traffic + transport

Angus Place

Mine Extension Project

Traffic Impact Assessment

July 2013

prepared for

Centennial Angus Place

prepared by

ARC Traffic + Transport

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Contents

Executive Summary

The Angus Place Mine Extension Project (the **Project**) provides for the extension of mining operations at the Angus Place Colliery (**APC**), and includes the provision of new surface infrastructure within the Newnes State Forest (**NSF**) and the continuance of existing operations at the APC Pit Top (the **Pit Top**) north of Lidsdale.

ARC Traffic + Transport (**ARC**) has completed an independent assessment of the access and traffic implications of the Project. The conclusions and recommendations of that assessment are provided below.

The Pit Top Road Network

Local & Sub-Regional Access Roads

The Project will not alter the characteristics of the existing Pit Top traffic generation. **No additional traffic would be generated by the Project to the local and sub-regional traffic network which provides access to the Pit Top in Wolgan Road north of Lidsdale**.

While the Project would not generate additional traffic to the Castlereagh Highway, annual average traffic growth and other sub-regional traffic generating projects would increase traffic flows over existing levels through the life of the Project. Notwithstanding, the Castlereagh Highway south-east and north-west of Lidsdale would continue to operate well below traffic capacity through an appropriate 10 year forecast horizon of 2024.

There is no information to suggest any significant potential for traffic growth in local access roads - including Wolgan Road and Ian Holt Drive, Lidsdale; and Main Street, Wallerawang - through 2024. Traffic flows in these roads would remain well within RMS environmental capacity limits.

Local & Sub-Regional Intersections

Further to SIDRA intersection modelling, the key access intersections of the Castlereagh Highway & Wolgan Road, and Castlereagh Highway & Main Street, will continue to operate at a good level of services in both the AM and PM peak periods, with significant spare capacity and consistently low average delays through 2024.

Local intersections in Lidsdale will also continue to operate at good levels of service based on very low traffic flows and no additional Project traffic generation.

The Newnes State Forest Project Sites

Access to the NSF Project Sites

During both the construction and operational phase of the Project, access into the NSF for Project heavy vehicles will be restricted to a route from Chifley Road to Old Bells Line of Road at Clarence. Light vehicles could utilise this route via Clarence or the route via State Gully Mine Road north of Lithgow. Within the NSF, access to the **NSF Project Sites** for both light and heavy vehicles will be via Glowworm Tunnel Road, Maiyingu Marragu Trail and Sunnyside Ridge Road.

From Sunnyside Ridge Road, the Project provides for extensions and upgrades of existing access tracks to the NSF Project Sites. As agreed with Forestry Corporation NSW (**FCNSW**), an access track (5 m) and adjacent Infrastructure Corridor (5 m) will be provided during the construction phase of each NSF Project Site. Each Infrastructure Corridor would then be remediated after the installation of required infrastructure, retaining a 5 m access track.

Recommendation That heavy vehicle trips to/from the NSF Project Sites be undertaken during daylight hours, which would generally require them to occur between 6:00am and 6:00pm.

Construction Traffic Generation

During the construction phase, up to 16 vehicle trips per day (vtpd) would be generated to each NSF Project Site. On average, 8 heavy vtpd would be generated in Old Bells Line of Road, and 8 light vtpd would be generated in State Mine Gully Road. All 16 vtpd would then be generated in Glowworm Tunnel Road between Old Bells Line of Road and Maiyingu Marragu Trail; in Maiyingu Marragu Trail between Glowworm Tunnel Road and Sunnyside Ridge Road; and in Sunnyside Ridge Road between Maiyingu Marragu Trail and the NSF Project Site access tracks.

Construction Traffic Impacts & Impact Mitigation

The additional traffic generated during the Project construction phase would not significantly impact the operation of the NSF road network or the NSF access intersections at Clarence and north Lithgow. This is a function of the low traffic generation potential of the construction phase of the Project and the available capacity within the NSF road network and the NSF access intersections at Clarence and north Lithgow. This conclusion appropriately considers periods where Project construction will coincide with the generation of other projects within the NSF.

Construction vehicle access at each of the NSF Project Sites will be provided with consideration of sight distance, gradient and carriageway width so as to ensure the safety of other NSF road network users, and construction parking demands will be met within NSF Project Site compounds.

Recommendation That a Construction Traffic Management Plan be prepared in consultation with FCNSW and Lithgow City Council and implemented for the duration of the construction phase at each NSF Project Site.

Operational Traffic Generation

During the operational phase, up to 10 vehicle trips per week (vtpw) would be generated to each NSF Project Site. On average, 6 heavy vtpw would be generated in Old Bells Line of Road, and 4 light vtpw would be generated in State Mine Gully Road. All 10 vtpw would be then be generated in Glowworm Tunnel Road between Old Bells Line of Road and Maiyingu Marragu Trail; in Maiyingu Marragu Trail between Glowworm Tunnel Road and Sunnyside Ridge Road; and in Sunnyside Ridge Road between Maiyingu Marragu Trail and the access tracks to the NSF Project Sites.

Operational Traffic Impacts & Impact Minimisation

The additional traffic generated during the Project operational phase would not significantly impact the operation of the NSF road network or the NSF access intersections at Clarence and north Lithgow. This is a function of the very low traffic generation potential of the operational phase of the Project and the available capacity within the NSF road network and the NSF access intersections at Clarence and north Lithgow. This conclusion appropriately considers periods where Project operations will coincide with the generation of other projects within the NSF.

Operational parking demands will be met within the NSF Project Site compounds.

Recommendation That a Traffic Management Plan be prepared in consultation with FCNSW and Lithgow City Council and implemented for the duration of the operational phase at each NSF Project Site.

General Newnes State Forest Impact Mitigation

Further to the remediation proposals detailed in the Angus Place Mine Extension Project Environmental Impact Statement for the NSF Project Sites following decommission - the potential exists for minor remedial works to be required within the NSF prior to or during the construction and operational phase of each NSF Project Site as a result of wear caused by Project vehicles; by significantly adverse weather conditions within the NSF; or a combination of these or other factors.

Recommendation That any NSF road network remedial tasks arising from the construction or operation of the NSF Project Sites be appropriately managed in conjunction with FCNSW.

Following our assessment of the key issues associated with the Project, and with the application of the recommendations outlined above, ARC Traffic + Transport has concluded that the Project is supportable from an access and traffic perspective.

Introduction

i Project Overview

Centennial Angus Place (**Centennial**) proposes to extend mining operations at the Angus Place Colliery (**APC**), located 15 kilometres northwest of Lithgow. The existing APC Development Consent (Project Approval **PA 06_0021**) will not lapse until August 2024; however, planned longwall mining at APC in accordance with the current mine plan will end in March 2016. Accordingly, the Project is seeking approval - pursuant to Division 4.1 of the *Environmental Planning and Assessment Act 1979* (**EP&A Act**) - for the continuation of longwall mining within its Mining Lease 1424 boundary beyond March 2016.

The Angus Place Mine Extension Project (the **Project**) will: -

- Continue to extract up to 4 million tonnes per annum (**Mtpa**) of run of mine (**ROM**) coal from the Lithgow Seam;
- Develop underground access headings and roadways from the current mining area;
- Undertake secondary extraction by longwall mining;
- Continue the use of existing ancillary surface facilities at the APC Pit Top (the **Pit Top**);
- Manage the handling of ROM coal through a crusher and screening plant at the Pit Top;
- Install and operate ancillary surface infrastructure including dewatering boreholes, ventilation, electricity, water, materials supply, environmental monitoring and communications;
- Progressively rehabilitate disturbed areas;
- Continue to operate 24 hours per day seven days per week;
- Continue to provide employment to a full time workforce of up to 225 and 75 contractors; and
- Transfer of the operational management of product coal transported via truck from Pit Top and operational management of the Kerosene Vale stockpile to the Centennial Western Coal Services upgrade project (SSD 12_5579 – the **WCS Project**).

To support underground mining, infrastructure will be located within the Newnes State Forest (**NSF**) consisting of: -

- An air ventilation facility (**APC-VS3**);
- Seven new dewatering bore facilities (the **Bore Sites**); and
- Upgrading and extending existing access tracks from Sunnyside Ridge Road to APC-VS3 and the Bore Sites (collectively the **NSF Project Sites**).

Significantly, **the Project will result in no change to existing infrastructure and operations associated with underground plant and equipment, underground access, management or mine services at the Pit Top or transport to and from the Pit Top**.

Full details of the Project are provided in the Angus Place Mine Extension Project Environmental Impact Statement (**Project EIS**).

ii Assessment Methodology

ARC Traffic + Transport (**ARC**) has been commissioned by Centennial to prepare this Traffic Impact Assessment (**TIA**) to appropriately and independently assess the access and traffic issues associated with the Project,

This TIA examines the existing APC operations (**Section 1**) and the road networks which provide for the Pit Top (**Section 2**) and the proposed NSF Project Sites (**Section 3**). An assessment of the access and traffic characteristics of the Project (**Section 4**) is then paired with an assessment of cumulative traffic increases arising from annual average increases in traffic flows and the generation of other proposed sub-regional projects (**Section 5** and **Section 6**).

The operations of both the Pit Top and NSF road networks through a future design year 2024 (which provides an appropriate 10 year future flow forecast) are examined in **Section 7**, along with specific strategies by which potential impacts associated with the Project will be ameliorated.

This methodology specifically responds to the Director General's Requirements (**DGRs**) of 6th November 2012, which provide the following in regard to traffic and transport: -

- ***Traffic & Transport – including:***
  - *an assessment of potential traffic impacts on the capacity, efficiency and safety of the road network; and*
  - *a description of the measures that would be implemented to maintain and/or improve the capacity, efficiency and safety of the road network in the surrounding area over the life of the development*

This TIA also references the traffic and transport guidelines and assessment criteria noted within the DGRs, and more broadly as appropriate to the specific Project characteristics. Key references include: -

- RTA Guide to Traffic Generating Developments (**RTA Guide**) and Road Design Guide (**RTA RDG**)
- AustRoads Guide to Road Design Part 4A Unsignalised & Signalised Intersections (**AustRoads GRD4A**); Rural Road Design Guide (**AustRoads RRDG**); and Guide to Traffic Engineering Practice Part 2 Roadway Capacity (**AustRoads GTEP2**)
- Australian Road Research Board Unsealed Roads Manual (**ARRB URM**)
- State Forests of NSW Forest Practices Code: Part 4 Forest Roads & Fire Trails (**FPC4**)
- *Forestry Act 2012*

ARC has consulted with Forest Corporation NSW (**FCNSW**) in regard to general traffic operating conditions and permits within State Forests in NSW; and with the Roads & Maritime Services (**RMS**) in regard to accident data. ARC acknowledges the assistance provided by FCNSW and RMS officers.

1 The Angus Place Colliery

1.1 Location

The APC is located north-east of the town of Lidsdale NSW, some 15 km northwest of Lithgow. The Pit Top is located off Wolgan Road approximately 3.5 km north of Lidsdale. **The Project proposes no new construction or operational changes beyond what is existing at the Pit Top**.

The Environmental Study Areas (**ESAs**) central to the Project are well removed from the Pit Top, located within the NSF in an area centred around Sunnyside Ridge Road. The NSF Project Sites include the APC-VS3 Site west of Sunnyside Ridge Road; and dewatering Bore Sites located to the west, north and east of Sunnyside Ridge Road.

The APC in its regional context is shown below in **Figure 1.1.1**. **Figure 1.1.2** shows the road network providing for the Pit Top, while **Figure 1.1.3** shows the road network providing for the NSF Project Sites.

