Sep-2021)

### 3.2 Putty Road interchange proposed modification

The proposed modification differs from the approved project in that it provides the interchange between the Singleton bypass and Putty Road through a single lane three-legged roundabout intersection on Putty Road (to the north-east of the Singleton bypass), with the north-west leg providing access to all Singleton bypass ramps and with an additional single lane roundabout intersection on the western terminal – refer to Figure 3 for Putty Road connection proposed modification.

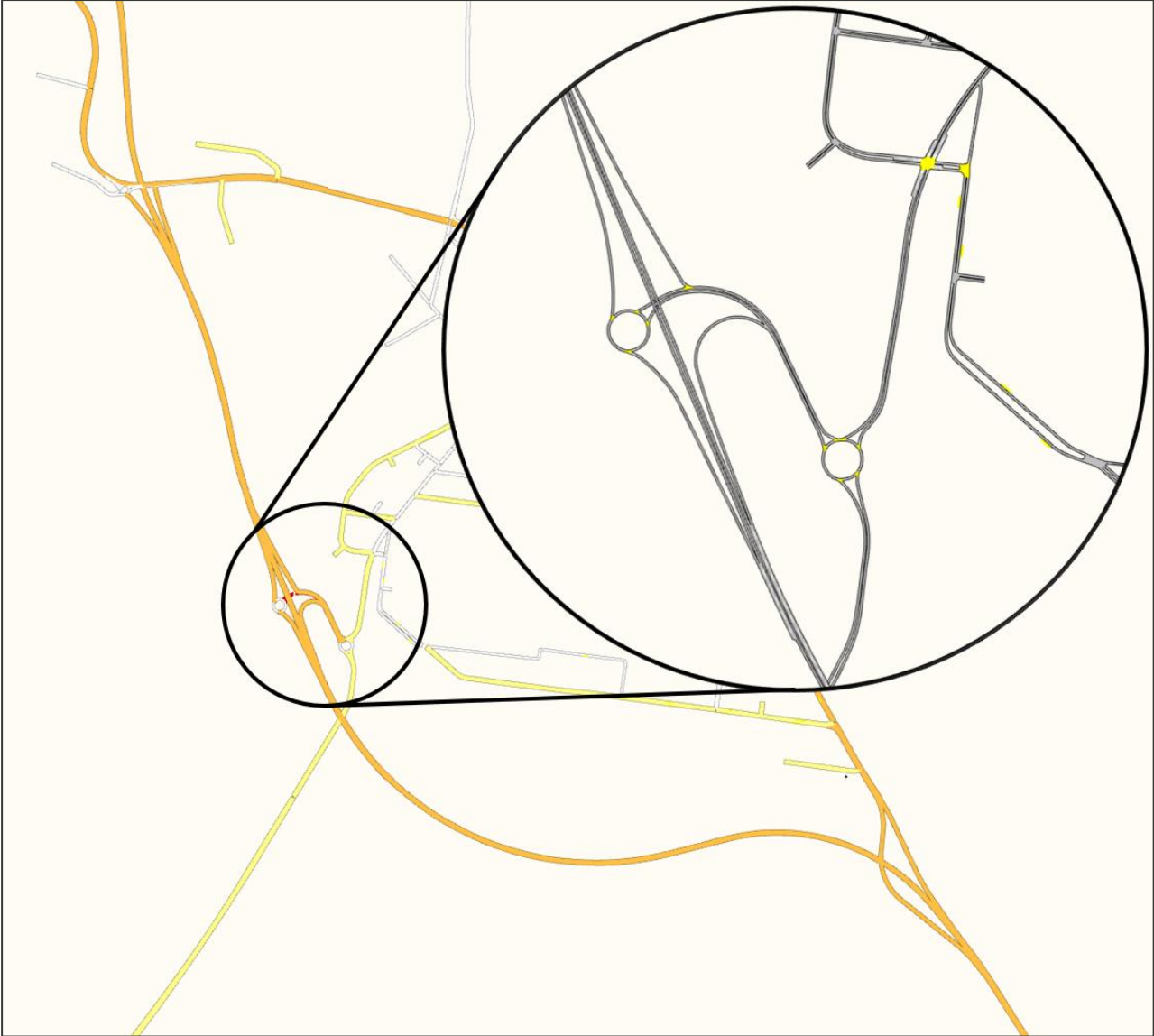


Figure 3 Putty Road interchange proposed modification

# 4 Putty Road Interchange Traffic Performance Comparison

As was noted in Section 2, the traffic performance assessments for this report were focussed on the 2046 horizon year, being the worst-case scenario. The subsections that follow present traffic performance comparisons between the approved project, and the proposed modification. The traffic performance is presented through four sets of performance comparisons, namely:

- Traffic flow comparison
- Intersection performance (average delay and Level of Service) comparison
- Travel time comparison
- Overall network performance.

## 4.1 Traffic flow comparison

Traffic flows have been reported at five locations surrounding the Putty Road interchange, as depicted in Figure 4, aligning to the approved project locations.

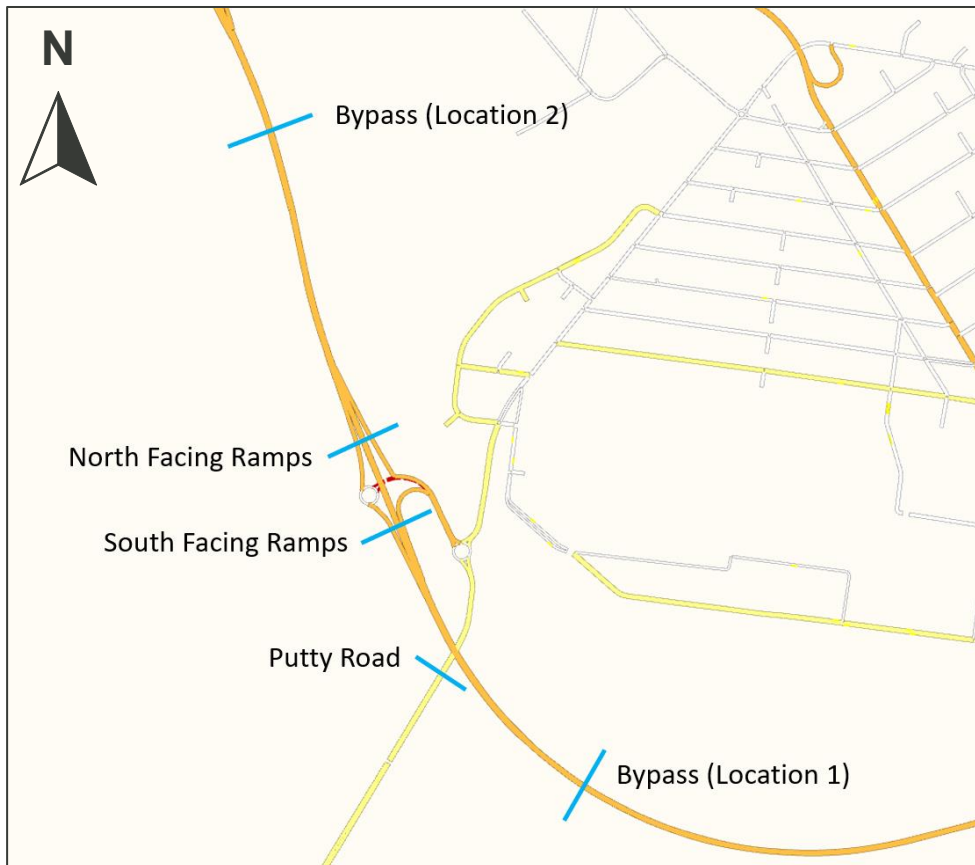


Figure 4 Mid-block traffic flow locations

Table 1 and Table 2 present the hourly traffic flow comparisons between the approved project and the proposed modification for the morning (AM) and afternoon (PM) peak periods. Overall, both the AM and PM peak periods saw a slight decline in traffic flows along the Singleton bypass, and through the Putty Road interchange, with the introduction of the proposed modification.

During the AM peak period, the largest reductions (approximately 60 vehicles per hour) were on northbound traffic on the Singleton bypass, which is primarily related to a reduction in traffic on Putty Road interchange’s northbound entry ramp.

