

# TRAFFIC ANALYSIS FOR REDUCED ROAD INFRASTRUCTURE

## EAST GUNGAHLIN HIGH SCHOOL, KENNY

NOVEMBER 2020



**CANBERRA**

CQ1, Level 5,  
68 Northbourne Avenue  
Canberra City ACT 2601  
**Phone:** (02) 6285 1022

**SYDNEY**

Suite 401 Level 4  
24 Hunter Street  
PARRAMATTA NSW 2150  
**Phone:** (02) 9633 2273

**WOLLONGONG**

Suite 1 Ground Floor  
25 Atchison Street  
WOLLONGONG NSW 2500  
**Phone:** (02) 4288 4401

**Web:** [www.indesco.com.au](http://www.indesco.com.au)

**Email:** [Indesco@indesco.com.au](mailto:Indesco@indesco.com.au)

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Prepared by:	██████████	Date:	18/11/2020
Reviewed by:	██████████	Date:	18/11/2020
Approved by:	██████████	Date:	19/11/2020

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## EXECUTIVE SUMMARY

### INTRODUCTION

Indesco has been engaged by Major Projects Canberra (MPC) on behalf of Transport Canberra and City Services (TCCS) to undertake a Traffic Impact Assessment (TIA) of the proposed East Gungahlin High School (EGHS) in Kenny. This report presents the analysis of additional road upgrade scenarios under the 2023 and 2031 future analysis years with the proposed development.

### TRAFFIC ANALYSIS

It is noted that the traffic demands adopted in these additional scenarios remain identical to the 2023 and 2031 EGHS Case traffic demands adopted in the previous analysis. Only the road upgrades considered in each scenario have been altered as summarised below.

#### ADDITIONAL 2023 SCENARIOS

The additional 2023 scenarios include **Works Packages A and E** to provide access to the Park & Ride Facility and to the initial stage of the proposed Kenny development. It is noted that Works Package E is also expected to improve pedestrian safety and amenity at the northeast corner of the subject site. Furthermore, **Works Package N** has also been included to improve pedestrian safety and amenity at the northwest corner of the subject site, the anticipated location of a key pedestrian desire-line across Well Station Drive. It is noted that the duplication of Well Station Drive has been omitted from Works Package N to avoid the need to carry the duplicated cross-section through adjacent intersections.

Under the 2023 EGHS Case traffic demands the road network, with the aforementioned works packages, is expected to generally operate satisfactorily. However, excessive delays (LOS F) are expected on the west approaches to the Horse Park Drive / Well Station Drive / Bettong Avenue and Well Station Drive / Nullarbor Avenue intersections during the AM commuter peak hour. These delays are due to a lack of capacity for the right-turn movement from Well Station Drive onto Horse Park Drive and the subsequent long queues, which extend back from this intersection, beyond the Well Station Drive / Nullarbor Avenue intersection. Similarly, the maximum queues on the east approach to the Flemington Road / Well Station Drive intersection (during all three of the analysed peak hours) are expected to extend back to block the Park & Ride Access.

#### ADDITIONAL 2031 SCENARIOS

In addition to **Works Packages A, E and N** as adopted in the additional 2023 scenarios, **Works Packages G and L** have been included in the additional 2031 scenarios to provide access to the latter stages of the proposed Kenny development and to provide an additional point of access to the School Loop Road.

Under the 2031 EGHS Case traffic demands significant delays and queueing are expected on the road network within the study area during the AM and PM commuter peak hours. This congestion is primarily due to a lack of capacity on the south, east and west approaches to the Flemington Road/ Well Station Drive intersection.

While previous analysis has demonstrated that this poor performance of the road network is not directly the result of the additional traffic demands associated with the proposed EGHS, it is recommended that consideration be given to infrastructure works or other measures to mitigate the significant congestion expected within the study area.

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## 1. INTRODUCTION

Indesco has been engaged by Major Projects Canberra (MPC) on behalf of Transport Canberra and City Services (TCCS) to undertake a Traffic Impact Assessment (TIA) of the proposed East Gungahlin High School (EGHS) in Kenny.

To date, two (2) reports have been prepared by Indesco detailing the development of a microsimulation traffic model (*Microsimulation Calibration and Validation Report for East Gungahlin High School Kenny TIA*, Reference 7281, Final Issue, dated 31 August 2020) as well as assessments into the public transport, active travel, road network impacts and parking associated with the proposed development (*Transport Impact Assessment Report for East Gungahlin High School, Kenny*, Reference 7281, Third Issue, dated 6 November 2020).

This report presents the analysis of additional road upgrade scenarios under the 2023 and 2031 future analysis years with the proposed development (i.e. EGHS Case).

## 2. PROPOSED DEVELOPMENT

As detailed in the previous report, *Transport Impact Assessment Report for East Gungahlin High School, Kenny*, the proposed development is primarily for a new high school, projected to accommodate 800-1,000 students. In addition to the high-school, provision has also been made on the subject site for a primary school (600-750 students) and a pre-school (44 places). Classes at the high school are forecast to commence in 2023, while the primary school and pre-school have been assumed to begin operation in 2031.

As shown in 'yellow' at Figure 1 below, the proposed school site is located on the south side of Well Station Drive between Albatross Crescent (West) and the Old Well Station Track.

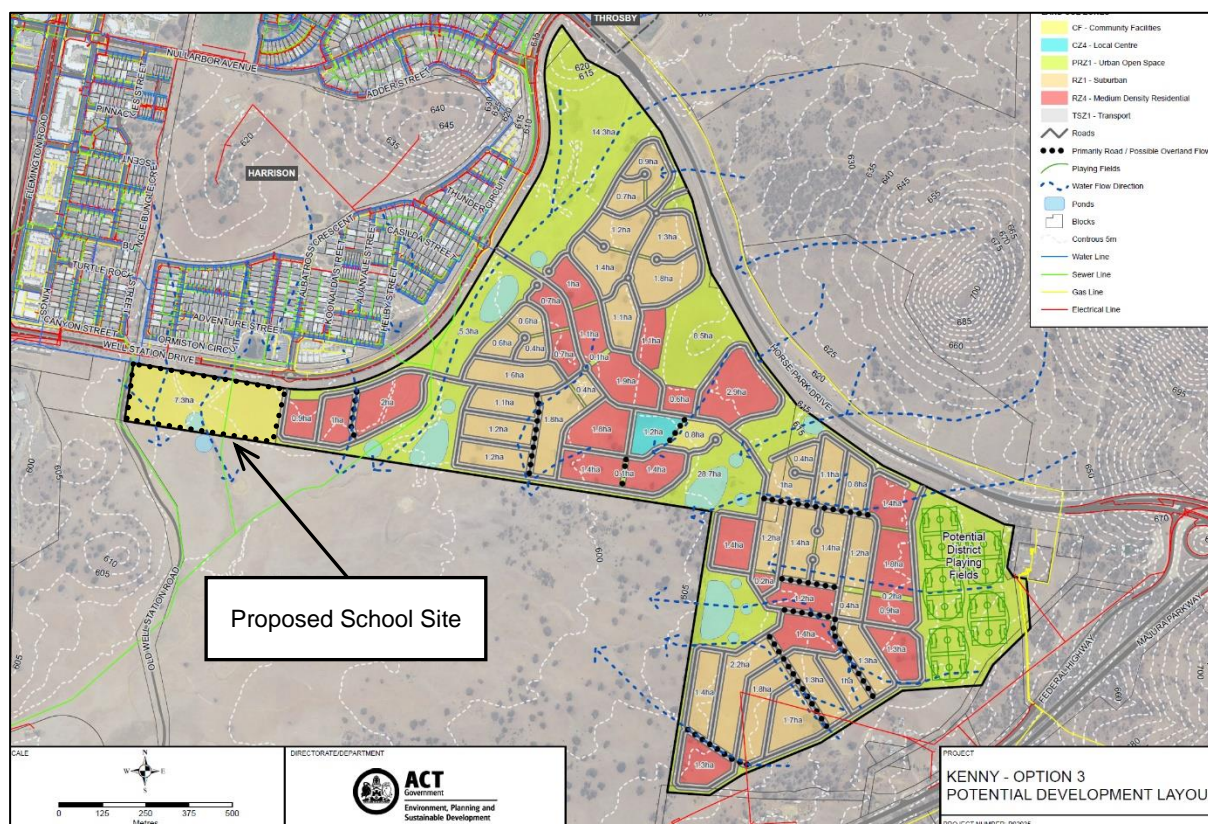


Figure 1. Kenny – Potential Development Layout – Option 3



### 3. BACKGROUND INFORMATION

#### 3.1 CALIBRE (2019) TRAFFIC IMPACT ASSESSMENT

A previous TIA for the EGHS site was undertaken by Calibre in late 2019. This assessment was based on the proposed school site being located to the west of the currently proposed site, generally between Flemington Road and Kings Canyon Street.