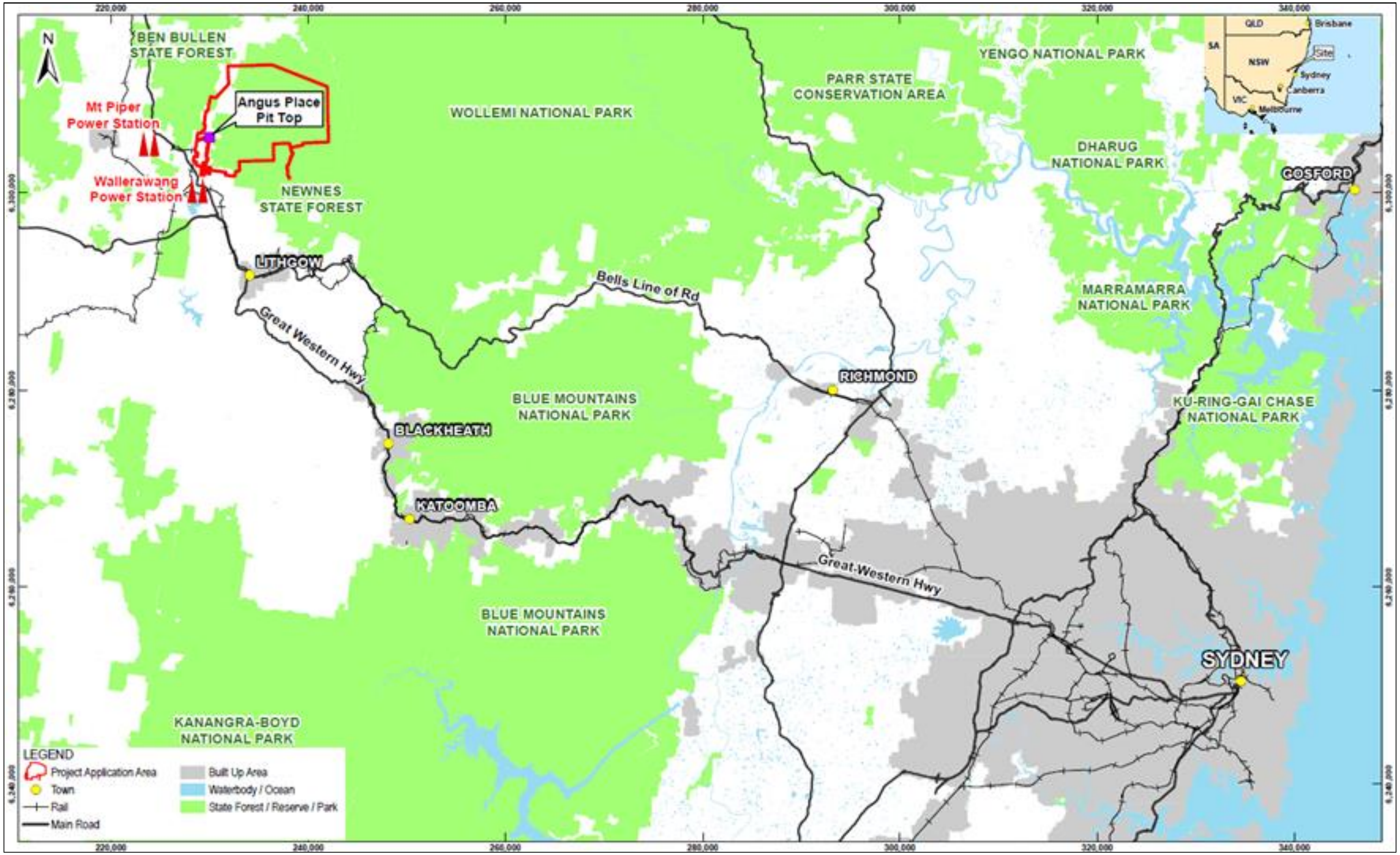
1.2 Operations

1.2.1 Background and Approvals

APC commenced production in 1979, after being developed as an extension of the Newcom Mine at Kerosene Vale. The main components of the APC are an underground longwall mine and development panels; supporting surface infrastructure (within the Pit Top and the NSF); a coal stockpile area (**Kerosene Vale**); and dedicated haul roads to the Wallerawang Power Station, Mt Piper Power Station, and the Springvale Coal Services Facility (**SCS Facility**) at Blackmans Flat.

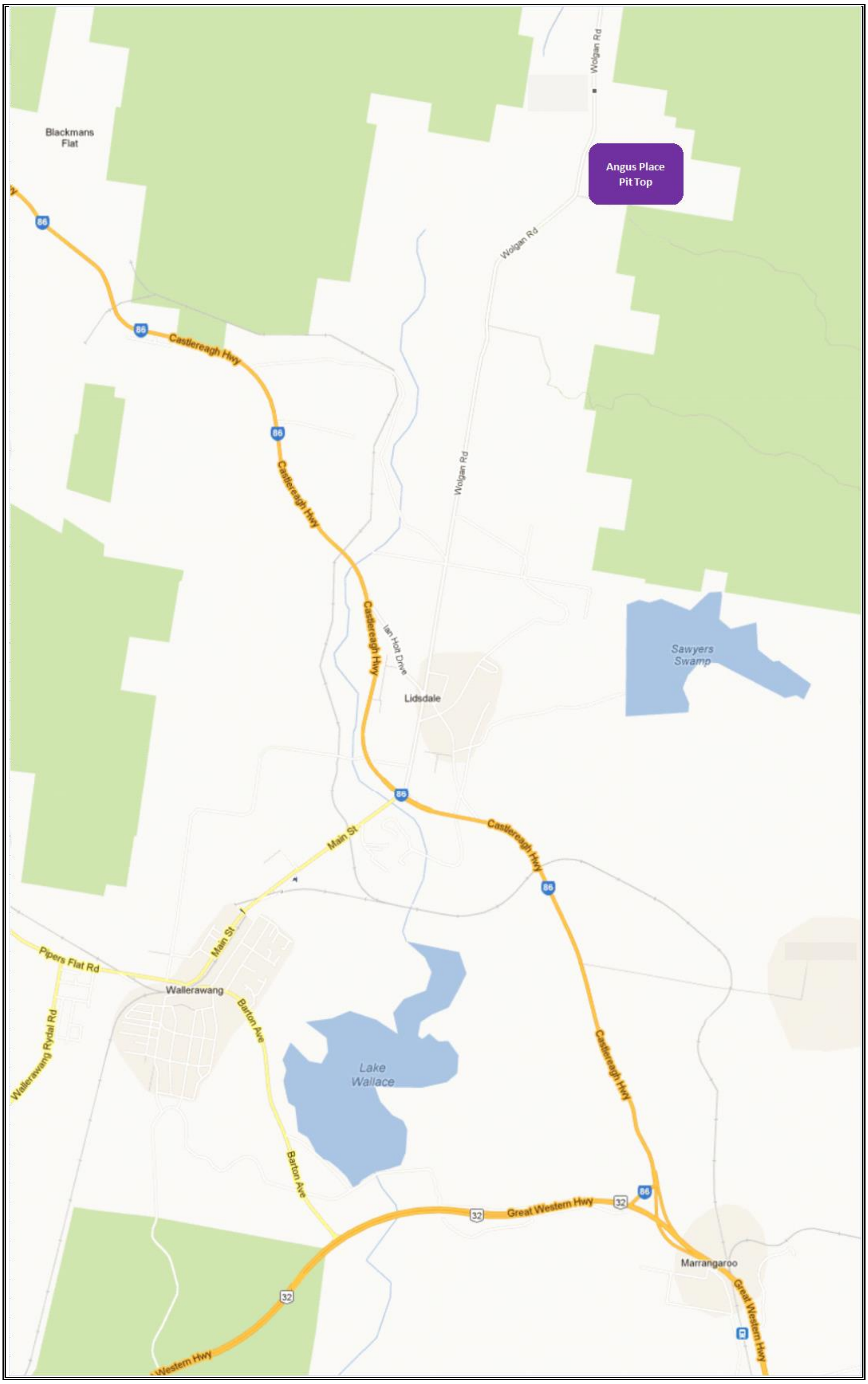
PA 06_0021 is applicable to the APC, approved by the DP&I pursuant to Part 3A of the EP&A Act. PA 06_0021 was granted in September 2006 to expand the mining area and increase the production limit to 3.5 Mtpa, and is currently due to lapse in August 2024.

Figure 1.1.1 Angus Place & Project Application Area



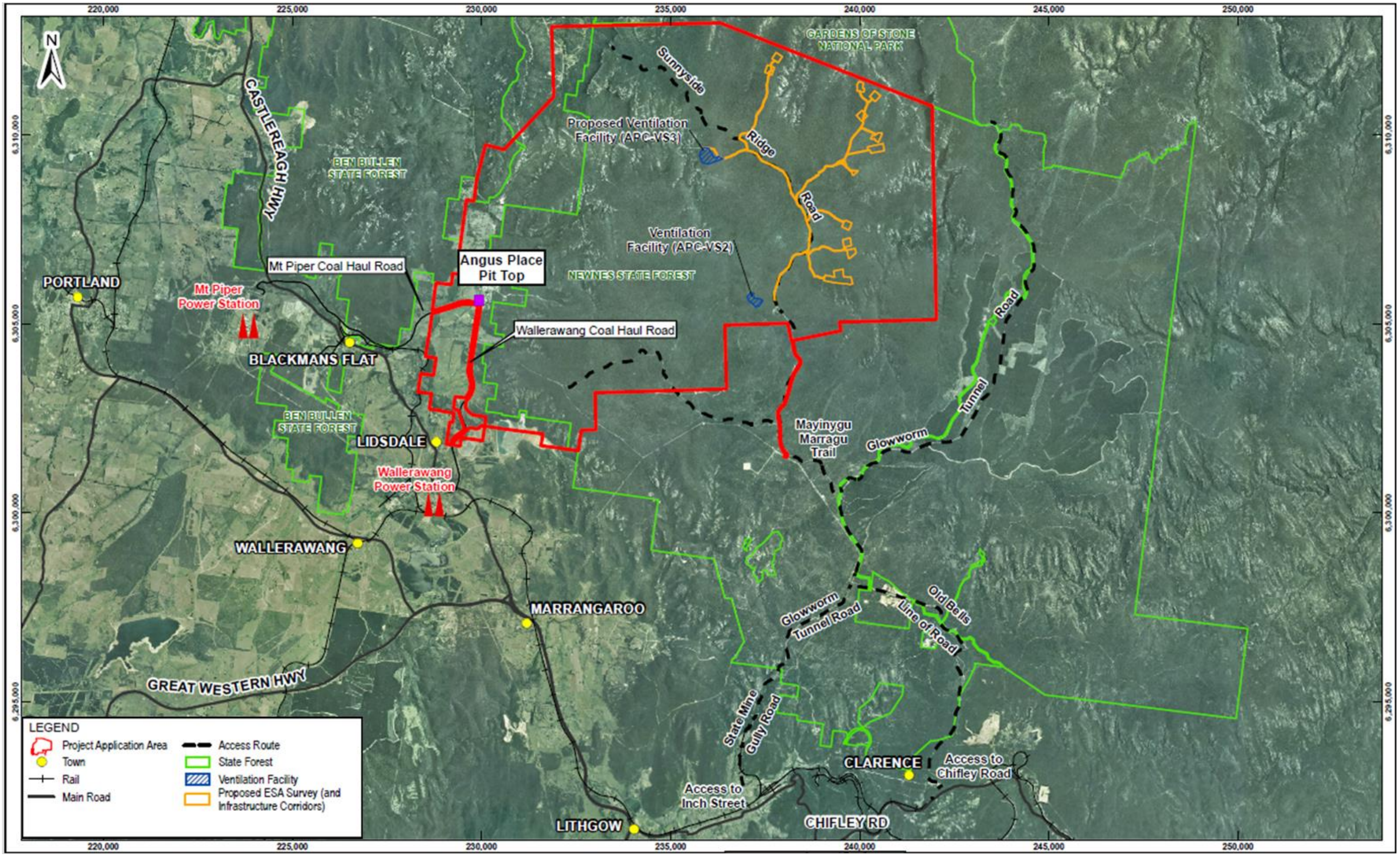
Source: Centennial

Figure 1.1.2 Angus Place Pit Top Road Network



Source: Google Maps

Figure 1.1.3 Newnes State Forest Project Sites & Road Network



Source: Centennial

Centennial has submitted two recent modification applications pursuant to Section 75W of the EP&A Act: -

- The 2010 Angus Place Colliery Section 75W Modification Project (**APC MOD 1 Project**) providing for an extension to the APC operations and supporting surface infrastructure at the Pit Top; an increase in annual production from 3.5 Mtpa to 4 Mtpa; and an increase in Pit Top staff to 225 full time staff and up to 75 contract staff.

  Approval for the APC MOD 1 Project was granted in August 2011, and provides for existing APC MOD 1 Project operations – including traffic operations - until 2024.

- The 2011 APC VF Project provides for the construction and operation of a ventilation facility and supporting infrastructure – including a substation, switchyard and trenched infrastructure corridors – in an area centred on Sunnyside Ridge Road within the NSF.

  Approval for the APC VF Project was granted in April 2013, and is expected to commence [construction] in mid 2013.