During the PM peak period, the largest reductions (approximately 70 vehicles per hour) were on southbound traffic on the Singleton bypass, which is primarily related to a reduction in traffic on Putty Road interchange's southbound entry ramp.

Following further investigation, specifically into the modelled route decisions, it was found that these traffic flow reductions are primarily related to traffic generated within Singleton town centre (with origins along New England Highway) and having destinations to the north of the Singleton bypass (during the AM peak) and destinations to the south of the Singleton bypass (during the PM peak). The two primary route options available to these trips are to, either access the Singleton bypass via Putty Road, or via New England Highway. The modelled preference of these two route choices is however similar, and therefore sensitive to road network changes, such as small changes to the length of a route.

With the introduction of the proposed modification, the distance along the route via Putty Road firstly increases slightly, and secondly sees a slight increase in travel delay as an additional intersection has been introduced along the route (2<sup>nd</sup> Putty Road interchange roundabout to the west of the Singleton bypass). These road network changes in the proposed modification, even though minor, result in a slight decrease in preference to access the Singleton bypass via the Putty Road interchange.

**Table 1 2046 AM peak period network flow comparison (vehicles per hour)**

Street	Mid-block position	Direction	05:30 - 06:30		08:30 - 09:30	
			Approved project	Proposed modification	Approved project	Proposed modification
Putty Road	South of Ryan Avenue	Northbound	98	98	218	219 (-1)
		Southbound	443	444 (-1)	375	374 (-1)
Bypass (Location 1)	East of Putty Road	Northbound	1255	1248 (-7)	815	786 (-29)
		Southbound	171	171	371	370 (-1)
Bypass (Location 2)	South of Maison Dieu Road	Northbound	1391	1374 (-17)	935	872 (-63)
		Southbound	303	301 (-2)	582	572 (-10)
New England Highway / Putty Road	South Facing Ramps	Northbound (Off-Ramp)	53	49 (-4)	153	127 (-26)
		Southbound (On-Ramp)	19	18 (-1)	43	41 (-2)
New England Highway / Putty Road	North Facing Ramps	Northbound (On-Ramp)	180	162 (-18)	262	200 (-62)
		Southbound (Off-Ramp)	146	143 (-3)	261	252 (-9)

**Table 2 2046 PM peak period network flow comparison (vehicles per hour)**

Street	Mid-block position	Direction	16:00 - 17:00	
			Approved project	Proposed modification
Putty Road	South of Ryan Avenue	Northbound	480	479 (-1)
		Southbound	344	346 (+2)
Bypass (Location 1)	East of Putty Road	Northbound	676	655 (-21)
		Southbound	1015	943 (-72)
Bypass (Location 2)	South of Maison Dieu Road	Northbound	1043	1029 (-14)
		Southbound	1158	1159 (+1)
New England Highway / Putty Road	South Facing Ramps	Northbound (Off-Ramp)	83	65 (-18)
		Southbound (On-Ramp)	164	87 (-77)



Street	Mid-block position	Direction	16:00 - 17:00	
			Approved project	Proposed modification
New England Highway / Putty Road	North Facing Ramps	Northbound (On-Ramp)	445	430 (-15)
		Southbound (Off-Ramp)	301	303 (+2)

## 4.2 Intersection performance comparison

Table 3 and Table 4 present the Putty Road interchange performance comparisons between the approved project and the proposed modification for the morning (AM) and afternoon (PM) peak periods. Overall, the proposed modification shows a very slight increase in average delay per vehicle, during both peak periods, whilst travelling through the Putty Road interchange (combined delay of two roundabouts), even though the Putty Road interchange saw a slight decline in traffic flow with the adoption of the proposed modification (as discussed in Section 4.1). This slight increase in delay is as a result of the proposed modification introducing an additional intersection/roundabout along some routes, when travelling through the interchange.

During the AM peak period, the largest increase in average vehicle delay, related to the adoption of the proposed modification, was three seconds, which occurred during the 1<sup>st</sup> morning peak hour. Whereas the PM peak period saw an overall increase in average vehicle delay of 1 second, related to the adoption of the proposed modification.