This assessment utilised microsimulation (Aimsun) to model a network generally including Flemington Road and Well Station Drive (to Albatross Crescent West). A diagram showing the location of the previous school site and extent of traffic modelling for the previous Calibre study is provided in Figure 2 below.

A summary of the previous assessments undertaken by Calibre is provided in a report titled *East Gungahlin High School – Traffic Impact Assessment Report*, Reference 19-000716, Version 4, dated 14 February 2020.

Calibre have provided their previous Aimsun model to TCCS to be utilised as part of subsequent studies.



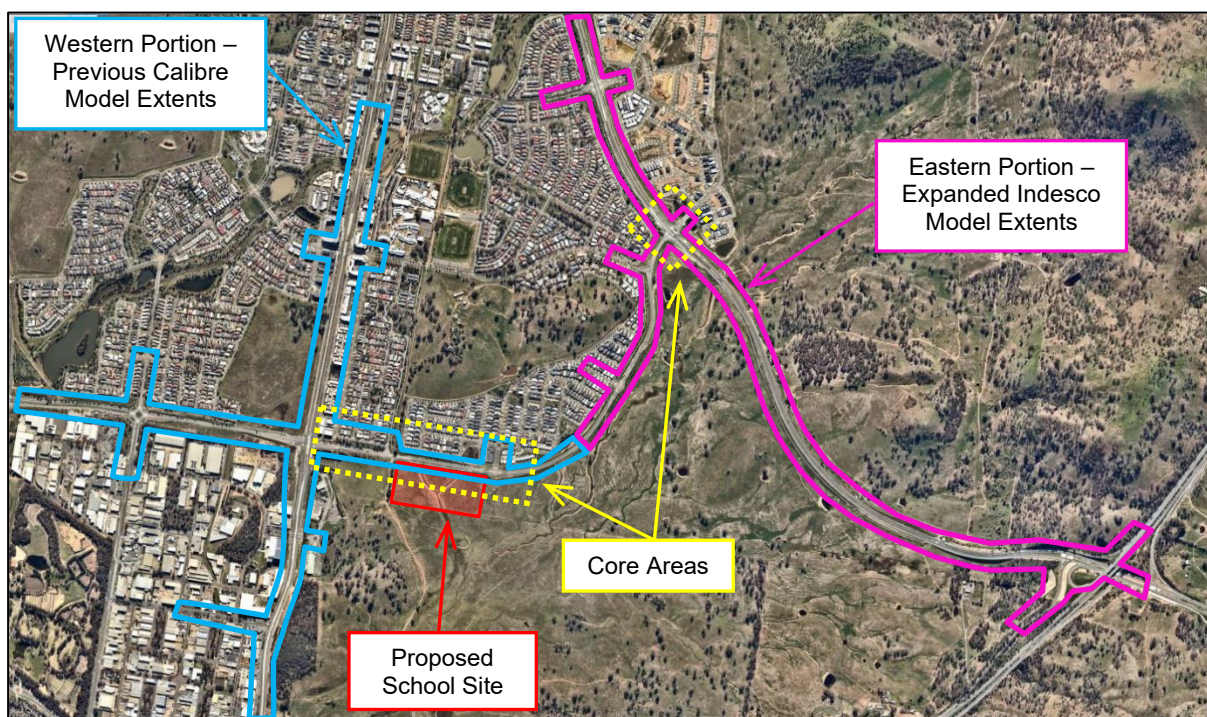
Figure 2. Previous Calibre TIA (2019) – Modelling Scope & Extent (Aerial Source: ACTMAPi)

#### 3.2 INDESCO (2020) TRAFFIC IMPACT ASSESSMENT

A more recent TIA for the EGHS site was undertaken by Indesco in 2020. This assessment was commissioned due to the relocation of the proposed school to the currently proposed site, on the south side of Well Station Drive, between Kings Canyon Street and Albatross Crescent West. On this basis, TCCS requested that traffic impacts be considered on a wider basis than the Calibre study, with the traffic modelling expanded further east to include the remaining sections of Well Station Drive and sections of Horse Park Drive.

The traffic assessments again utilised a microsimulation model (Aimsun), building on the previous Calibre model to include the additional sections of the road network. The general structure and nature of the Calibre model was generally retained for the west portion of the model.

A summary of the assessments undertaken by Indesco prior to this analysis, are presented in the previous report, *Transport Impact Assessment Report for East Gungahlin High School, Kenny*. The proposed school location and the extents of the Indesco microsimulation model are presented at Figure 3 below. This model also forms the basis of additional traffic analysis, the subject of this report.



**Figure 3. Previous Indesco TIA (2020) – Modelling Scope & Extents (Aerial Source: Nearmap)**

## 4. EXISTING CONDITIONS

### 4.1 ROAD NETWORK

#### 4.1.1 Well Station Drive

Well Station Drive is an arterial road extending in an east-west direction between Gungahlin Drive in the west and Horse Park Drive in the east.

In the vicinity of the subject site, Well Station Drive includes a single traffic lane in each direction, with sealed shoulders providing for on-road cycling.

Adjacent to the proposed school site, the intersection with Albatross Crescent West is controlled by a single lane roundabout with east-west off-road bicycle bypasses. The intersection with Kings Canyon Street is sign controlled (give-way) with left and right turn lanes provided on Well Station Drive.

A shared path is provided along the north side of Well Station Drive, adjacent to the existing residential properties within Harrison.

Well Station Drive has a posted speed limit of 80km/h.

Photographs of Well Station Drive adjacent to the subject site are provided in Figure 4 and Figure 5 below.





**Figure 4. Well Station Drive (View East)**



**Figure 5. Well Station Drive (View West)**

#### 4.1.2 Flemington Road

Flemington Road is an arterial road extending in a north-south direction between Kate Crace Street in the north and Federal Highway in the south.

In the vicinity of the subject site, Flemington Road includes two traffic lanes and on-road bicycle lanes in each direction. In the section to the north of Well Station Drive, a service road is located on the east side of the road with various entry / exit points to the main Flemington Road carriageway.

The intersection of Flemington Road and Well Station Drive is controlled by traffic signals, which facilitates signalised pedestrian crossings at the intersection.

The Canberra Light Rail operates within the median along Flemington Road, with a stop located on the south side of the Flemington Road / Well Station Drive intersection.

A shared path is provided on the east side of the road to the south of the Well Station Drive intersection and on the west side of the road to the north of the Well Station Drive intersection.

A posted speed limit of 70km/h applies to Flemington Road.

Photographs of Flemington Road are provided in Figure 6 and Figure 7 below.



**Figure 6. Flemington Road (View North)**



**Figure 7. Flemington Road (View South)**

#### 4.1.3 Horse Park Drive

Horse Park Drive is a major arterial road extending in a north-south direction between Gungahlin Drive in the north and Federal Highway in the south (where it continues as Majura Parkway).