Centennial is currently finalising a submission to the DP&I in regard to the Western Coal Services Project (**WCS Project**), which would provide for the APC coal processing and distribution network to be amalgamated into the existing SCS Facility. Coal processing and distribution is currently managed by Springvale Coal Services, a separate Centennial business unit; the WCS Project would provide for an administrative transfer of existing infrastructure between two of Centennial's business units, and for this reason the transport of ROM coal from the Pit Top to the nearby power stations and the SCS Facility has not been included as part of this Project. ARC notes that the construction and operation of the WCS Project has been examined to account for potential cumulative road network impacts (see **Section 5.3**)

1.2.2 Shift Structure and Staff Numbers

The Pit Top operates 24 hours a day, 7 days a week, and employs 225 full-time staff and up to 75 contract staff. Office staff and staff numbers for the existing day, afternoon and night shifts – and their equivalent vehicle generation - are outlined in **Table 1.2.2.**

Table 1.2.2 APC Staff & Shifts

Angus Place Colliery Staff & Shifts	Staff	Vehicle Equivalent
Weekday		
Day 6:00am - 2:00pm	109	109
Afternoon 2:00pm - 10:00pm	80	80
Night 10:00pm - 6:00am	61	61
Weekend		
Day 6:00am - 6:00pm	42	42
Night 6:00pm - 6:00am	42	42
Office		
Day 6:30am - 5:00pm	32	32
Max On-Site Staff/Vehicles	141	141

1.3 Vehicle Access

1.3.1 Pit Top Access

All Pit Top staff and service vehicle access is provided via Wolgan Road north of Lidsdale. Access to Wolgan Road from the sub-regional road network is provided via the intersection of Castlereagh Highway & Wolgan Road & Main Street; or via the intersection of Castlereagh Highway & Ian Holt Drive (to Wolgan Road).

1.3.2 NSF Project Sites Access

Access to the NSF Project Sites (and more generally to APC surface infrastructure within the NSF) is available via two routes from the sub-regional network, both of which are shown in **Figure 1.3.2** below. These access routes are currently used by APC vehicles undertaking surface infrastructure maintenance and approved exploration activities within NSF, including construction works associated with the approved APC VF Project. These routes are also used by a variety of other vehicles associated with logging and forestry management; by the adjacent Springvale Colliery (**Springvale**) and other mining and exploration vehicles; and by recreational vehicles.

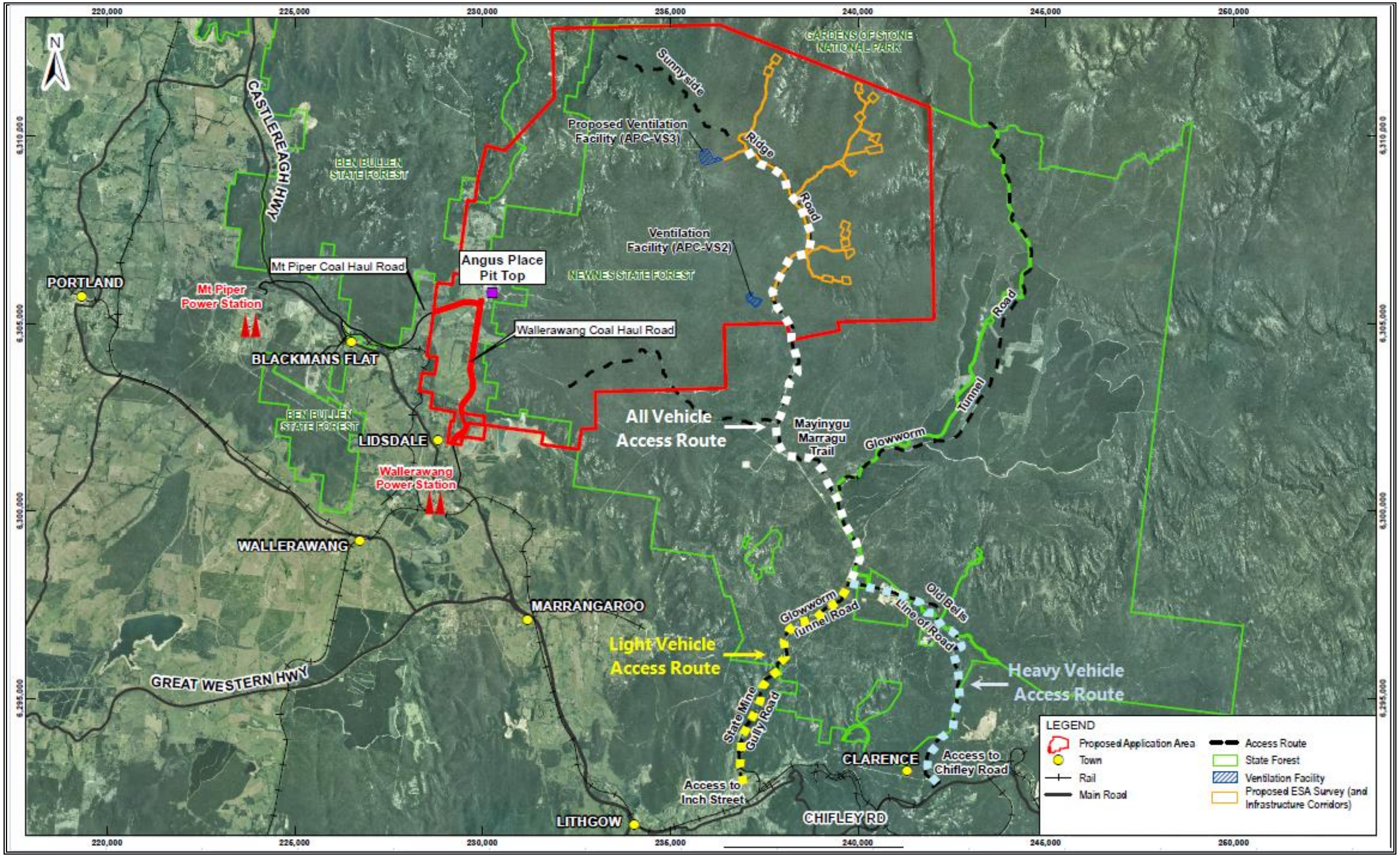
- **Heavy Vehicle Access Route**

  Heavy vehicles are defined with reference to the AustRoads *Vehicle Classification System* (see **Appendix A**) and include Class 3 – Class 12 vehicles. With reference to **Figure 1.3.2** below, heavy vehicles are required to use a designated route into the NSF via the intersection of Chifley Road & Old Bells Line of Road & Petra Avenue at Clarence, and then access to the NSF Project Sites is along a route including Old Bells Line of Road, Glowworm Tunnel Road, Mayinygu Marragu Trail (formerly Blackfellows Hands Road) and Sunnyside Ridge Road.

- **Light Vehicle Access Routes**

  Light vehicles are defined with reference to the AustRoads *Vehicle Classification System* and include Class 1 and Class 2 vehicles. With reference to **Figure 1.3.2**, the designated heavy vehicle access route to the NSF Project Sites via Clarence is available to light vehicles, along with a route via north Lithgow which includes Inch Street, Atkinson Street, State Mine Gully Road, Glowworm Tunnel Road, Mayinygu Marragu Trail and Sunnyside Ridge Road. Access to Inch Street at the start of this route is available via a number of access paths through the north of Lithgow, in turn connecting to Main Street and Mort Street.

Figure 1.3.2 Newnes State Forest Project Sites Access Routes



Source: Centennial

1.4 Existing Traffic Generation

1.4.1 Pit Top

The 2010 Angus Place Colliery Section 75W Modification Project Traffic Impact Assessment (**APC MOD 1 TIA**) examined the traffic generation and distribution issues associated with the APC MOD 1 Project described in **Section 1.2**, and specifically the potential impacts on the road network providing access to the Pit Top.

The traffic generation of the Pit Top comprises mining staff trips along with office, visitor and [minor] service vehicle demands. Almost the entire staff complement drives to the Pit Top in private vehicles, and there is only a very minor level of car sharing. This is not surprising considering the nature and hours of the work; the location of the Pit Top; and the appropriate provision of parking at the Pit Top.

The Pit Top generates peak traffic flows prior to and following the shifts outlined in **Table 1.2.2** and traffic flows during these peaks (generally over 2 hours) mirror staff numbers (i.e. one car per staff member). Peak periods include: -

- 5:00 am – 7:00 am peak period Approximately 140 arrival trips and 60 departure trips
- 13:00 am – 15:00 pm peak period Approximately 80 arrival trips and 110 departure trips
- 21:00 am – 23:00 pm peak period Approximately 60 arrival trips and 80 departure trips

In addition, the Pit Top generates an average of approximately 32 heavy vehicle trips per day, the majority of which are smaller (Class 3 – 5 with reference to the AustRoads *Vehicle Classification System*) heavy vehicles.

The operation of the road network which provides access to the Pit Top is examined in **Section 2**.

1.4.2 NSF Project Sites

The NSF Project Sites have over recent months seen minor activity associated with exploration and preliminary environmental studies for the Project, but this has generated only a small number of vehicle trips per week (**vtpw**), mostly being light vehicles (4WD). As discussed in **Section 1.3.2**, the APC VF Project is also currently generating construction vehicle trips (including light and heavy vehicles) to Sunnyside Ridge Road south of the NSF Project Sites. These trips are examined in **Section 5.1** and detailed in the Project Schedule (**Appendix C**).

The operation of the road network which provides access to the NSF Project Sites is examined in **Section 3**.

2 Pit Top Road Network

The road network which provides access to the Pit Top is shown in **Figure 1.1.2** and further detailed below.

2.1 Access Roads

2.1.1 Castlereagh Highway

The Castlereagh Highway (State Highway 18, State Route 86) is a regional highway connecting the Great Western Hwy at Marrangaroo to Mudgee and Gulgong and then further through north-west NSW. The Castlereagh Highway generally provides two traffic lanes and well designed at-grade and grade separated intersections appropriate to through and turning traffic demands. It has a speed limit of 80 km/h through the [relatively] 'busier' intersections with Wolgan Road and Main Road south of Lidsdale, but otherwise is generally 100 km/h.

2.1.2 Great Western Highway

The Great Western Highway (State Highway 5, National Route 32) is a regional highway which intersects with the Castlereagh Highway at Marrangaroo. It connects to the east to Lithgow, Katoomba and then through to the broader Sydney metropolitan area (M4); and to the west to Bathurst. It generally provides a speed limit of 100 km/h.

2.1.3 Wolgan Road/Bicentennial National Trail

Wolgan Road north from the Castlereagh Highway operates as a local collector road, providing for the local township of Lidsdale; for the Pit Top; and - north of the Pit Top as Bicentennial National Trail - for the very minor access demands of residents/farmers to the north, and visitors to the Wolgan Valley. Between the Castlereagh Highway and the Pit Top, Wolgan Road generally provides two traffic lanes with wide verges; it has a 50 km/h speed limit north from the Castlereagh Highway and through Lidsdale, then 80 km/h north to and past the Pit Top.

Unlike both the Castlereagh Highway and Great Western Highway, Wolgan Road does not provide for RMS defined "Restricted Access Vehicles" (**RAV**s) - vehicles over 19m in length and/or more than 50 tonnes in weight. Heavy vehicles of 19m and under, and less than 50 tonnes, are permitted to use Wolgan Road, and the Pit Top does generate these heavy vehicle trips to Wolgan Road (for service, maintenance and general equipment and supplies for the Pit Top).

RAVs are operated by APC for coal haulage but are restricted to the private haul roads; not APC RAVs are generated to Wolgan Road.

2.1.4 Ian Holt Drive

Ian Holt Drive is a minor link road between Wolgan Road and the Castlereagh Highway west of Lidsdale, providing for local trips generated to/from the north and west. Ian Holt Drive provides two traffic lanes with wide verges and has a 50 km/h speed limit. Ian Holt Drive does not provide for RAVs.

2.1.5 Main Street

Main Street is a local collector route running south from the Castlereagh Highway to Wallerawang. It provides two wide traffic lanes with varying width verges, and has a 50 km/h speed limit. Main Street does not provide for RAVs.

2.2 Access Intersections

2.2.1 Castlereagh Highway & Wolgan Road & Main Street

These adjacent priority (to Castlereagh Highway) "T" intersections provide turning lanes from the Castlereagh Highway to both Wolgan Road and Main Street, as well as a slip lane from Wolgan Road eastbound to the Castlereagh Highway. While the Project will not generate additional trips to this intersection, annual average growth and other sub-regional projects will generate trips to the Castlereagh Highway.

2.2.2 Wolgan Road, Ian Holt Drive & Skelly Road

This priority (to Wolgan Road) 4-way intersection provides for basic turns on all approaches as well as a short slip lane for the left turn Wolgan Road to Ian Holt Drive. With reference to the traffic surveys in **Appendix A**, flows at the intersection are very localised, essentially restricted to the generation of Lidsdale residents and the Pit Top. The APC MOD 1 TIA also determined that the intersection would operate at a good level of service through 2021.

The Project will not generate additional trips to this intersection, nor is there any information to suggest that annual average growth or other sub-regional projects would generate trips to this intersection through 2024. As such, it is the conclusion of ARC that **this intersection will continue to operate at a good level of service through 2024, with very low average delays and significant spare capacity**.

2.2.3 Castlereagh Highway & Ian Holt Drive

This priority 'T' intersection provides a left turn treatment from the Castlereagh Highway to Ian Holt Drive and basic turn treatments on all other approaches. With reference to the traffic surveys in **Appendix A**, turning demands at the intersection are very low, with the majority of Lidsdale and Pit Top traffic being generated to/from the south and east.