Overall, with both the approved project and proposed modification, the roundabout operates at acceptable levels of performance (LoS A) during all peak hours with low average delays (time that vehicle is delayed at the approach of the intersection).

**Table 3 2046 AM peak period intersection performance comparison**

Intersection performance	05:30 - 06:30				08:30 - 09:30			
	Approved project		Proposed modification		Approved project		Proposed modification	
Intersection	Ave. Delay (sec/veh)	LoS	Ave. Delay (sec/veh)	LoS	Ave. Delay (sec/veh)	LoS	Ave. Delay (sec/veh)	LoS
Putty Road interchange – eastern terminal roundabout	3	A	4 (+1)	A	6	A	3 (-3)	A
Putty Road interchange – western terminal roundabout	-	-	2 (+2)	A	-	-	2 (+2)	A
<b>Combined Putty Road interchange</b>	<b>3</b>	<b>A</b>	<b>6 (+3)</b>	<b>A</b>	<b>6</b>	<b>A</b>	<b>5 (-1)</b>	<b>A</b>

**Table 4 2046 PM peak period intersection performance comparison**

Intersection performance	16:00 - 17:00			
	Approved project		Proposed modification	
Intersection	Ave. Delay (sec/veh)	LoS	Ave. Delay (sec/veh)	LoS
Putty Road interchange – eastern terminal roundabout	6	A	4 (-2)	A
Putty Road interchange – western terminal roundabout	-	-	3 (+3)	A
<b>Combined Putty Road interchange</b>	<b>6</b>	<b>A</b>	<b>7 (+1)</b>	<b>A</b>

### 4.3 Travel time comparison

Three travel time routes were considered for travel time performance comparison for the proposed modification, corresponding to the previously reported travel time routes in the approved project. The three routes that were considered are shown in Figure 5, and included:

- Route 1 – New England Highway, between New England Highway south and New England Highway north (both directions)
- Route 2 – John Street/Queen Street, between Putty Road west and Gresford Road east (both directions)
- Route 5 – Singleton Bypass, between New England Highway south and New England Highway north (both directions).



Figure 5 Travel time routes (Source: Singleton bypass Concept Design and Environmental Assessment, Traffic Assessment Report – Addendum, Revision 2, 08-Sep-2021)

Table 5 and Table 6 present the peak period travel time comparisons between the approved project and the proposed modification, for the morning (AM) and afternoon (PM). Overall, both the AM and PM peak periods saw very similar travel times on the three routes between the approved project and the proposed modification.

During the AM peak period, with the adoption of the proposed modification, the largest increase in travel time was seven seconds (on New England Highway northbound), and the largest reduction in travel time was 17 seconds (on the Singleton bypass northbound). During the PM peak period, the largest increase in travel time was one second (on John Street/Queen Street southbound), and the largest reduction in travel time was 18 seconds (on New England Highway northbound).

Overall, the travel times see minimal changes, holding similar travel times between the approved project and proposed modification. The slight travel time increases and decreases are attributed to the slight shift in traffic flow between the Singleton bypass and New England Highway as a result of the adoption of the proposed modification, as discussed in Section 4.1.

**Table 5 2046 AM peak period travel time comparison**

Route	Time Period	Northbound		Southbound	
		Approved project	Proposed modification	Approved project	Proposed modification
Route 1 – New England Highway	05:30 – 06:30	14:29	14:35 (+0:06)	09:15	09:13 (-0:02)
	08:30 – 09:30	10:20	10:27 (+0:07)	09:44	09:41 (-0:03)
Route 2 – John Street / Queen Street	05:30 – 06:30	05:07	05:05 (-0:02)	05:02	05:05 (+0:03)
	08:30 – 09:30	05:58	05:57 (-0:01)	05:22	05:27 (+0:05)
Route 5 – Singleton Bypass	05:30 – 06:30	07:56	07:39 (-0:17)	05:40	05:40 (0:00)
	08:30 – 09:30	05:58	05:57 (-0:01)	05:45	05:45 (0:00)