In the vicinity of the subject site, Horse Park Drive includes two traffic lanes and on-road bicycle lanes (sealed shoulders) in each direction.

The intersection with Well Station Drive / Bettong Avenue is controlled by traffic signals, with movements to/from Bettong Avenue limited to left in / left out only.

A shared path is generally provided on the east side of road to the north of the Well Station Drive / Bettong Avenue intersection and on the west side of the road to the south of the Well Station Drive / Bettong Avenue intersection.

Horse Park Drive has a posted speed limit of 80km/h.

Photographs of Horse Park Drive are provided in Figure 8 and Figure 9 below.



**Figure 8. Horse Park Drive (View South)**



**Figure 9. Horse Park Drive (View North)**

#### 4.1.4 Albatross Crescent

Albatross Crescent is a local access street extending in a 'loop' configuration through the Harrison residential area, connecting to Well Station Drive at each end.

Albatross Crescent includes a single traffic lane in each direction separated by a centre median at the western end, with a typical local street cross section for the remaining length.

Albatross Crescent is subject to the default urban speed limit of 50km/h.

#### 4.1.5 Kings Canyon Street

Kings Canyon Street is a local access street that extends generally in a north-south direction between Nullarbor Avenue in the north and Well Station Drive in the south.

In the vicinity of the subject site, Kings Canyon Street includes a single traffic lane in each direction.

Kings Canyon Street is subject to the default urban speed limit of 50km/h.

### 4.2 MICROSIMULATION TRAFFIC MODELLING

The traffic impacts for this project have been assessed utilising a microsimulation model. This model has been prepared utilising Aimsun Next 20, the current version of the Aimsun software package.

Model development, calibration and validation has been detailed in a previous report from August 2020, titled *Microsimulation Calibration and Validation Report for East Gungahlin High School Kenny TIA*. Furthermore, the existing conditions road network performance has been detailed in a subsequent report, dated November 2020, titled *Traffic Impact Assessment Report for East Gungahlin High School, Kenny*.

### 4.3 TRAFFIC CONDITIONS

For comparison purposes, the following sections summarise the existing performance of the road network, as presented in the *Traffic Impact Assessment Report for East Gungahlin High School, Kenny*.

The existing operation of the road network was assessed on a network wide basis (overall model) and in a more detailed manner for the intersections within the core area of the model.

A summary of the existing performance for the three (3) peak periods is provided below. Table 1 presents a summary of the network wide performance, whilst the key intersection performance is provided in Table 2.

The traffic demands adopted for the existing conditions, along with full results from the existing conditions model are presented in *Traffic Impact Assessment Report for East Gungahlin High School, Kenny*.

**Table 1. Network-Wide Performance Summary – Existing Conditions**

Performance Measure	AM Commuter Peak		PM School Peak		PM Commuter Peak	
	All Vehicles	Public Transport	All Vehicles	Public Transport	All Vehicles	Public Transport
VKT [km]	28,227.99	87.34	18,190.39	66.34	26,940.93	72.79
VHT [hours]	550.99	2.96	288.02	2.22	556.96	2.54
Average Flow [veh/h]	8,048.20	21.62	5,919.00	19.78	8,181.20	17.08
Average Speed [km/h]	52.40	31.65	60.67	29.57	51.27	28.32
Average Density [veh/km]	8.60	0.02	4.52	0.02	9.17	0.02
Average Travel Time [s/km]	82.78	163.74	74.05	168.38	84.31	154.62
Average Delay Time [s/km]	37.17	57.55	26.68	56.00	38.71	45.29
Total Stops	15,962.20	115.00	6,220.00	91.20	18,837.40	93.60
Total Missed Turns	14.80	0.00	11.60	0.00	15.40	0.00
Vehicles Waiting to Enter [veh]	226.20	0.00	0.20	0.00	38.60	0.00

**Table 2. Key Intersections Performance Summary – Existing Conditions**

Approach	AM Commuter Peak			PM School Peak			PM Commuter Peak		
	Delay	LOS	Queue	Delay	LOS	Queue	Delay	LOS	Queue
<b>Flemington Road / Well Station Drive – Traffic Signals</b>									
S: Flemington Rd	36s	C	50m	25s	B	88m	20s	B	69m
E: Well Station Dr	31s	C	191m	26s	B	183m	34s	C	125m
N: Flemington Rd	22s	B	119m	32s	C	60m	34s	C	55m
W: Well Station Dr	44s	D	180m	21s	B	121m	25s	B	153m
<b>TOTAL</b>	<b>29s</b>	<b>C</b>	<b>191m</b>	<b>26s</b>	<b>B</b>	<b>183m</b>	<b>26s</b>	<b>B</b>	<b>153m</b>
<b>Well Station Drive / Kings Canyon Street – ‘Give-Way’ Control</b>									
E: Well Station Dr	3s	A	7m	3s	A	1m	3s	A	0m
N: Kings Canyon St	1s	A	19m	1s	A	7m	2s	A	8m
W: Well Station Dr	2s	A	7m	2s	A	5m	2s	A	8m
<b>TOTAL</b>	<b>3s</b>	<b>A</b>	<b>19m</b>	<b>3s</b>	<b>A</b>	<b>7m</b>	<b>3s</b>	<b>A</b>	<b>8m</b>
<b>Well Station Drive / Albatross Crescent West - Roundabout</b>									
E: Well Station Dr	3s	A	44m	2s	A	13m	2s	A	12m
N: Albatross Cr W	2s	A	27m	1s	A	7m	1s	A	7m
W: Well Station Dr	4s	A	19m	3s	A	22m	3s	A	30m
<b>TOTAL</b>	<b>4s</b>	<b>A</b>	<b>44m</b>	<b>3s</b>	<b>A</b>	<b>22m</b>	<b>3s</b>	<b>A</b>	<b>30m</b>

Approach	AM Commuter Peak			PM School Peak			PM Commuter Peak		
	Delay	LOS	Queue	Delay	LOS	Queue	Delay	LOS	Queue
<b>Well Station Drive / Albatross Crescent East – Roundabout</b>									
E: Well Station Dr	3s	A	22m	3s	A	22m	3s	A	19m
N: Albatross Cr E	1s	A	7m	1s	A	7m	1s	A	10m
W: Well Station Dr	4s	A	22m	4s	A	22m	3s	A	19m
<b>TOTAL</b>	<b>4s</b>	<b>A</b>	<b>22m</b>	<b>4s</b>	<b>A</b>	<b>22m</b>	<b>3s</b>	<b>A</b>	<b>19m</b>
<b>Well Station Drive / Nullarbor Avenue – ‘Give-Way’ Control</b>									
S: Well Station Dr	4s	A	20m	2s	A	9m	2s	A	19m
N: Well Station Dr	6s	A	6m	6s	A	5m	6s	A	14m
W: Nullarbor Av	14s	A	85m	2s	A	48m	4s	A	40m
<b>TOTAL</b>	<b>14s</b>	<b>A</b>	<b>85m</b>	<b>6s</b>	<b>A</b>	<b>48m</b>	<b>6s</b>	<b>A</b>	<b>40m</b>
<b>Horse Park Drive / Well Station Drive / Bettong Avenue – Traffic Signals</b>									
S: Horse Park Dr	17s	B	71m	13s	A	104m	20s	B	211m
E: Bettong Av	9s	A	13m	3s	A	6m	2s	A	2m
N: Horse Park Dr	35s	C	318m	12s	A	88m	18s	B	79m
W: Well Station Dr	52s	D	213m	20s	B	89m	56s	D	147m
<b>TOTAL</b>	<b>34s</b>	<b>C</b>	<b>318m</b>	<b>14s</b>	<b>A</b>	<b>104m</b>	<b>24s</b>	<b>B</b>	<b>211m</b>

Under the existing conditions, all core intersections operate at LOS C or better in all three (3) analysis peak hours. A summary of the key performance measures at each core intersection is provided below:

- **Flemington Road / Well Station Drive:** The intersection operates well in all three (3) peak hours. The west approach (Well Station Drive) is critical, in the AM commuter peak hour, with an average delay of 44s (LOS D). The maximum queue length (191m) occurs in the through lane on the west approach (Well Station Drive), during the AM commuter peak hour.
- **Kings Canyon Street / Well Station Drive:** The intersection operates well with average delays of 3s or less (LOS A) on all approaches, during all three (3) peak hours. The maximum queue length (19m) occurs in the left-turn lane on the north approach (Kings Canyon Street) during the AM commuter peak hour.
- **Well Station Drive / Albatross Crescent West:** The intersection operates well with average delays of 4s or less (LOS A) on all approaches, during all three (3) peak hours. The maximum queue length (44m) occurs on the east approach (Well Station Drive) during the AM commuter peak hour.
- **Well Station Drive / Albatross Crescent East:** The intersection operates well with average delays of 4s or less (LOS A) on all approaches, during all three (3) peak hours. The maximum queue length (22m) occurs on both the east and west approaches (both Well Station Drive), during both the AM and PM school peak hours.
- **Well Station Drive / Nullarbor Avenue:** The intersection operates well with average delays of 14s or less (LOS A), during all three (3) peak hours. The maximum queue length (85m) occurs in the right-turn lane on the west approach (Nullarbor Avenue) during the AM commuter peak hour.
- **Horse Park Drive / Well Station Drive / Bettong Avenue:** The overall intersection operates at LOS C, however, the right turn from the north approach (Horse Park Drive) operates with long average delays (122s, LOS F). This is due to some vehicles having to wait multiple cycles to complete the turn. The maximum queue length for the right turn (128m), exceeds the length of the right turn lane. Other movements at the intersection generally operate well, with the other critical movement being the right turn from Well Station Drive (57s, LOS E). The maximum queue length in this lane (213m), extends back to block the Well Station Drive / Nullarbor Avenue intersection.



## 5. FUTURE CONDITIONS

This analysis assesses the operation of the proposed road network in the future with contributions from a range of nearby developments, including the EGHS.

### 5.1 ASSESSMENT HORIZON YEARS

The future horizon years have been adopted, as 2023 and 2031, to match the previous assessments. The 2023 horizon year represents the first year of operation for the EGHS, whilst the 2031 horizon year represents the anticipated full build-out of the surrounding land uses.

### 5.2 TRAFFIC GROWTH AND NEARBY DEVELOPMENTS

A summary of the key developments surrounding the subject site that have been included in this modelling is provided below.

- **2023:**
  - EGHS – 800 high school students,
  - Kenny – 200 dwellings, and
  - Park & Ride – 200 car parking spaces.
- **2031:**
  - EGHS – 1,000 high school students, 750 primary school students and 44 pre-school places,
  - Kenny – 1,500 dwellings (full build-out), and
  - Park and Ride – 200 car parking spaces.

In addition to the key developments identified above, a broader growth in background traffic demands was adopted based on outputs from the Canberra Strategic Transport Model (CSTM). After omitting traffic demands associated with the Kenny development, linear annual growth rates of 1.05%, 0.60% and 0.60% were adopted for the AM commuter, PM school and PM commuter peak hours, respectively. Further details of the anticipated travel demand associated with each of the key developments and the calculation of the background growth rates are presented in the *'Traffic Impact Assessment Report for East Gungahlin High School, Kenny'*.

### 5.3 TRAFFIC CONDITIONS

The following sections describe the modifications to the road network and the anticipated traffic conditions within the study area under the 2023 and 2031 future scenarios. The future scenarios described below are based on the 2023 and 2031 EGHS Case traffic demands as described in the *'Traffic Impact Assessment Report for East Gungahlin High School, Kenny'*.

#### 5.3.1 Additional 2023 Scenarios

The following sections summarise the road upgrades and the performance of the road network under the additional 2023 scenarios.

#### Scenario Road Network

The road upgrades adopted under the additional 2023 scenarios are principally required in order to provide access to future developments located within the study area, including the proposed EGHS. This includes Works Package A to provide access to the Park & Ride Facility and Works Package E to provide access to both the initial stage of the proposed Kenny development and to the subject site.

Also included in this scenario is Works Package N (traffic signals at Kings Canyon Street / Well Station Drive). This upgrade has been adopted under this scenario to improve safety and amenity for pedestrians wishing to cross Well Station Drive in the vicinity of the high school. It is noted that this works package involves the retention of the two-lane, two-way cross-section along Well Station Drive, rather than the duplicated cross-section as adopted in the previous analysis (Works Package M). This is due to the cascading effect of additional upgrade works that result from the reconstruction of Well Station Drive in a duplicated (four-lane, two-way) arrangement.

#### Works Package A – Park & Ride Access

Works Package A includes a new sign-controlled 'T'-intersection on Well Station Drive, between Flemington Road and Kings Canyon Street. This package of works is required to provide access to the proposed Park & Ride Facility.

The model represents these works as a priority-controlled ‘seagull’-intersection, located midway between the Flemington Road and Kings Canyon Street intersections on Well Station Drive, as shown at Figure 10 below. An auxiliary left-turn lane (90m length) and a channelised right-turn lane (60m length) provide access to the Park & Ride Facility, while vehicles exit the facility via a single lane, providing for both the left- and right-turns onto Well Station Drive. Median storage (approximately 6m length) is provided for vehicles exiting the facility and turning right. The model reflects this general arrangement irrespective of the cross-section of Well Station Drive adjacent to the Park & Ride Access (i.e. unduplicated: two-lane, two-way, or duplicated: four-lane, two-way).



Figure 10. Works Package A – Park & Ride Access

### Works Package E – Albatross Crescent West / Well Station Drive: Traffic Signals

Works Package E primarily includes the signalisation of the Albatross Crescent West / Well Station Drive intersection. This package of works is recommended to improve access to the school site for pedestrians and buses.

The model represents these works as a signalised cross-intersection with two (2) approach and one (1) departure lane on the south leg, four (4) approach and two (2) departure lanes on the east leg, one (1) approach and one (1) departure lane on the north leg and four (4) approach and two (2) departure lanes on the west leg. For pedestrian safety, all left-turns at the intersection are signalised (i.e. no high-angle left-turns) and traffic signal timings have been developed assuming pedestrian signals are called at least 80% of signal cycles during the AM commuter and PM school peak hours. At all times, the intersection operates with single diamond overlap signal phasing on the east and west approaches and with split approach signal phasing on the north and south approaches.

Also included as part of this works package is a roundabout at the southeast corner of the subject site to provide access to the initial stages of the proposed Kenny development, the School Loop Road and to enable school buses to undertake a U-turn to access the bus stops located along the eastern frontage of the school site.

The model represents these additional works as a three-legged roundabout providing access to the north (Albatross Crescent West extension), east (Kenny West Access Road) and west (School Loop Road).

Figure 11 below presents the model representation of Works Package E.



**Figure 11. Works Package E – Albatross Crescent West / Well Station Drive: Traffic Signals**

#### **Works Package N – Kings Canyon Street / Well Station Drive: Traffic Signals**

Works Package N primarily includes the signalisation of the Kings Canyon Street / Well Station Drive intersection. This package of works is recommended to improve access to the school site for pedestrians. As aforementioned, Well Station Drive has not been duplicated as part of this works package (unlike Works Packages E and M, above and in the previous analysis, respectively). This is due to the significant additional works that would be required to appropriately tie the duplicated cross-section into the adjacent intersections. It is therefore noted that future-proofing in the case of a broader duplication of Well Station Drive is a significant limitation of this works package, particularly compared to Works Package M as analysed previously.

The model represents these works as a signalised 'T'-intersection with two (2) approach and one (1) departure lane on the east and west legs and single approach and departure lanes on the north leg. For pedestrian safety, all left-turns at the intersection are signalised (i.e. no high-angle left-turns) and traffic signal timings have been developed assuming pedestrian signals are called at least 80% of signal cycles during the AM commuter and PM school peak hours. At all times, the intersection operates with standard three-phase 'T'-intersection signal phasing.