The Project will not generate additional trips to this intersection, and while there will be some growth in the Castlereagh Highway arising from annual average growth and sub-regional traffic generating projects, the turning demands at the intersection are so low as to allow for a conclusion that **this intersection will continue to operate at a good level of service, with very low average delays and significant spare capacity**.

2.3 Traffic Flows

The key intersections for assessment in regard to Pit Top traffic generation are those of Castlereagh Highway & Wolgan Road, and Castlereagh Highway & Main Street. These are the only intersections where flows – and specifically Castlereagh Highway flows - would change to any significant level as a result of annual average growth and other sub-regional traffic generating projects. **Again, the Project would not generate any additional traffic to these intersections, and there is no information to suggest future variations in traffic flows in Wolgan Road**.

As part of the APC MOD 1 TIA, TCS Instruments and Curtis Traffic Surveys were commissioned to survey the intersections of Castlereagh Highway & Wolgan Road; and Castlereagh Highway & Main Street. An Automatic Traffic Counter (**ATC**) was also installed in Wolgan Road north of Ian Holt Drive. These 2010 surveys are provided in **Appendix A**, and indicate that peak hours (total movements at the key Castlereagh Highway intersections) occur between 8:00 – 9:00 am, and between 14:00 – 15:00 pm. These peak hours have been retained for the assessment of the Project.

With further reference to the APC MOD 1 TIA, it was determined that the APC MOD 1 Project could generate up to 51 additional vehicle trips per hour (**vtph**) in the AM Peak Hour (37 arrival vtph and 21 departure vtph); and up to 64 additional vtph in the PM Peak Hour (27 arrival vtph and 37 departure vtph). These trips are included in the 2013 base flows.

Finally, in order to determine 2013 base through flows in the Castlereagh Highway, an ATC was installed in the Castlereagh Highway south of Wolgan Road in February 2013 by Skyhigh Traffic Data The ATC data is also provided in **Appendix A**.

Using all this available information, ARC has prepared base (2013) flows for the key Castlereagh Highway intersections, which are shown in **Figure 2.3.1** (AM Peak Hour) and **Figure 2.3.2** (PM Peak Hour) below.

Figure 2.3.1 2013 AM Peak Hour 8:00 – 9:00am

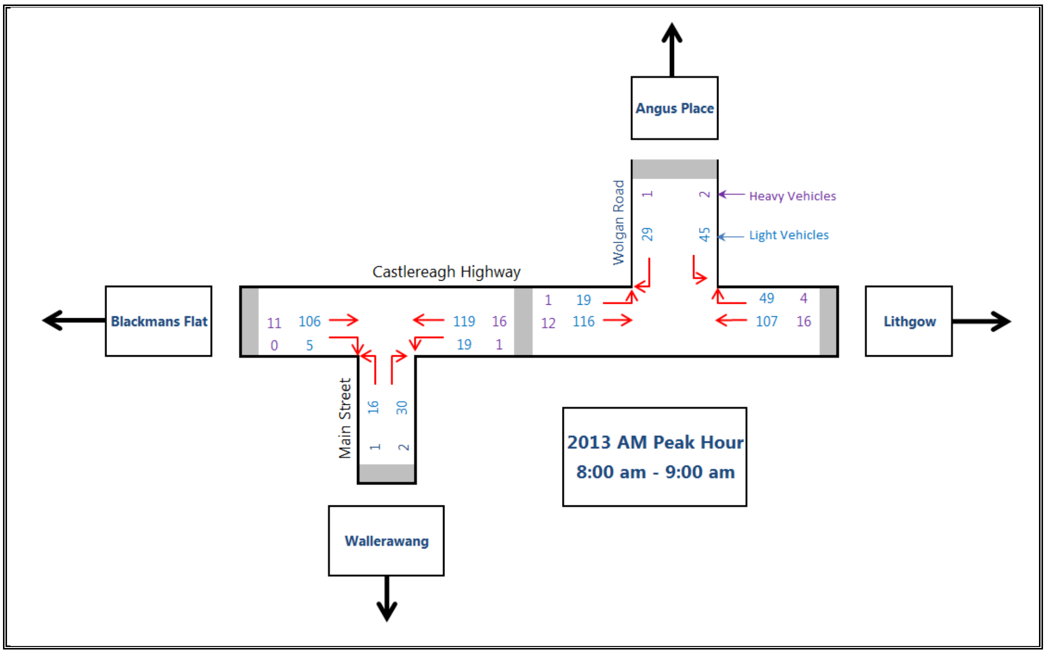
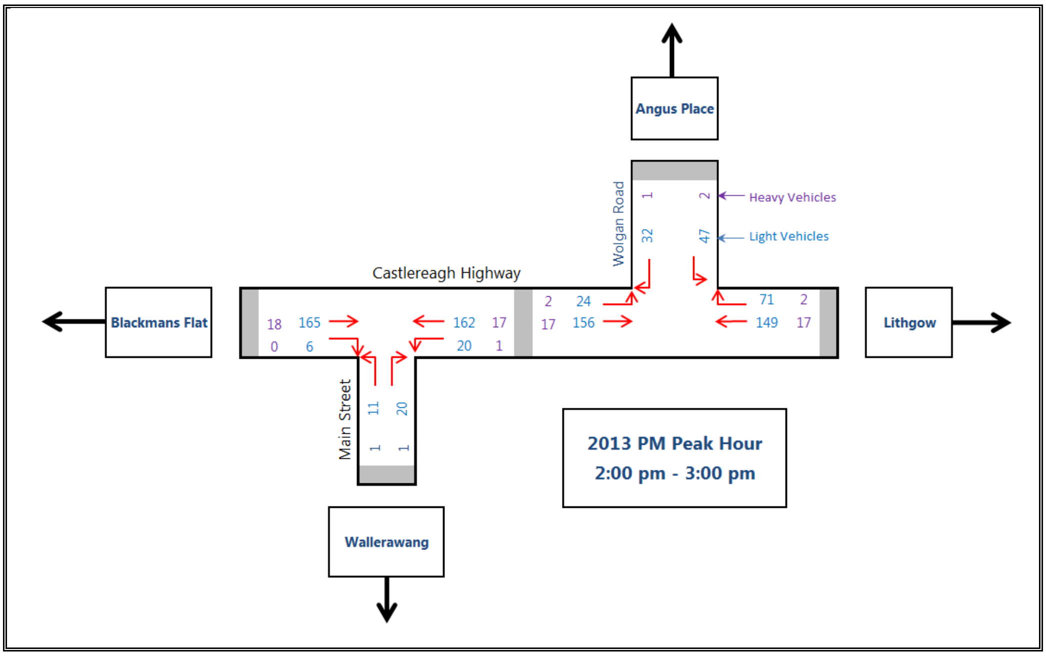


Figure 2.3.2 2013 PM Peak Hour 14:00 – 15:00pm



2.4 Road Network Operations

2.4.1 Intersection Operations

SIDRA is an RMS approved micro-analytical traffic evaluation tool used to determine key performance measures of intersections operation. The key inputs in the SIDRA analysis include peak hour traffic flows and speed profiles; intersection geometry and control; and vehicle entry profiles (gap acceptance) appropriate to the intersection design. SIDRA then reports the following: -

- **Level of Service**

  Level of Service (**LoS**) is a basic performance indicator assigned to an intersection based on average delay; at priority controlled intersections, the reported LoS is based on the worst approach delay. The RMS LoS criteria is provided below: -

Level of Service (RMS)	Control delay per vehicle in seconds (d) (including geometric delay)		
	Signals and Roundabouts	Rating	Stop and Give Way / Yield Signs
A	d < 14.5	Good	d < 14.5
B	14.5 < d < 28.5	Good with acceptable delay	14.5 < d < 28.5
C	28.5 < d < 42.5	Satisfactory	28.5 < d < 42.5
D	42.5 < d < 56.5	Near capacity	42.5 < d < 56.5
E	56.5 < d < 70.5	At capacity	56.5 < d < 70.5
F	70.5 < d	Over capacity	70.5 < d

- **Delay**

  Delay represents the difference between interrupted and uninterrupted travel times through an intersection, and is measured in seconds per vehicle in this assessment. Delays include queued vehicles accelerating and decelerating from/to the intersection stop, as well as general delays to all vehicles travelling through the intersection. For priority intersections, the average delay for the worst approach is used in defining LoS.

- **Degree of Saturation**

  Degree of Saturation (**DoS**) is defined as the ratio of demand (arrival) flow to capacity. DoS above 1.0 represent over-saturated conditions (demand flows exceed capacity) and degrees of saturation below 1.0 represent under-saturated conditions (demand flows are below capacity). The capacity of the movement with the highest DoS is reported.

The intersections of Castlereagh Highway & Wolgan Road, and Castlereagh Highway & Main Street, effectively operate as a single 4-way priority intersection, with the minor ('through') approaches of Wolgan Road and Main Street marginally off-set. Based on our observations of the intersection ARC has modelled this intersection as a standard 4-way intersection; this provides for a worst case assessment of its operation, as right turn movements from the minor approaches (Wolgan Road and Main Street) are modelled as being opposed to through movements between the minor approaches. This is the same analysis method as that used in the APC MOD 1 TIA.

The results of the SIDRA analysis are provided below.

Table 2.4.1 Existing Intersection Performance

APC Pit Top Road Network Intersection Performance 2013	Level of Service		Average Delay (s)		Worst Delay (s)		Degree of Saturation	
	AM	PM	AM	PM	AM	PM	AM	PM
Castlereagh Hwy & Wolgan Rd & Main St	A	A	<10	<10	11.4	13.4	0.08	0.10

The SIDRA analysis confirms our observations on-site, and shows that the intersection operates at a good LoS, with minimal average delays and significant spare capacity. Importantly, ARC has conducted sensitivity testing of the earlier APC AM arrival peak hour (5:00 am – 6:00 am) and determined a similar LoS "A"; while turning volumes during this earlier hour to Wolgan Road are higher, the through flow in the Castlereagh Highway is significantly lower (approximately 150 vtph two-way).

The Wolgan Road access driveway intersections at the Pit Top also operate at a good LoS as a result of a minimal – indeed virtually non-existent - passing flows in Wolgan Road, such that in most instances there is no delay to vehicles entering and departing the Pit Top access driveways.

2.4.2 Castlereagh Highway Operations

While the capacity of urban and rural roads is generally determined by the capacity of intersections (as examined above in **Section 2.4.1**) roads can also be assessed with reference to their general traffic carrying capacity. Table 4.5 of the RTA Guide to Traffic Generating Developments (**RTA Guide**) (reproduced below) provides a basic means by which to assess LoS for two-way, two-lane rural roads such as the Castlereagh Highway.

Table 2.4.2 RTA Guide (Table 4.5) Peak Hour Flow on Two-Lane Rural Roads

Terrain	Level of Service	Percent of Heavy Vehicles			
		0	5	10	15
Level	B	630	590	560	530
	C	1030	970	920	870
	D	1630	1550	1480	1410
	E	2630	2500	2390	2290
Rolling	B	500	420	360	310
	C	920	760	650	570
	D	1370	1140	970	700
	E	2420	2000	1720	1510
Mountainous	B	340	230	180	150
	C	600	410	320	260
	D	1050	680	500	400
	E	2160	1400	1040	820

The LoS reported in Table 4.5 of the RTA Guide is based on conditions which are generally represented in the Castlereagh Highway in the sub-region, including: -

- A 60/40 directional split of traffic;
- Level terrain with good overtaking opportunities; and
- Wide traffic lanes with good side clearances

With reference to the 2013 Castlereagh Highway traffic survey data (**Appendix A**) the Castlereagh Highway has a peak hour flow of 474 vtph south-east of Wolgan Road, with a heavy vehicle component of 12% of ADT. As such, during these peak periods the Castlereagh Highway would operate at a LoS "B".

Flows in the Castlereagh Highway north-west of Main Road are lower than east of Wolgan Road. The Western Coal Services Project Traffic Impact Assessment (2013) references a RMS reported two-way peak flow of 430 vtph (with 17% heavy vehicles) south of Boulder Road. While the heavy vehicle component of this flow is higher, reference to AustRoads Guide to Traffic Engineering Practice Part 2 Roadway Capacity (**AustRoads GTEP2**) upon which the RTA Guide Table 4.5 is based, indicates peak period operations also at a Level of Service "B".

Outside of the mining staff arrival and departure peak periods in the sub-region, Castlereagh Highway flows are significantly lower than these peak flows both north-west and south-east of the Wolgan Road & Main Road intersections.

2.4.3 Local Road Operations

Table 4.6 of the RTA Guide provides assessment standards for Environmental Capacity in urban roads.