**Table 6 2046 PM peak period travel time comparison**

Route	Time Period	Northbound		Southbound	
		Approved project	Proposed modification	Approved project	Proposed modification
Route 1 – New England Highway	16:00 – 17:00	10:47	10:29 (-0:18)	09:47	09:44 (-0:03)
Route 2 – John Street / Queen Street	16:00 – 17:00	05:35	05:34 (-0:01)	04:57	04:58 (+0:01)
Route 5 – Singleton Bypass	16:00 – 17:00	05:58	05:58 (0:00)	05:50	05:50 (0:00)

## 4.4 Overall network performance comparison

Table 7 presents the peak periods' overall network performance comparisons between the approved project and the proposed modification. Overall, both the AM and PM peak periods recorded very similar network performance statistics between the proposed modification and the approved project.

During both the AM and PM peak periods, the proposed modification resulted in less vehicle kilometres and hours being travelled. The average network travel speed and number of completed trips however remained very similar between the proposed modification and the approved project.

**Table 7 2046 AM and PM peak period network performance comparison**

Network performance statistic	AM Period		PM Period	
	Approved project	Proposed modification	Approved project	Proposed modification
Vehicle Kilometres Travelled (km) –	128,224	127,749 (-475)	124,805	124,450 (-355)
Vehicle Hours Travelled (hrs) – VHT	2,283	2,260 (-23)	2,205	2,203 (-2)
Average Network Speed (km/h)	55	55 (0)	52	53 (+1)
Completed Trips (veh)	21,991	21,984 (-7)	24,712	24,707 (-5)
Incomplete Trips (veh)	479	483 (+4)	714	720 (+6)
Unreleased Trips (veh)	-	-	2	2 (0)
Delay for Unreleased Trips (hrs)	-	-	-	-

# 5 Conclusion

Due to modifications being made to the Project's approved project, a third addendum REF is being prepared to assess the potential environmental impacts of the proposed modification. This report serves as a specialist traffic study in support of the proposed modification. It presents the traffic performance of the proposed modification in comparison to the traffic performance of the approved project.

The traffic performance comparison focusses on the 2046 horizon year (being the worst-case scenario), and only considers the Putty Road interchange and surrounds, which is the only area of the proposed modification which has been functionally modified.

Traffic performance comparisons focussed on four traffic performance criteria. The following conclusions are drawn from each of the traffic performance criteria, when comparing the performance of the proposed modification against the approved project:

- Traffic flow comparison
  - With the adoption of the proposed modification, both the AM and PM peak periods saw a slight decline in traffic flows along the Singleton bypass, and through the Putty Road interchange. These traffic flow reductions are however minor in comparison to the overall flow on the Singleton bypass – maximum reduction of 60 vehicles during AM peak and 70 during PM peak.
  - The reduced traffic flow is as a result of the available route options from the Singleton town centre having similar preferences to using the Singleton bypass via the Putty Road interchange or using New England Highway and are therefore sensitive to road network changes. The proposed modification slightly reduces the preference of using the Singleton Bypass by slightly increasing the travel distance, and slightly increasing the delay along this route with the introduction of the 2nd roundabout.
- Intersection performance (average delay and Level of Service) comparison
  - The proposed modification shows a slight increase in vehicle delay, during both peak periods, when travelling through the Putty Road interchange, in comparison to the approved project. This is however only a minor increase, with the maximum increase being 3 seconds during the AM peak period.
  - As with the approved project, the proposed modification operates at low delays, resulting in acceptable levels of performance (LoS A) during all peak hours.
- Travel time comparison
  - The proposed modification and approved project produced very similar travel times along the three routes that were considered.
  - With the adoption of the proposed modification, the largest increase in travel time was observed during the AM peak period on New England Highway northbound, which increased with 7 seconds. The largest decrease in travel time was also observed on New England Highway northbound, but during the PM peak period, seeing a decrease of 18 seconds.
- Overall network performance
  - The AM and PM peak periods recoded very similar network performance statistics between the proposed modification and the approved project.
  - During both the AM and PM peak periods, the proposed modification resulted in less vehicle kilometres and hours being travelled, and the average network travel speed and number of completed trips remained very similar between the proposed modification and the approved project.

Overall, the proposed modification at the Putty Road interchange is expected to result in the same level of reliability and performance as was previously reported for the approved project.



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