Figure 12 below presents the model representation of Works Package N.





**Figure 12. Works Package N – Kings Canyon Street / Well Station Drive: Traffic Signals**

### Network Wide Performance Summary

A summary of the overall network wide operation in the additional 2023 scenarios are presented in Table 3 below.

The traffic demands adopted for the additional 2023 scenarios are identical to those adopted under the 2023 EGHS Case scenarios presented in the previous analysis. These traffic demands are presented at Appendix A, while full results are presented at Appendix B.

**Table 3. Network-Wide Summary – Additional 2023 Scenarios**

Performance Measure	AM Commuter Peak		PM School Peak		PM Commuter Peak	
	All Vehicles	Public Transport	All Vehicles	Public Transport	All Vehicles	Public Transport
VKT [km]	30,720.53	108.98	20,051.31	89.33	27,788.95	78.06
VHT [hours]	631.64	4.72	337.31	3.59	647.75	3.02
Average Flow [veh/h]	8,978.40	26.81	6,503.60	24.24	8,578.60	20.99
Average Speed [km/h]	49.60	23.99	58.52	26.42	47.86	25.18
Average Density [veh/km]	9.55	0.03	5.09	0.03	10.42	0.02
Average Travel Time [s/km]	89.67	206.10	74.62	171.65	91.23	205.21
Average Delay Time [s/km]	43.77	89.86	28.45	58.39	45.85	89.03
Total Stops	19,178.60	192.00	8,350.40	147.20	24,545.40	121.60
Total Missed Turns	56.80	0.00	53.80	0.00	51.40	0.00
Vehicles Waiting to Enter [veh]	373.00	0.00	0.20	0.00	151.60	0.00



The network performance summaries for the 2023 EGHS Case with Minimal Road Upgrades demonstrate the broad impacts of the additional traffic demands on the road network (associated with background growth plus a range of developments including the proposed school), compared to the 2019 Existing Conditions. In the AM commuter peak hour, the total distance travelled by vehicles in the network (VKT) is expected to increase (by 8.8%). The total travel time of vehicles in the network (VHT) is expected to increase (by 14.6%). This reflects a marginal increase in congestion as indicated by the decrease in average vehicle speeds (by -5.3%) and an increase in the number of stops (by 20.2%).

### Core Area Performance Summary

Table 4 below presents a summary of the peak hour intersection performance for the core area intersections along Well Station Drive between Flemington Road and Horse Park Drive, under the additional 2023 scenarios.

**Table 4. Core Area Summary – Additional 2023 Scenarios**

Approach	AM Commuter Peak			PM School Peak			PM Commuter Peak		
	Delay	LOS	Queue	Delay	LOS	Queue	Delay	LOS	Queue
<b>Flemington Road / Well Station Drive – Traffic Signals</b>									
S: Flemington Rd	40s	C	58m	34s	C	124m	22s	B	78m
E: Well Station Dr	38s	C	261m	27s	B	192m	36s	C	202m
N: Flemington Rd	23s	B	161m	33s	C	73m	34s	C	65m
W: Well Station Dr	58s	E	241m	22s	B	156m	24s	B	151m
<b>TOTAL</b>	<b>35s</b>	<b>C</b>	<b>261m</b>	<b>29s</b>	<b>C</b>	<b>192m</b>	<b>27s</b>	<b>B</b>	<b>202m</b>
<b>Well Station Drive / Park &amp; Ride – ‘Give-Way’ Control</b>									
S: Park & Ride	1s	A	5m	1s	A	6m	1s	A	12m
E: Well Station Dr	12s	A	61m	10s	A	0m	8s	A	13m
W: Well Station Dr	4s	A	12m	2s	A	12m	2s	A	12m
<b>TOTAL</b>	<b>12s</b>	<b>A</b>	<b>61m</b>	<b>10s</b>	<b>A</b>	<b>12m</b>	<b>8s</b>	<b>A</b>	<b>13m</b>
<b>Well Station Drive / Kings Canyon Street – Traffic Signals</b>									
E: Well Station Dr	11s	A	78m	8s	A	62m	5s	A	10m
N: Kings Canyon St	35s	C	33m	31s	C	19m	26s	B	17m
W: Well Station Dr	10s	A	159m	11s	A	141m	10s	A	144m
<b>TOTAL</b>	<b>12s</b>	<b>A</b>	<b>159m</b>	<b>10s</b>	<b>A</b>	<b>141m</b>	<b>9s</b>	<b>A</b>	<b>144m</b>
<b>Well Station Drive / Albatross Crescent West – Traffic Signals</b>									
S: Albatross Cr W	26s	B	100m	26s	B	91m	28s	B	37m
E: Well Station Dr	46s	D	96m	38s	C	80m	28s	B	60m
N: Albatross Cr W	32s	C	63m	26s	B	25m	23s	B	24m
W: Well Station Dr	36s	C	96m	44s	D	127m	29s	C	56m
<b>TOTAL</b>	<b>36s</b>	<b>C</b>	<b>100m</b>	<b>37s</b>	<b>C</b>	<b>127m</b>	<b>28s</b>	<b>B</b>	<b>60m</b>
<b>Well Station Drive / Albatross Crescent East – Roundabout</b>									
E: Well Station Dr	3s	A	32m	2s	A	22m	2s	A	23m
N: Albatross Cr E	2s	A	12m	1s	A	6m	1s	A	6m
W: Well Station Dr	5s	A	32m	5s	A	22m	5s	A	23m
<b>TOTAL</b>	<b>5s</b>	<b>A</b>	<b>32m</b>	<b>5s</b>	<b>A</b>	<b>22m</b>	<b>5s</b>	<b>A</b>	<b>23m</b>

Approach	AM Commuter Peak			PM School Peak			PM Commuter Peak		
	Delay	LOS	Queue	Delay	LOS	Queue	Delay	LOS	Queue
<b>Well Station Drive / Nullarbor Avenue – ‘Give-Way’ Control</b>									
S: Well Station Dr	12s	A	147m	3s	A	25m	3s	A	29m
N: Well Station Dr	11s	A	16m	6s	A	6m	6s	A	14m
W: Nullarbor Av	1,215s	F	266m	4s	A	36m	5s	A	47m
<b>TOTAL</b>	<b>1,215s</b>	<b>F</b>	<b>266m</b>	<b>6s</b>	<b>A</b>	<b>36m</b>	<b>6s</b>	<b>A</b>	<b>47m</b>
<b>Horse Park Drive / Well Station Drive / Bettong Avenue – Traffic Signals</b>									
S: Horse Park Dr	29s	C	98m	20s	B	157m	21s	B	222m
E: Bettong Av	9s	A	14m	4s	A	6m	3s	A	7m
N: Horse Park Dr	14s	A	128m	28s	B	137m	28s	B	127m
W: Well Station Dr	73s	F	224m	18s	B	108m	32s	C	118m
<b>TOTAL</b>	<b>28s</b>	<b>B</b>	<b>224m</b>	<b>22s</b>	<b>B</b>	<b>157m</b>	<b>23s</b>	<b>B</b>	<b>222m</b>

Under the additional 2023 scenarios the following localised capacity constraints were identified at core intersections:

- **Flemington Road / Well Station Drive:**
  - Queues on the east approach (Well Station Drive) are expected to extend back to block the Well Station Drive / Park & Ride intersection during each of the three (3) analysed peak hours (261m, 192m and 202m queues, respectively, in 155m storage). The lack of capacity on this approach is due to both the single through lane arrangement and the traffic signal operation which provides strong priority for light rail services.
- **Well Station Drive / Kings Canyon Street:**
  - Queues on the west approach (Well Station Drive) are expected to extend back to block the Well Station Drive / Park & Ride intersection during the AM commuter peak hour (159m queues in 155m storage). This queue is the result of the traffic signals installed at the intersection.
- **Well Station Drive / Nullarbor Avenue:**
  - The west approach (Nullarbor Avenue) is expected to operate with an average delay of 1,215s (LOS F) during the AM commuter peak hour. This is due to the intersection being blocked by vehicles queued on the west approach to the Horse Park Drive / Well Station Drive / Bettong Avenue intersection.
- **Horse Park Drive / Well Station Drive / Bettong Avenue:**
  - The west approach (Well Station Drive) is expected to operate with an average delay of 73s (LOS F) during the AM commuter peak hour. Furthermore, queues on this approach are expected to extend back to block the Well Station Drive / Nullarbor Avenue intersection (224m queue in 180m storage). These capacity constraints are primarily due to a lack of capacity for the right-turn movement from this approach.