Table 2.4.3 RTA Guide (Table 4.6) Environmental Capacity Standards for Residential Streets

Road class	Road type	Maximum Speed (km/hr)	Maximum peak hour volume (veh/hr)
Local	Access way	25	100
	Street	40	200 environmental goal
			300 maximum
Collector	Street	50	300 environmental goal
			500 maximum

While Wolgan Road performs a number of functions – access road, local road, collector road - it is perhaps best assessed with reference to environmental capacity standards so as to account for its residential nature; the fact that Wolgan Road could carry flows significantly higher than current flows without traffic impact is not as relevant in our opinion as potential amenity impacts on residents.

With reference to the available survey data, peak period flows in Wolgan Road coincide with Pit Top arrival and departure periods - two-way flows (north of Ian Holt Drive) can approach 200 vtph. With reference to Table 4.6 of the RTA Guide, this is well below the 300 vtph environmental goal for a 50 km/h collector road, and as such Wolgan Road provides a good level of environmental amenity (and significant spare traffic capacity). This same general conclusion is applicable to the other local access roads in Lidsdale (Ian Holt Drive and Skelly Road for example); these minor roads have peak flows well below 100 vtph and therefore meet environmental capacity goals for minor access ways, and as such provide good levels of environmental amenity and significant spare traffic capacity.

Finally, available peak period survey data for Main Road south of the Castlereagh Highway indicates two-way peak hour flows of up to 100 vtph. While 24 hour flow data is not available, it is our opinion – based on this available peak period data – that flows in Main Road also remain well below the 300 vtph environmental goal for a 50 km/h collector road.

2.5 Accident Data

The RMS has provided data in regard to accidents occurring in the local area over the period 2007 – 2011. A crash plot indicating crash location and severity, and crash summary information, is provided in **Appendix B**. Two accidents are reported at the intersection of Castlereagh Highway & Wolgan Road & Main Street; one had alcohol as a contributing factor, while the second resulted from a vehicle turning into the wrong lane, resulting in a sideswipe. Both incidents required a tow-away, but neither reported injury to the driver or passengers. In our opinion, the absence of significant incidents at the intersection results from a combination of factors, not least of which are good lane and turning path delineation; good sight distance; and very moderate traffic flows.

3 NSF Road Network

The road network which provides access to the NSF Project Sites is shown in **Figure 1.1.3**, and is described in more detail below.

3.1 Access Roads

3.1.1 Chifley Road

Chifley Road (State Road 40) runs from Lithgow east (as Bells Line of Road) to North Richmond. Chifley Road/Bells Line of Road generally provides two lanes for two-way traffic, and has lower speed limits (60 km/h) through smaller urban areas but more broadly is posted at 80 km/h or 100 km/h. Additional turning lanes are provided at key locations, including the intersection with Old Bells Line of Road & Petra Avenue.

3.1.2 Old Bells Line of Road

Old Bells Line of Road runs north and then north-west from its intersection with Chifley Road at Clarence. Old Bells Line of Road provides a gravel road of varying width (though generally minimum 5.5 m) suitable under many conditions for 2WD vehicles from Clarence through to the junction with Glowworm Tunnel Road. Old Bells Line of Road provides primary access for large logging vehicles (including RAVs, generally being longer than 19m) as well as a number of mining/forestry sites within the NSF, and as such is generally well maintained (graded).

3.1.3 Inch St/Atkinson Street

Inch Street is a local sealed residential access road which links to Main Street south-west of the intersection with Atkinson Street. Inch Street provides two lanes for two-way traffic, and provides on-street parking for most of its length. Atkinson Street – which is predominantly residential with some light industrial at its northern end - provides a two lane, two way sealed surface and becomes State Mine Gully Road north of the railway crossing.

While both roads provide significant spare traffic carrying capacity, they are not in our opinion appropriate for the movement of concentrated heavy vehicle demands as a function of their geometry and residential nature.

3.1.4 State Mine Gully Road/Glowworm Tunnel Road

State Mine Gully Road provides access into the NSF from the north of Lithgow, where as Glowworm Tunnel Road it intersects with Maiyingu Marragu Trail near the **Bungleboori** picnic area before continuing north-east.

State Mine Gully Road has a sealed surface that winds north for approximately 1.5 km from the railway crossing after which – as Glowworm Tunnel Road – it provides a gravel road of varying width, but generally of minimum 5.5 m; certainly it provides for two-way traffic (including RAVs) in separate travel lanes, and sight distances along the route are good through to (and beyond) Bungleboori. While undertaking a visit to the NSF in July 2011, ARC observed grading being undertaken on sections of Glowworm Tunnel Road near Bungleboori, providing a road surface suitable for 2WD vehicles; similar (graded road) conditions were observed during 2013.

3.1.5 Mayinygu Marragu Trail

Mayinygu Marragu Trail intersects with Glowworm Tunnel Road near Bungleboori and then travels north-west; it provides a gravel carriageway of varying width (down to approximately 4.0 m) and the quality of the gravel edge/verge can vary as a function of weather conditions (rain) such that such that it generally suitable for 4WD and heavy vehicles (including RAVs). Notwithstanding, our observations in 2013 showed a good quality surface along most of Mayinygu Marragu Trail to Sunnyside Ridge Road.

3.1.6 Sunnyside Ridge Road

Sunnyside Ridge Road provides a gravel road of varying widths north from the intersection with Mayinygu Marragu Trail. Immediately north of this intersection, the road narrows to approximately 4.0 m – it is our understanding that this short section of road will be widened as part of the APC VF Project. For the majority of its length, Sunnyside Ridge Road provides a minimum carriageway of 5.5 m that is regularly graded by FCNSW and as such suitable for all vehicles including RAVs.

3.1.7 Access Tracks

Minor access tracks of varying width are located off Sunnyside Ridge Road; these are generally suitable only to 4WD and heavy vehicles. The Project would upgrade and extend existing access tracks to provide access to the NSF Project Sites; more details are provided in **Section 4.2.2**.

3.2 Access Intersections

3.2.1 Inch Street & Atkinson Street

Based on our observations, this priority access intersection operates at a good LoS as a function of good basic geometry, appropriate sight distances (to the low speed residential area) and – most importantly – very low traffic flows.

3.2.2 Lithgow Town Centre Intersections

Inch Street in turn provides a number of access paths to key roads in the Lithgow town centre, including Railway Parade and Main Street, and in turn Mort Street.

Based on our observations, the intersections providing access to Inch Street generally operate at a good LoS as a function of good basic geometry, appropriate control (including traffic signals and sign control); low vehicle speeds; and very moderate traffic flows.

3.2.3 Chifley Road & Old Bells Line of Road & Petra Avenue

The intersection of Chifley Road & Old Bells Line of Road & Petra Avenue provides access to the Zig Zag Railway (currently closed) as well as Old Bells Line of Road itself. The southern approach to the intersection (Petra Avenue) provides access primarily to rural residential properties and some light industrial sites.

The intersection has significant infrastructure capacity, including a channelised left turn treatment from the west to Old Bells Line of Road; and channelised right turn treatments from the east to Old Bells Line of Road and from the west to Petra Avenue. The Old Bells Line of Road approach to the intersection is very wide (though unmarked and unsealed) which allows for the movement of heavy vehicles through the intersection.

This intersection will be used by Project vehicles including heavy vehicles, and is examined further in sections below.

3.2.4 NSF Intersections

There are a number of intersections within the NSF through which Project vehicles would travel, including: -

- Old Bells Line of Road & Glowworm Tunnel Road (all Project vehicles)
- Glowworm Tunnel Road & Maiyingu Marragu Trail (all Project vehicles)
- Maiyingu Marragu Trail & Sunnyside Ridge Road (all Project vehicles)
- Sunnyside Ridge Road & NSF Project Site Access Tracks (all Project vehicles)

With reference to the traffic volume data provided below in **Section 3.3**, and further to our observations within the NSF, the potential for two vehicles to arrive at any of these intersection with conflicting travel paths at the same time is relatively remote;. As importantly, appropriate sight distances are generally available between through and passing traffic at these intersections.

3.3 Traffic Flows

In 2011, ARC commissioned traffic surveys in key roads within the NSF and at the NSF access intersection of Chifley Road & Old Bells Line of Road & Petra Avenue. These are the same roads as those which will be used for access to the NSF Project Sites, and it is our opinion that there would be no significant difference between the flows surveyed in 2011 and current flows (notwithstanding additional trips generated by the recently commenced APC VF Project – see **Section 5.2**).

Automatic traffic counters (**ATC**s) providing 24 hour counts by vehicle type over a period of 7 days were installed at the following locations: -

- Glowworm Tunnel Road south of Old Bells Line of Road
- Old Bells Line of Road east of Glowworm Tunnel Road
- Sunnyside Ridge Road north of Maiyingu Marragu Trail

The surveys were completed by Skyhigh Traffic Data; the survey period (June 2011) coincided with NSW school holidays and a period of clear sunny weather, providing in our opinion a relatively high demand period in the NSF and also at the Zig Zag Railway (which was operating at the time).

The survey data in full is provided in **Appendix A** and summarised below, while **Figure 3.3** provides a summary of surveyed flows and an estimate of turning movements based on ARC observations and a review of traffic generators within the NSF.

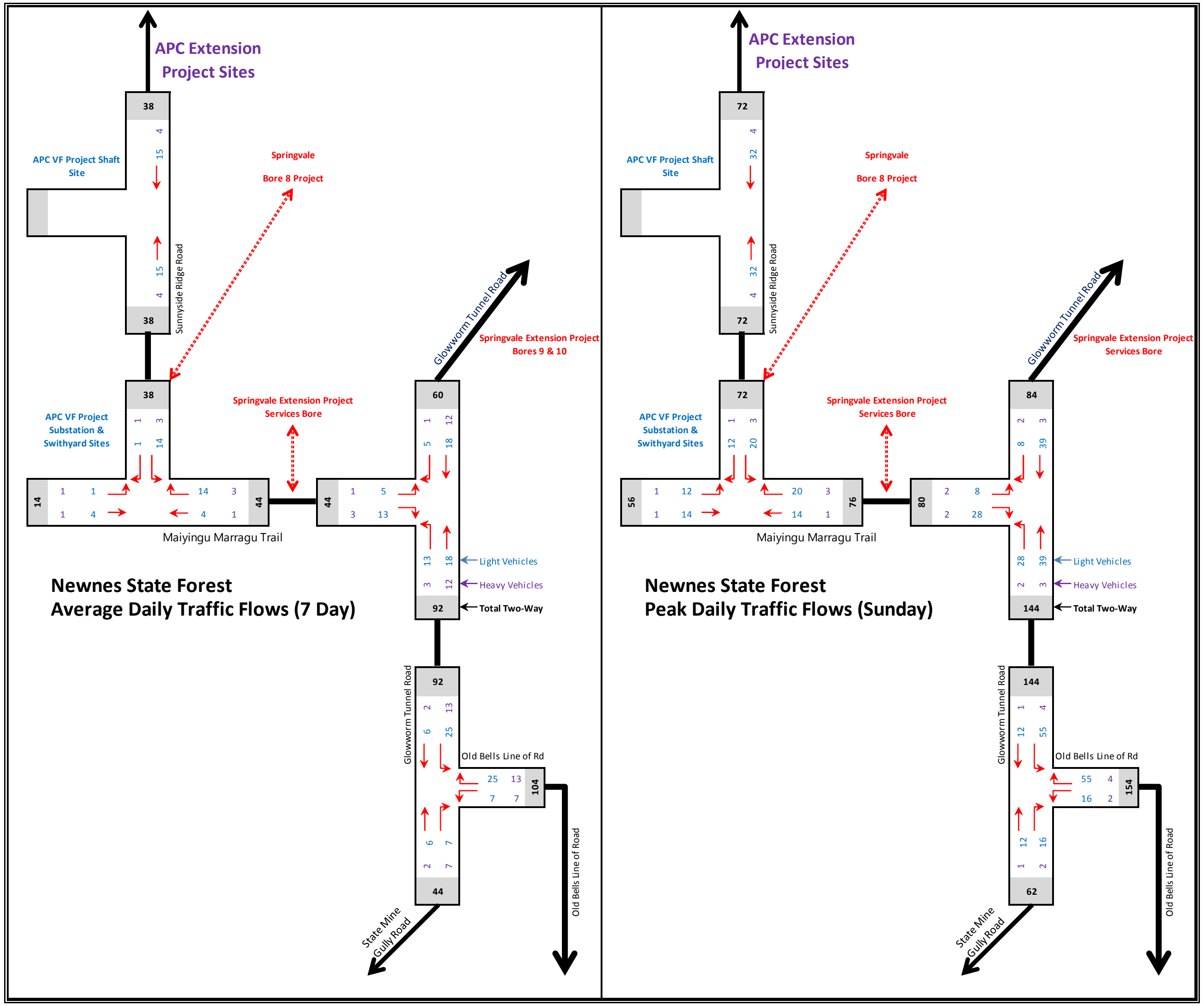
3.3.1 Glowworm Tunnel Road at Old Bells Line of Road

Glowworm Tunnel Road north of Old Bells Line of Road reported an average daily traffic (**ADT**) flow of 91 vtpd; the average weekday traffic (**AWT**) flow is lower at 75 vtpd, a result of a higher average weekend traffic (**AWE**) flow of 131 vtpd. The flow reported on the Sunday was the highest of the week at 144 vtpd, representing almost double the AWT. With reference to the AustRoads *Vehicle Classification System*, the majority of the flow comprises light vehicles (68%) and smaller heavy vehicles (28%); 4% of vehicles reported were combination heavy vehicles including logging vehicles.

3.3.2 Old Bells Line of Road east of Glowworm Tunnel Road

Old Bells Line of Road east of Glowworm Tunnel Road has an ADT flow of 104 vtpd; as for Glowworm Tunnel Road, the AWT flow is lower at 92 vtpd, a result of a higher AWE flow of 135 vtpd. The flow reported on the Sunday was the highest of the week at 154 vtpd. The survey reported a high number of combination heavy vehicles in Old Bells Line of Road (31%), with the remaining flow comprising 62% light vehicles and 7% smaller heavy vehicles.

Figure 3.3 NSF Average Daily & Peak Daily Traffic Flows



Source: Skyhigh & ARC

3.3.3 Sunnyside Ridge Road

Sunnyside Ridge Road north of Maiyingu Marragu Trail has an ADT of 39 vtpd; the AWT flow is lower at 32 vtpd, a result of a higher AWE flow of 57 vtpd. The flow reported on the Sunday was the highest of the week at 72 vtpd. The majority of the flow comprises light vehicles (79%), with minor combination heavy vehicle (12%) and smaller heavy vehicle (9%) flows.

3.3.4 Chifley Road

Annual Average Daily Traffic (**AADT**) data for Chifley Road/Bells Line of Road is available from the RMS, summarised in the RTA report Mount Victoria to Lithgow Great Western Highway Upgrade Strategic Review of a Newnes Plateau Corridor 2008, and provided below in **Table 3.3.4**

Table 3.3.4 Chifley Road/Bells Line of Road AADT

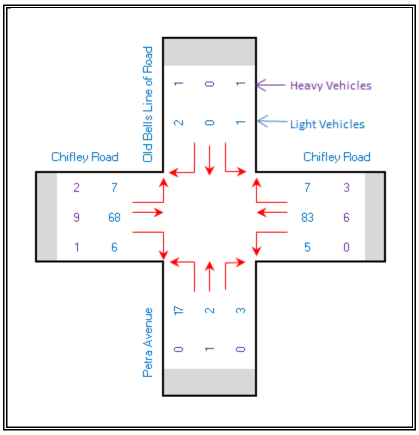
Location	Year						
	1989	1991	1993	1996	1999	2002	2005
Bell	3330		3150	3111	3068	3037	3145
Clarence				3301	3166	2979	2905

As shown in **Table 3.3.4**, growth rates in Chifley Road/Bells Line of Road are historically low, with the AADT at both Bell and Clarence trending down to 2005.

3.3.5 Intersection Chifley Road & Old Bells Line of Road & Petra Avenue

In June 2011, Skyhigh Traffic Data also completed an AM peak period survey at the intersection of Chifley Road & Old Bells Line of Road & Petra Avenue. The results of this surveys are also provided in **Appendix A**, while the peak hour flows (8:45 am - 9:45 am) are shown in **Figure 3.3.5**.

Figure 3.3.5 AM Peak Hour Chifley Road & Old Bells Line of Road & Petra Avenue



3.4 Road Network Operations

3.4.1 Intersection Chifley Road & Old Bells Line of Road & Petra Avenue

At the intersection of Chifley Road & Old Bells Line of Road & Petra Avenue, SIDRA modelling indicates that the intersection currently operates at a LoS "B" in the AM peak hour, based on a 15.4 second maximum delay to the right turn movement from Chifley Road to Old Bells Line of Road. All other approaches operate at a LoS "A", and the average delay at the intersection for all movements is less than 10 seconds. The intersection operates with significant spare capacity (DoS 0.054).

ARC acknowledges that the potential exists for higher peaks to be generated at the intersection associated with peak holiday periods or special events within the NSF. However, the SIDRA analysis indicates that the intersection could accommodate significantly higher flows with little potential for impact, a conclusion reinforced in our opinion by the good safety (crash) record at the intersection as outlined in **Section 3.5**.

3.4.2 NSF Road Network Operations

The key roads providing access to the NSF Project Sites are largely unsealed but well formed gravel roads running through the NSF; these roads have developed over many years to serve general forestry operations, recreational access, and to provide for access to exploration and other mining related activities such as environmental monitoring and surface equipment access as provided for in *Forestry Act 2012*.

The design and operation of these types of road can be considered with reference to the Australian Road Research Board Unsealed Roads Manual (**ARRB URM**); and to State Forests of NSW Forest Practices Code: Part 4 Forest Roads & Fire Trails (**FPC4**)

ARRB URM provides a review of the operation of unsealed rural roads which accounts for the road safety and efficiency, while also considering environmental, economic and other issues in establishing operational and capacity guidelines. It provides a classification system for such roads, which is shown in **Table 3.4.2**, and illustrated in **Figure 3.4.2**.

Table 3.4.2 ARRB USM Unsealed Road Classification

Road class	Class type	Service function description	Road type description
4A	Main road > 150 ADT	This type of road is used for major movements between population centres and connection to adjacent areas. High traffic volumes occur and the road can carry large vehicles.	• All weather road predominantly two-lane and unsealed. Can be sealed if economically justified • Operating speed standard of 50–80 km/h according to terrain • Minimum carriageway width is 7 m
4B	Minor road 150–50 ADT	This type of road is used for connection between local centres of population and links to the primary network. Roads may or may not be sealed depending on the importance and function of the road.	• All weather two-lane road formed and gravelled or single-lane sealed road with gravel shoulders • Operating speed standard of 30–70 km/h according to terrain • Minimum carriageway width is 5.5 m.
4C	Access road 50–10 ADT	Provides access to low use areas or individual rural property sites and forest areas. Caters for low travel speed and a range of vehicles and may be seasonally closed.	• Substantially a single lane two-way generally dry-weather, formed (natural materials) track/road • Operating speeds standard of < 20–40 km/h according to terrain • Minimum carriageway width is 4 m • May be restricted to four-wheel drive vehicles
4D	Tracks < 10 ADT	Provides primarily for four-wheel drive vehicles. Mainly used for fire protection purposes, management access and limited recreational activities.	• Predominantly a single-lane two-way earth track (unformed) at or near the natural surface level • Predominantly not conforming to any geometric design standards • Minimum cleared width is 3 m

Figure 3.4.2 ARRB USM Road Unsealed Road Classification

Further (ARRB USM Section 4.6.2 and 4.6.3): -

> *Unsealed roads in the majority of cases are either one-lane two-way roads of two-lane two way roads…For roads with low traffic volumes <150 vpd, AustRoads suggests that a single lane two-way operation is adequate as there is a low probability of vehicles meeting and the few passing manoeuvres can be undertaken at reduced speeds using the shoulders. Providing there is sufficient sight distance these manoeuvres can be performed without hazard and the overall loss in efficiency brought about by reduced speeds when vehicles cross will be small.*

The ARRB USM is the primary traffic reference provided in FPC4. While FPC4 does not prescribe traffic volume limits (an issue discussed and confirmed with FCNSW) the designated *Primary Access Road*, *Secondary Access Road* and *Feeder Road* described in FPC4 are generally equivalent to the Class 4A, 4B and 4C roads respectively as described in ARRB URM.

The FPC4 *Primary Access Road* has the following description: -

- 5.5 m – 7.3 m formation width
- All weather road, unsealed, two lanes
- **This generally describes Old Bells Line of Road, State Mine Gully Road, Glowworm Tunnel Road and Sunnyside Ridge Road**.

The FPC4 *Secondary Access Road* has the following description: -

- 4.2 m – 5.5 m formation width
- All weather road, unsealed, one lane.
- **This generally describes Maiyingu Marragu Trail**.

The FPC4 *Feeder Road* has the following description: -

- 3.7 – 4.2 m formation width
- All weather road, unsealed, one lane.
- **This generally describes a number of the existing access tracks which will be upgraded/extended to provide access to the NSF Project Sites**.

Most of the primary NSF roads provide well in excess of a 3.5m single lane, for which a flow of 150 vtpd is generally designated as a target flow. **In regard to traffic capacity, these roads – Glowworm Tunnel Road, Old Bells Line of Road, Sunnyside Ridge Road and sections of Maiyingu Marragu Trail – provide more than appropriate formations to accommodate flows well beyond 150 vpd**; indeed, these roads could accommodate many times this flow without significant *traffic capacity* impacts, a conclusion supported by the ARRB Research Report ARR 367, which examined logging movements in state forests: -

> *In the case of two-lane two-way roads the carrying capacity of such roads is well over 3,000 vpd….The carrying capacity of a single lane, two way road is <1,000 vpd and such a road is able to accommodate additional traffic caused by normal logging operations, particularly if suitable layover areas are provided. Road capacity is generally not an issue with low volume roads provided that adequate safety measures are implemented along the route and at intersections.*

The NSF road network traffic surveys provided in **Section 3.3** report flows during what might be expected to a be a generally high period of generation (winter school holidays); however, as discussed in regard to the intersection of Chifley Road & Old Bells Line of Road & Petra Avenue, it is the case that flows during warmer months could be higher, and that peak recreational events or the like might generate higher flows again, particularly in key recreational areas such as Bungleboori. Based on all available information, it is the opinion of ARC that higher flows are already accommodated by the NSF road network without significant impact on either safety or general traffic efficiency.

3.5 Accident Data

The RMS has provided ARC with data in regard to accidents occurring within and adjacent to the NSF over the period 2006 – 2011. A crash plot indicating crash location and severity is provided in **Appendix B**.

A total of sixteen accidents are reported in the NSF during the period 2006 – 2011, including twelve injury crashes and four tow-away crashes; no fatalities are reported. Importantly, it was determined in eleven of the incidents that speeding (eight), alcohol (two) or fatigue (three) factored as a cause.

Eight of the crashes occurred in Old Bells Line of Road, including four just north of Chifley Road (though away from the intersection) and four spaced along the road. Three head-on accidents are reported, all occurring in fine dry conditions, while the other five crashes were run-off-road, occurring under both dry and wet conditions. Two injury crashes are reported for Glowworm Tunnel Road, both run-off in dry conditions, one in darkness and one during the day. A further crash is reported in Maiyingu Marragu Trail west of the Bungleboori picnic area (off road at bend, wet conditions), while the other reported crashes are scattered through the NSF road network and generally comprise run-of-road incidents.

Based on our observations in the NSF, and with reference to the RMS crash data, it is certainly the case that inappropriate speed can lead to incidents on these roads, either as a case of run-off-road (i.e. not slowing appropriately for a curve) or head-on (i.e. not taking due caution on narrower sections of road). The posted (or at least NSW Police/RMS reported) speed limit for many of these crashes was 80 km/h or 100 km/h, limits which have since October 2010 been revised to a maximum of 60 km/h in all State Forests.

Finally, and as stated in earlier sections, no crashes are reported at the intersection of Bells Line of Road & Old Bells Line of Road & Petra Avenue over the 6 year reporting period. This reflects the good intersection geometry and turning infrastructure; excellent sight distances; and very moderate traffic flows.

4 Project Description

4.1 Project Components

The Project would provide for the continuation of mining operations at the APC. Full details of the Project are provided in the Project EIS which this TIA accompanies, but from a traffic and transport perspective the components of the Project requiring specific assessment are limited to: -

- **The continued operation of the Pit Top**; and
- **The construction and operation of the NSF Project Sites**.

4.2 Access

4.2.1 Pit Top

Access to the Pit Top in Wolgan Road would be unaffected by the Project, with all vehicles utilising the existing entry points to the Pit Top, and accessing Wolgan Road itself via the same local and sub-regional intersections as identified in **Section 2**.

4.2.2 NSF Project Sites

Access to the NSF Project Sites will be along existing NSF roads and tracks, and specifically **via Old Bells Line of Road for heavy vehicles**, and via Old Bells Line of Road or State Mine Gully Road for light vehicles. Both roads lead to Glowworm Tunnel Road, Maiyingu Marragu Trail and then Sunnyside Ridge Road, from which upgraded and extended access tracks will link to the NSF Project Sites.

The Project proposes the following sections of upgraded and extended access track: -

- The APC-VS3 Site will require an upgrade of an existing access track east of Sunnyside Ridge Road. As agreed with FCNSW, the upgraded access track will initially provide a width of 10 m to accommodate an access track (5 m) and Infrastructure Corridor (5 m), before the Infrastructure Corridor is rehabilitated, retaining the 5 m access track as per a FPC4 *Secondary Access Road*.