### Key External Intersections Performance Summary

It is noted that the vehicle arrival patterns at these intersections do not necessarily reflect real-world conditions and as such, are presented below to provide context to the performance of the core area intersections. To assess the impacts of road upgrades at these external intersections, additional, more detailed modelling would be required.

A summary of the performance of key intersection on the periphery of the model (outside the core area) are presented in Table 5 below.

**Table 5. Key External Intersections Summary – Additional 2023 Scenarios**

Intersection	AM Commuter Peak	PM School Peak	PM Commuter Peak
Well Station Dr / Hoskins St	Acceptable	Acceptable	Acceptable
Horse Park Dr / Mapleton Av / Dugong Wy	Delays	Acceptable	Acceptable
Horse Park Dr / Federal Hwy (West Interchange)	Delays	Acceptable	Delays & Queues

Under the additional 2023 scenarios the following observations were made at intersections outside the core area:

- **Horse Park Drive / Mapleton Avenue / Dugong Way:** The Horse Park Drive / Mapleton Avenue / Dugong Way intersection acted to ‘meter’ the arrival of vehicles at the north approach to the Horse Park Drive / Well Station Drive / Bettong Avenue intersection. It was noted that increased traffic demands along Horse Park Drive during the AM commuter peak hour are likely to result in increased delays at the intersection, particularly on the east, north and west approaches.
- **Horse Park Drive / Federal Highway (West Interchange):** The Horse Park Drive / Federal Highway (West Interchange) intersection acted to ‘meter’ the arrival of vehicles at the south approach to the Horse Park Drive / Well Station Drive / Bettong Avenue intersection. It is noted that the model does not include the two (2) signalised intersections immediately east of Federal Highway and on this basis, the signal timing has not been optimised for the increased traffic demands. Under these increased traffic demands, increased delays are expected at the intersection, particularly on the south approach during the AM commuter peak hour and on the east approach during the PM commuter peak hour.

### 5.3.2 Additional 2031 Scenarios

The following sections summarise the road upgrades and the performance of the road network under the additional 2031 scenarios.

#### Scenario Road Network

The road upgrades adopted under the additional 2031 scenarios include those works packages adopted in the additional 2023 scenarios. This includes Works Package A to provide access to the Park & Ride Facility and Works Package E to provide access to the initial stage of the proposed Kenny development and to the subject site. Similarly, Works Package N, as adopted in the additional 2023 scenarios, has again been adopted to improve pedestrian access across Well Station Drive in the vicinity of the proposed high school. Further details on these works packages are presented at section 0 (page 8) of this report.

Additionally, Works Package G has been adopted under the additional 2031 scenarios to provide access to the latter stages of the proposed Kenny development, while Works Package L has been adopted to improve access to the school site.

#### Works Package G – Kenny Accesses (2031)

Works Package G includes a new fourth leg on the southeast side of the existing single-lane roundabout at Albatross Crescent East / Well Station Drive, as well as two (2) new signalised ‘T’-intersections on Horse Park Drive, between Well Station Drive and Federal Highway. This works package is required to provide access to the latter stages (areas A & B) of the proposed Kenny development.

The model represents each of these accesses as a two-lane, two-way collector road extending from Well Station Drive or Horse Park Drive, into the proposed Kenny development as shown at Figure 13 below. The model assumes that the fourth leg at the Albatross Crescent East / Well Station Drive roundabout, can be constructed without further significant alterations to the existing roundabout.



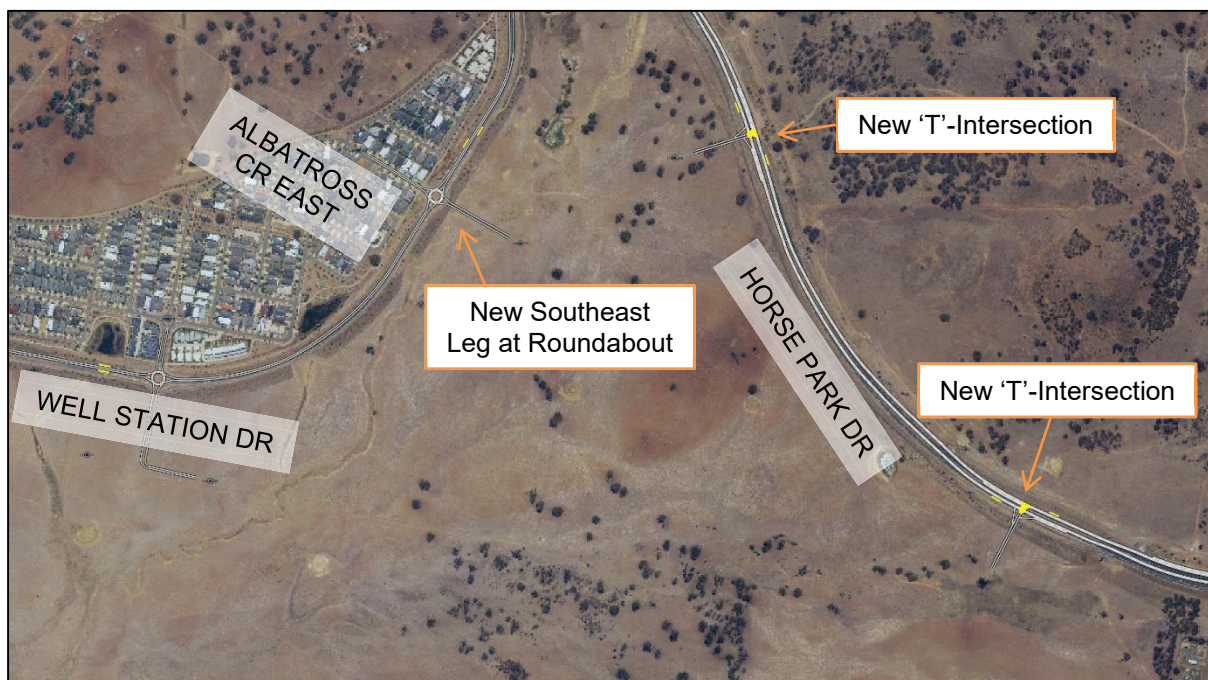


Figure 13. Works Package G – Kenny Accesses (2031)

#### Works Package L – School Loop Road / Well Station Drive: Left-In, Left-Out Access

Works Package L includes a new priority-controlled left-in, left-out intersection on Well Station Drive at the northwest corner of the school site (approximately 50m east of Kings Canyon Street). This package of works is recommended to improve vehicular access and traffic circulation in the vicinity of the school site, in the case that the primary school and pre-school are constructed.

The model represents these works as an access road (School Loop Road) extending south from Well Station Drive, approximately 50m east of Kings Canyon Street as shown at Figure 14 below. Given the close proximity to the Kings Canyon Street / Well Station Drive intersection, only left-turn movements have been permitted at the School Loop Road / Well Station Drive intersection.



Figure 14. Works Package L – School Loop Road / Well Station Drive: Left-In, Left-Out Access

#### Network Wide Performance Summary



A summary of the overall network wide operation in the additional 2031 scenarios is presented at Table 6 below.