- Each of the Bore Sites will require the upgrade and extension of existing access tracks off Sunnyside Ridge Road. As agreed with FCNSW, these upgraded and extended access tracks will initially provide a width of 10 m to accommodate an access track (5 m) and Infrastructure Corridor (5 m), before the Infrastructure Corridor is rehabilitated, retaining the 5 m access track as per a FPC4 *Secondary Access Road*.

4.3 Construction Traffic Generation

4.3.1 Pit Top

The Project does not provide for new construction at the Pit Top.

4.3.2 NSF Project Sites

4.3.2.1 General Project Construction Proposals

The construction of each NSF Project Site is based on the following general Project construction proposals: -

- Construction work would take place 24 hours a day, 7 days a week, based on a two-shift structure (6:00 am – 6:00 pm, and 6:00 pm – 6:00 am).

- NSF Project Site construction staff would generally travel in groups to/from off-site locations, which is made possible by the proposed shift structure. This method of travel has been used for past projects by Centennial within the NSF, and minimises vehicle movements to the NSF.

- The construction of the NSF Project Sites would be undertaken progressively as required; at this time, it is estimated that the NSF Project Sites would be operational from: -

  - Bore 1 May 2014
  - Bore 2 August 2016
  - Bore 3 January 2018
  - APC-VS3 May 2021
  - Bore 4 November 2022
  - Bore 5 February 2024
  - Bore 6 July 2026
  - Bore 7 July 2030

- Construction of each Bore Site (including the access track and Infrastructure Corridor) is estimated to occur over 6 months prior to each operational target date, while the construction of APC-VS3 (including the access track and Infrastructure Corridor) is estimated to occur over 16 months prior to the operational target date.

4.3.2.2 Peak Construction Traffic Generation

Based on the general construction principles outlined above; the past construction of similar sites within the NSF by Centennial; and with reference to the detailed Project Schedule (**Appendix C**); it is estimated that the **Project would generate up to 16 vtpd during the construction phase of each NSF Project Site**. On average this would comprise the generation of 8 light vtpd and 8 heavy vtpd.

4.3.2.3 Construction Traffic Trip Distribution

During the construction phase for each NSF Project Site, the following directional distribution would occur: -

- Up to 8 light vtpd along the available light vehicle routes via State Mine Gully Road or via the Old Bells Line of Road. Based on the proposed shift start and end times, few light vehicles would be generated to the NSF access intersections during existing peak periods.

- Up to 8 heavy vtpd along the designated heavy vehicle route via Old Bells Line of Road. A small percentage of these trips could be generated through the intersection of Chifley Road & Old Bells Line of Road & Petra Avenue during existing peak periods.

Recommendation It is the recommendation of ARC that all construction heavy vehicle trips to/from the NSF Project Sites be undertaken during daylight hours, which would generally require them to occur between 6:00am and 6:00pm.

4.4 Operational Traffic Generation

4.4.1 Pit Top

The Project does not provide for any changes to existing 1 operational traffic generation at the Pit Top, nor for any changes to existing shift structures, employment levels or general trip distribution.

4.4.2 NSF Project Sites

During the operational phase of the Project, it is estimated that a total of less than 10 vtpw would be generated to/from the NSF Project Sites, with an expected peak of 4 vtpd. These trips would comprise a mixture of light and heavy vehicle trips.

From an assessment perspective, the operational traffic generation of the NSF Project Sites is extremely minor; **it is the opinion of ARC that the operational traffic generation of the Project would have no significant impact on the operation of the NSF road network or on the NSF access intersections at Clarence and north Lithgow**.

Recommendation It is the recommendation of ARC that all operational heavy vehicle trips to/from the NSF Project Sites be undertaken during daylight hours, which would generally require them to occur between 6:00am and 6:00pm.

4.5 Parking

4.5.1 Pit Top

All Pit Top parking will continue to be provided within the Pit Top, which provides capacity in excess of the peak demands which occur during shift changeover periods.

4.5.2 NSF Project Sites

As for existing and approved APC surface infrastructure sites within the NSF, parking for the NSF Project Sites (both during construction and operation) will be provided within compounds at each of NSF Project Sites.

It is acknowledged that during the earlier stages of the construction phase for each NSF Project Site, parking may need to be provided in the broader NSF Project Site ESAs (as detailed in the Project EIS) for a short period until such time as each NSF Project Site compound is completed.

5 Potential Cumulative Traffic

To account for potential cumulative traffic impacts within the access networks providing for the Pit Top and for the NSF Project Sites, ARC has completed a desktop review of projects before the DP&I which could generate traffic to these networks.

5.1 APC VF Project

As discussed in **Section 1.2**, the APC VF Project was recently approved by the DP&I, and provides for the construction of new surface infrastructure within the NSF off Sunnyside Ridge Road, immediately south of the proposed NSF Project Sites. Based on our discussions with Centennial, the APC VF Project construction phase commenced in mid 2013, and will at times coincide with the construction of the NSF Project Sites, as illustrated in the Project Schedule (**Appendix C**). Analysis which considers the APC VF Project traffic generation to the NSF road network is provided in **Section 6**. The APC VF Project would not generate additional trips to the Pit Top road network.

5.2 Springvale Extension Project

Springvale Coal has commenced preliminary investigations into the Springvale Mine Extension Project (**Springvale Extension Project**); the Springvale Extension Project proposes new surface facilities within the NSF, but would not alter staff or shift structures at the Springvale Pit Top at Wallerawang.

As part of a future Springvale Extension Project EIS submission, ARC has been commissioned to examine the traffic and transport issues associated with the Springvale Extension Project; ARC has determined that the construction phase of proposed Springvale Extension Project sites within the NSF would at times coincide with the construction of the NSF Project Sites, as illustrated in the Project Schedule provided in **Appendix C**.

The Springvale Extension Project would more generally provide for continued operations at the Springvale Pit Top; this would include contingencies for the transportation of up to 50,000 tonnes per annum of coal to the Wallerawang Power Station and Mt Piper Power Stations by the public road network, contingencies provided in the current Springvale approval.

Analysis which considers the Springvale Extension Project traffic generation potential to both the Pit Top and NSF road networks is provided in **Section 6**.

5.3 Western Coal Services Project

The WCS Project would provide for an upgrade of the existing infrastructure within the SCS Facility to support ongoing coal operations in the sub-regional coal fields. The traffic issues associated with the WCS Project are detailed in the 2013 Western Coal Services Project Traffic Impact Assessment (**WCS Project TIA**), and include provisions for the creation of 3 additional permanent staff positions, and a construction program that will generate some 60 vtph between 6:00 – 8:00 am and between 4:00 – 6:00 pm, for a 3 month period during a broader [lower generating] 18 month total construction period. Analysis which considers the WCS Project traffic generation to the Pit Top access network is provided in **Section 6**. The WCS Project would not generate trips to the NSF road network.

5.4 Neubeck Coal Project

DGRs have been issued in regard to the Neubeck Coal Project (the **Neubeck Project**), which would provide for an open-cut mine north-east of the Mt Piper Power Station. The general issues associated with the Neubeck Project are outlined in the 2012 *Neubeck Coal Project Briefing Paper* (***Neubeck Project BP***); from a traffic perspective, the Neubeck Project provides for the creation of up to 65 permanent staff positions. Analysis which considers the potential Neubeck Project traffic generation to the Pit Top road network is provided in **Section 6**. The Neubeck Project would not generate trips to the NSF road network.

5.5 Airly Mine Extension Project

DGRs have been issued in regard to the Airly Mine Extension Project (**Airly Project**) north-east of Capertee. The general issues associated with the Airly Project are outlined in the 2012 *Airly Mine Extension Project Briefing Paper* (***Airly Project BP***); from a traffic perspective, the Airly Project provides for the creation of up to 15 additional permanent staff positions and 20 contractor positions. Analysis which considers the potential Airly Project traffic generation to the Pit Top road network is provided in **Section 6**. The Airly Project would not generate trips to the NSF road network.

5.6 Coalpac Consolidation Project

The Coalpac Consolidation Project (the **Coalpac Project**) – which is currently before the DP&I for assessment - would provide for an expansion of mining operations at the Cullen Valley and Invincible coal mines near Cullen Bullen, as well as the establishment of a new quarry and associated infrastructure. The Coalpac Consolidation Project Environmental Assessment Traffic & Transport Impact Assessment (**Coalpac Project T&TIA**) reports provisions for: -

- A 15 – 18 month construction program, generating (at its peak) the following additional construction staff trips: -
  - 60 AM vtph (6:00 – 7:00 am) arrival and 60 PM vtph (4:00 – 5:00 pm) departure to/from the south-east

- An Ultimate Operational period generating the following additional staff trips: -
  - 21 AM vtph (6:00 – 7:00 am) arrival and 9 AM vtph (6:00 – 7:00 am) departure to/from the south-west

- 9 PM vtph (7:00 – 8:00 pm) arrival and 21 PM vtph (7:00 – 8:00 pm) departure to/from the south-west
- Up to 8 sand haulage heavy vehicle trips per hour to/from the south-east

Analysis which considers the Coalpac Project traffic generation to the Pit Top road network is provided in **Section 6**. The Coalpac Project would not generate trips to the NSF road network.

5.7 Annual [Average] Traffic Growth

5.7.1 Intersection Castlereagh Highway & Wolgan Road & Main Street

In order to assess the future operation of the intersections of Castlereagh Highway & Wolgan Road and Castlereagh Highway & Main Street, ARC has examined the potential for annual increases in traffic flows in the Castlereagh Highway.

To this end, ARC has sourced information from the RMS for the permanent count station on the Castlereagh Highway at Lidsdale (Station 99.253). While a full data set is not publicly available, in 2010 the [then] RTA provided additional yearly data and a growth projection for the Lidsdale Count Station to Barnson Pty Ltd to assist in the preparation of the Pine Dale Coal Mine Yarraboldy Extension Traffic and Transportation Assessment (**Pine Dale T&TA**). Reference to Appendix 3 of the Pine Dale T&TA indicates a growth forecast of **1.7% per annum** in the Castlereagh Highway adjacent to Springvale through the year 2020. ARC has adopted this growth rate for the assessment of future traffic flows in the Castlereagh Highway. We note that the Pine Dale T&TA does not forecast an traffic increases to the sub-regional network further to an approval of the Pine Dale Extension Project.

There is no information to suggest any annual average increases in Wolgan Road, Ian Holt Drive or Main Street.

5.7.2 NSF Road Network

There is no information to suggest that traffic flows in the NSF road network would increase significantly through the life of the Project. As acknowledged in **Section 3**, traffic flows in the NSF may increase in the summer months (or due to specific events or the like), but there is no information to suggest consistent annual increases in the NSF road network.

5.7.3 Intersection Chifley Road & Old Bells Line of Road & Petra Avenue

In Chifley Road, very minor annual increases may occur over time (though the available AADT data in **Table 3.3.4** shows flows tending down through 2005). The significant capacity available at the intersection of Chifley Road & Old Bells Line of Road & Petra Avenue, paired with Project construction phase traffic generated for the most part outside of peak periods, in our opinion suggests that annual growth would not have any significant impact on future performance in Chifley Road or at its intersection with Old Bells Line of Road & Petra Avenue.

6 Cumulative Traffic Flows

6.1 Pit Top Road Network

6.1.1 Assessment Scenarios

With reference to sections above, the key sub-regional location for assessment in regard to the Pit Top is the intersection of Castlereagh Highway & Wolgan Road & Main Road; total flows at the intersection will increase over time as a result of annual traffic growth and sub-regional projects (outlined in **Section 5**). ARC has examined flows for two forecast years: -

- **An interim forecast year of 2015**, during which the WCS Project and Coalpac Project could potentially be generating short term peak construction flows while other sub-regional projects would potentially be operational and generating additional operational (staff) flows.

- **A design forecast year of 2024** to provide an appropriate 10 year forecast horizon including annual growth and sub-regional projects operational (staff) flows.

For sub-regional project sites located north-west of the intersection of Castlereagh Highway & Main Street, ARC has based trip distribution (where not specified) on the general characteristics of APC staff trips, which indicate approximately 75% of trips are to/from the south-east. The remaining (APC) trips are to/from the north west and south (Wallerawang); all 25% have been assigned to Wallerawang, thereby assigning all additional sub-regional trips to the two key intersections as either a through or turning movement.

6.1.2 2015 Forecast Flows

Along with existing flows, annual growth in the Castlereagh Highway and continued approved Pit Top flows, ARC has included the following potential sub-regional generation in the 2015 flow forecast: -

- **Springvale Extension Project (emergency haulage provisions)**

  Contingency short term haulage of coal via the public road network between the Springvale Pit Top and the Mt Piper Power Station (off Boulder Road) could generate up to 6 north-west bound heavy vtph and 6 south-east bound heavy vtph (24 hours a day).