The traffic demands adopted for the additional 2031 scenarios are identical to those adopted under the 2031 EGHS Case scenarios in the previous analysis. These traffic demands are presented at Appendix C, while full results are presented at Appendix D.

**Table 6. Network-Wide Summary – Additional 2031 Scenarios**

Performance Measure	AM Commuter Peak		PM School Peak		PM Commuter Peak	
	All Vehicles	Public Transport	All Vehicles	Public Transport	All Vehicles	Public Transport
VKT [km]	29,827.93	79.89	24,229.51	85.15	29,328.14	77.93
VHT [hours]	1,019.02	4.11	478.42	3.65	1,147.03	4.21
Average Flow [veh/h]	8,599.80	21.35	8,069.40	23.52	8,996.40	20.31
Average Speed [km/h]	36.70	19.75	53.76	25.16	34.52	19.41
Average Density [veh/km]	22.04	0.05	7.45	0.03	19.30	0.03
Average Travel Time [s/km]	150.70	257.01	85.02	178.02	173.35	285.05
Average Delay Time [s/km]	104.69	132.16	37.98	61.29	128.09	164.22
Total Stops	44,224.40	159.60	15,089.40	158.00	49,981.80	170.00
Total Missed Turns	108.00	0.00	115.20	0.00	147.00	0.00
Vehicles Waiting to Enter [veh]	2,292.80	4.60	12.00	0.00	1,299.00	1.60

The network performance summary for the additional 2031 scenarios demonstrates the broad impacts of the additional traffic demands on the road network (associated with background growth plus a range of developments including the proposed school), compared to the additional 2023 scenarios. In the AM commuter peak hour, the total distance travelled by vehicles in the network (VKT) is expected to decrease (by -2.9%). The total travel time of vehicles in the network (VHT) is expected to increase significantly (by 61.3%). This reflects a significant increase in congestion as indicated by the significant decrease in average vehicle speeds (by -26.0%) and a significant increase in the number of stops (by 130.6%).

### Core Area Performance Summary

Table 7 below presents a summary of the peak hour intersection performance for the core area intersections along Well Station Drive between Flemington Road and Horse Park Drive, under the additional 2031 scenarios.

**Table 7. Core Area Summary – Additional 2031 Scenarios**

Approach	AM Commuter Peak			PM School Peak			PM Commuter Peak		
	Delay	LOS	Queue	Delay	LOS	Queue	Delay	LOS	Queue
<b>Flemington Road / Well Station Drive – Traffic Signals</b>									
S: Flemington Rd	198s	F	122m	214s	F	214m	330s	F	281m
E: Well Station Dr	84s	F	255m	53s	D	297m	100s	F	274m
N: Flemington Rd	72s	F	322m	31s	C	77m	29s	C	57m
W: Well Station Dr	705s	F	919m	97s	F	617m	451s	F	916m
<b>TOTAL</b>	<b>173s</b>	<b>F</b>	<b>919m</b>	<b>97s</b>	<b>F</b>	<b>617m</b>	<b>243s</b>	<b>F</b>	<b>916m</b>
<b>Well Station Drive / Park &amp; Ride – ‘Give-Way’ Control</b>									
S: Park & Ride	128s	F	8m	91s	F	58m	1,130s	F	97m
E: Well Station Dr	78s	F	230m	28s	B	213m	99s	F	219m

Approach	AM Commuter Peak			PM School Peak			PM Commuter Peak		
	Delay	LOS	Queue	Delay	LOS	Queue	Delay	LOS	Queue
W: Well Station Dr	840s	F	179m	16s	B	21m	47s	D	17m
<b>TOTAL</b>	<b>840s</b>	<b>F</b>	<b>230m</b>	<b>91s</b>	<b>F</b>	<b>213m</b>	<b>1,130s</b>	<b>F</b>	<b>219m</b>
<b>Well Station Drive / Kings Canyon Street – Traffic Signals</b>									
E: Well Station Dr	28s	B	94m	11s	A	81m	30s	C	91m
N: Kings Canyon St	52s	D	32m	45s	D	20m	53s	D	19m
W: Well Station Dr	14s	A	177m	11s	A	172m	10s	A	178m
<b>TOTAL</b>	<b>24s</b>	<b>B</b>	<b>177m</b>	<b>12s</b>	<b>A</b>	<b>172m</b>	<b>19s</b>	<b>B</b>	<b>178m</b>
<b>Well Station Drive / School Loop Road – ‘Give-Way’ Control</b>									
S: School Loop Rd	1,419s	F	96m	17s	B	79m	673s	F	96m
E: Well Station Dr	229s	F	541m	28s	B	233m	197s	F	494m
<b>TOTAL</b>	<b>1,419s</b>	<b>F</b>	<b>541m</b>	<b>28s</b>	<b>B</b>	<b>233m</b>	<b>673s</b>	<b>F</b>	<b>494m</b>
<b>Well Station Drive / Albatross Crescent West – Traffic Signals</b>									
S: Albatross Cr W	93s	F	166m	31s	C	76m	74s	F	54m
E: Well Station Dr	678s	F	969m	38s	C	108m	124s	F	239m
N: Albatross Cr W	142s	F	101m	36s	C	28m	57s	E	34m
W: Well Station Dr	44s	D	113m	28s	B	116m	26s	B	69m
<b>TOTAL</b>	<b>257s</b>	<b>F</b>	<b>969m</b>	<b>33s</b>	<b>C</b>	<b>116m</b>	<b>68s</b>	<b>E</b>	<b>239m</b>
<b>Well Station Drive / Albatross Crescent East – Roundabout</b>									
S: Albatross Cr E	124s	F	187m	3s	A	43m	4s	A	49m
E: Well Station Dr	199s	F	667m	7s	A	98m	9s	A	92m
N: Albatross Cr E	11s	A	53m	3s	A	7m	3s	A	12m
W: Well Station Dr	13s	A	187m	8s	A	43m	7s	A	60m
<b>TOTAL</b>	<b>199s</b>	<b>F</b>	<b>667m</b>	<b>8s</b>	<b>A</b>	<b>98m</b>	<b>9s</b>	<b>A</b>	<b>92m</b>
<b>Well Station Drive / Nullarbor Avenue – ‘Give-Way’ Control</b>									
S: Well Station Dr	32s	C	61m	2s	A	6m	3s	A	30m
N: Well Station Dr	26s	B	116m	6s	A	2m	6s	A	11m
W: Nullarbor Av	81s	F	170m	4s	A	45m	3s	A	45m
<b>TOTAL</b>	<b>81s</b>	<b>F</b>	<b>170m</b>	<b>6s</b>	<b>A</b>	<b>45m</b>	<b>6s</b>	<b>A</b>	<b>45m</b>
<b>Horse Park Drive / Well Station Drive / Bettong Avenue – Traffic Signals</b>									
S: Horse Park Dr	51s	D	178m	10s	A	88m	4s	A	38m
E: Bettong Av	9s	A	14m	3s	A	5m	3s	A	5m
N: Horse Park Dr	30s	C	219m	29s	C	138m	35s	C	131m
W: Well Station Dr	50s	D	206m	14s	A	90m	25s	B	112m
<b>TOTAL</b>	<b>37s</b>	<b>C</b>	<b>219m</b>	<b>15s</b>	<b>B</b>	<b>138m</b>	<b>12s</b>	<b>A</b>	<b>131m</b>

During the AM and PM commuter peak hours under the additional 2031 scenarios, a lack of capacity on the south, east and west approaches to the Flemington Road / Well Station Drive intersection is expected to cause significant queueing and delays throughout the core area and to the west along Well Station Drive, as shown at Figure 15 and Figure 16 below.



Figure 15. Additional 2031 Scenarios – Congestion during the AM commuter peak hour



Figure 16. Additional 2031 Scenarios – Congestion the PM commuter peak hour

During the PM school peak hour, capacity constraints are expected to be more localised:

- **Flemington Road / Well Station Drive:**
  - The south approach (Flemington Road) is expected to operate with average delays of **214s (LOS F)** in the PM school peak hour. This capacity constraint is primarily associated with the right-turn movement from this approach, which operates in a single lane and with limited green time due to the light rail priority.
  - The queue on the east approach is expected to extend back to block the Well Station Drive / Park & Ride intersection during the PM school peak hour (**297m** queues in 155m storage). The lack of capacity on this approach is due to both the single through lane arrangement and the traffic signal operation which provides strong priority for light rail services.
  - The west approach (Well Station Drive) is expected to operate with an average delay of **97s (LOS F)** in the PM school peak hour. The lack of capacity on this approach is due to both the single through lane arrangement and the traffic signal operation which provides strong priority for light rail services.
- **Well Station Drive / Park & Ride:**
  - The south approach (Park & Ride) is expected to operate with average delays of **91s (LOS F)** during the PM school peak hour. This delay is due to the intersection being blocked by



vehicles queued from the east approach to the Flemington Road / Well Station Drive intersection.

- The queue on the east approach (Well Station Drive) is expected to extend back to block the Well Station Drive / Kings Canyon Street intersection (213m queue in 155m storage). This queue is an extension of the queue from the east approach to the Flemington Road / Well Station Drive intersection.
- **Well Station Drive / Kings Canyon Street:**
  - The queue on the east approach (Well Station Drive) is expected to extend back to block the Well Station Drive / School Loop Road intersection (81m queue in 45m storage). This is an extension to the queue from the east approach of the Flemington Road / Well Station Drive intersection.
  - The queue on the north approach (Kings Canyon Street) is expected to extend back to the Kings Canyon Street / Turtle Rock Street intersection (20m queue in 20m storage). This is due to vehicles not being able to enter the intersection on green signals due to the queue of westbound vehicles extending back from the Flemington Road / Well Station Drive intersection.
  - The queue on the west approach (Well Station Drive) is expected to extend back to block the Well Station Drive / Park & Ride intersection (172m queue in 155m storage). This queue is the result of the traffic signals installed at the intersection.

### Key External Intersections Performance Summary

It is noted that the vehicle arrival patterns at these intersections do not necessarily reflect real-world conditions and as such, are presented below to provide context to the performance of the core area intersections. To assess the impacts of road upgrades at these external intersections, additional, more detailed modelling would be required.

A summary of the performance of key intersection on the periphery of the model (outside the core area) are presented at Table 8 below.

**Table 8. Key External Intersections Summary – Additional 2031 Scenarios**

Intersection	AM Commuter Peak	PM School Peak	PM Commuter Peak
Well Station Dr / Hoskins St	Delays & Queues	Acceptable	Delays & Queues
Horse Park Dr / Mapleton Av / Dugong Wy	Delays	Acceptable	Acceptable
Horse Park Dr / Kenny Northeast Access Rd	Acceptable	Acceptable	Acceptable
Horse Park Dr / Kenny Southeast Access Rd	Delays	Acceptable	Acceptable
Horse Park Dr / Federal Hwy (West Interchange)	Delays	Acceptable	Delays & Queues

Under the additional 2031 scenarios the following observations were made at intersections outside the core area:

- **Well Station Drive / Hoskins Street:** The Well Station Drive / Hoskins Street intersection acted to ‘meter’ the arrival of vehicles at the west approach to the Flemington Road / Well Station Drive intersection. It was noted that increased traffic demands along Well Station Drive are likely to result in increased delays at the intersection. In the AM commuter peak hour, it is expected that the demand for the right-turn movements from the north and west approaches will significantly limit the capacity of the east approach.
- **Horse Park Drive / Mapleton Avenue / Dugong Way:** The Horse Park Drive / Mapleton Avenue / Dugong Way intersection acted to ‘meter’ the arrival of vehicles at the north approach to the Horse Park Drive / Well Station Drive / Bettong Avenue intersection. It was noted that increased traffic demands along Horse Park Drive during the AM commuter peak hour are likely to result in increased delays at the intersection, particularly on the east, north and west approaches.
- **Horse Park Drive / Kenny Southeast Access Road:** The Horse Park Drive / Kenny Southeast Access Road intersection was found to operate with unacceptable delays and long queues on the north approach (Horse Park Drive) during the AM commuter peak hour. This is primarily due to downstream effects from the Horse Park Drive / Federal Highway (West Interchange).

- **Horse Park Drive / Federal Highway (West Interchange):** The Horse Park Drive / Federal Highway (West Interchange) intersection acted to ‘meter’ the arrival of vehicles at the south approach to the Horse Park Drive / Well Station Drive / Bettong Avenue intersection. It is noted that the model does not include the two (2) signalised intersections immediately east of Federal Highway and on this basis, the signal timing has not been optimised for the increased traffic demands. Under these increased traffic demands, increased delays are expected at the intersection, particularly on the south and west approaches during the AM commuter peak hour and on the east approach during the PM commuter peak hour.

## 6. CONCLUSION

Indesco were engaged by Major Projects Canberra (MPC) on behalf of Transport Canberra and City Services (TCCS) to undertake a Traffic Impact Assessment (TIA) for the proposed East Gungahlin High School (EGHS). This report summarises the analysis of additional road upgrade scenarios under the 2023 and 2031 future analysis years with the proposed development. This additional traffic analysis has concluded that:

1. Under the 2023 EGHS Case traffic demands:
  - a. The following road upgrades were adopted:
    - i. **Works Package A – Park & Ride Access** (Access),
    - ii. **Works Package E – Albatross Crescent West / Well Station Drive: Traffic Signals** (Access and Pedestrian Safety), and
    - iii. **Works Package N – Kings Canyon Street / Well Station Drive: Traffic Signals** (Pedestrian Safety).
  - b. The road network generally performed acceptably, with the exceptions of the following capacity constraints:
    - i. Queues on the east approach to the Flemington Road / Well Station Drive intersection extending back to block the upstream intersection (261m, 192m and 202m queues in 155m storage) in all three (3) analysed peak hours,
    - ii. Queues on the west approach to the Well Station Drive / Kings Canyon Street intersection extending back to block the upstream intersection (159m queue in 155m storage) during the AM commuter peak hour,
    - iii. Excessive average delays (1,215s, LOS F) on the west approach to the Well Station Drive / Nullarbor Avenue intersection during the AM commuter peak hour, and
    - iv. Excessive delays (73s, LOS F) and queues on the west approach to the Horse Park Drive / Well Station Drive / Bettong Avenue intersection extending back to block the upstream intersection (224m queue in 180m storage) during the AM commuter peak hour.
2. Under the 2031 EGHS Case traffic demands:
  - a. The following road upgrades were adopted:
    - i. **Works Package A – Park & Ride Access** (Access),
    - ii. **Works Package E – Albatross Crescent West / Well Station Drive: Traffic Signals** (Access and Pedestrian Safety),
    - iii. **Works Package G – Kenny Accesses (2031)** (Access), and
    - iv. **Works Package N – Kings Canyon Street / Well Station Drive: Traffic Signals** (Pedestrian Safety).
  - b. The core area of the model experienced significant queuing (up to 969m) and delays (up to 1,419s, LOS F) during the AM and PM commuter peak hours, due primarily to a lack of capacity on the east, west and south approaches to the Flemington Road / Well Station Drive intersection.
3. While previous analysis has demonstrated that the poor performance of the road network is not directly the result of the additional traffic demands associated with the proposed EGHS, it is recommended that consideration be given to infrastructure works or other measures to mitigate the significant congestion expected within the study area.

# Appendix A

## Traffic Demand Matrices – 2023 EGHS Case



# Appendix B

## Model Results – Additional 2023 Scenarios

# Appendix C

## Traffic Demand Matrices – 2031 EGHS Case

# Appendix D

## Model Results – Additional 2031 Scenarios