- **Neubeck Project**

  While the majority of Neubeck Project Day Shift staff arrival trips would be generated outside of the existing AM peak hour at the intersection, 20 vtph, including 15 arrival vtph and 5 departure vtph, have been assigned to the AM peak hour. In the PM peak hour – which coincides with the changeover between Day and Afternoon Shifts at many sub-regional mines - the Neubeck Project could generate 50 vtph, including 25 arrival vtph and 25 departure vtph.
  ARC acknowledges that the estimated Shift structure used in this assessment may be different to that ultimately employed by the Neubeck Project further to an approval.

- **Airly Project**

  While the majority of Airly Project Day Shift staff arrival trips would be generated outside of the existing AM peak hour at the intersection, 15 vtph, including 10 arrival vtph and 5 departure vtph, have been assigned to the AM peak hour. In the PM peak hour, the Airly Project could generate 30 vtph, including 15 arrival vtph and 15 departure vtph.

  ARC again acknowledges that the estimated shift structure used in this assessment may be different to that ultimately employed by the Airly Project further to an approval.

- **WCS Project (construction)**

  Based on the information provided in the WCS Project TIA the majority of WCS Project construction staff arrival trips would be generated outside of the existing AM peak hour at the intersection; as a worst case, 30 arrival vtph have been assigned to the AM peak hour. In the PM peak hour, the WCS Project is unlikely to generate any trips to the intersection.

- **Coalpac Project (construction)**

  Based on information provided in the Coalpac Project T&TIA the majority of Coalpac Project construction staff arrival trips would be generated outside of the existing AM peak hour; 30 arrival vtph have been assigned to the AM peak hour, along with 8 heavy vtph (4 vtph arrival, 4vtph departure). In the PM peak hour, the Coalpac Project is unlikely to generate any staff trips to the intersection, but again could generate 8 heavy vtph (4 vtph arrival, 4vtph departure).

The resulting AM and PM Peak Hour flows for the year 2015 are shown below.

Figure 6.1.2.1 2015 AM Peak Flows Castlereagh Highway & Wolgan Road & Main Street

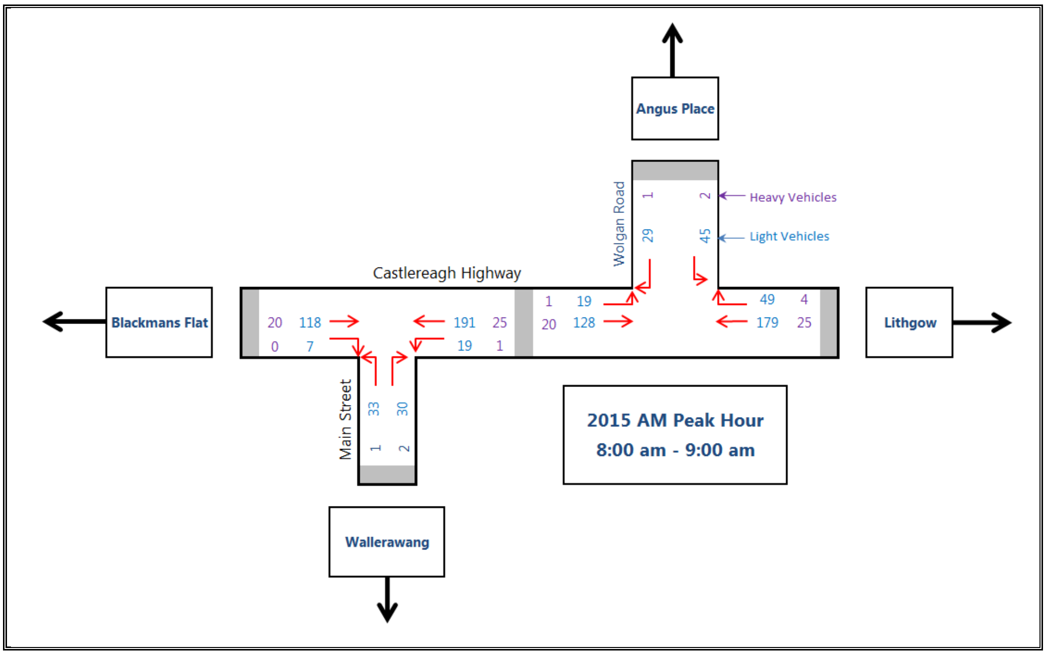
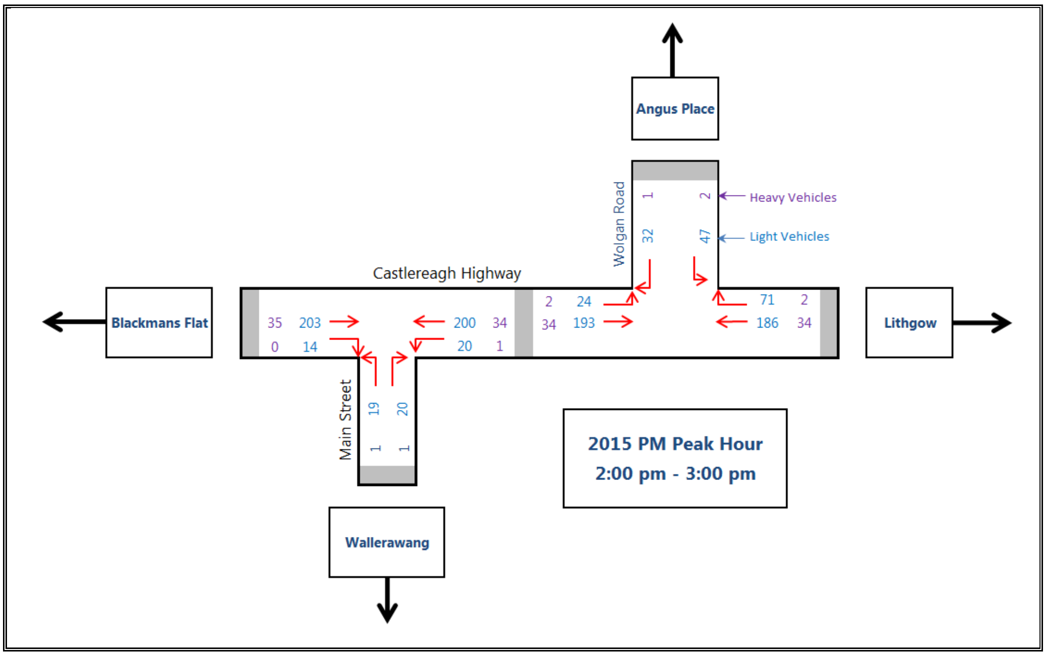


Figure 6.1.2.2 2015 PM Peak Flows Castlereagh Highway & Wolgan Road & Main Street



6.1.3 2024 Forecast Flows

Along with existing flows, annual growth in the Castlereagh Highway and continued approved Pit Top flows, ARC has included the following potential sub-regional generation in the 2024 flow forecast: -

- **Neubeck Project** (as per **Section 6.1.2** above)

- **Airly Project** (as per **Section 6.1.2** above)

- **Coalpac Project (operational)**

  Based on the information provided in the Coalpac Project T&TA, operational staff arrival and departure trips would all be generated outside of the existing AM and PM peak hours at the intersection, and up to 8 heavy vtph could be generated during both the AM and PM peak hour.

The resulting flows for the year 2024 are shown below.

Figure 6.1.3.1 2024 AM Peak Flows Castlereagh Highway & Wolgan Road & Main Street

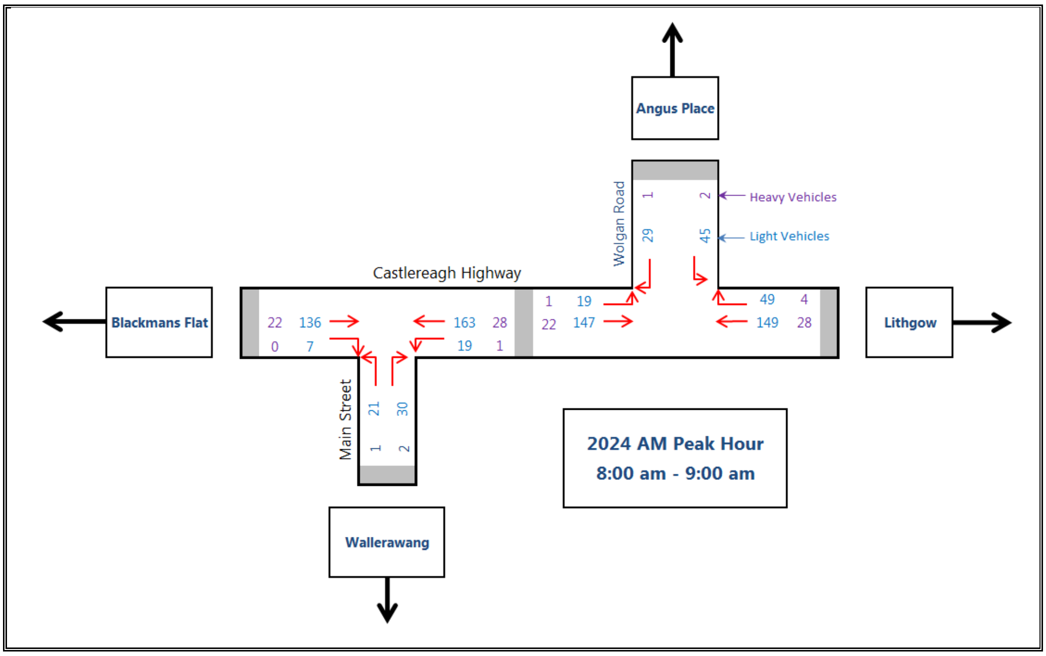
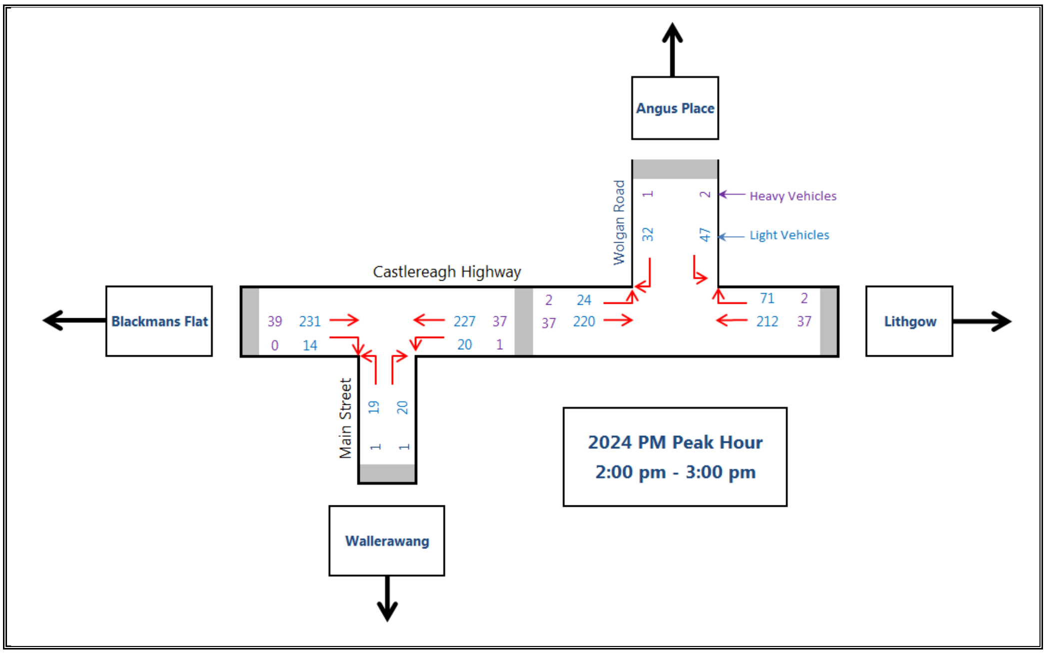


Figure 6.1.3.2 2024 PM Peak Flows Castlereagh Highway & Wolgan Road & Main Street



6.2 NSF Road Network

With reference to **Section 5** – and the detailed Project Schedule provided in **Appendix C** - the future total flows along the key roads providing access to the NSF Project Sites will [at various times] comprise: -

- **State Gully Mine Road**
  - Existing flows
  - Project flows
  - APC VF Project flows
  - Springvale Extension Project flows

- **Old Bells Line of Road**
  - Existing flows
  - Project flows
  - APC VF Project flows
  - Springvale Extension Project flows

- **Glowworm Tunnel Road between Old Bells Line of Road & Maiyingu Marragu Trail**
  - Existing flows
  - Project flows
  - APC VF Project flows
  - Springvale Extension Project flows

- **Maiyingu Marragu Trail between Glowworm Tunnel Road & Sunnyside Ridge Road**
    - Existing flows
    - Project flows
    - APC VF Project flows
    - Springvale Extension Project flows

- **Sunnyside Ridge Road north of Maiyingu Marragu Trail**
    - Existing flows
    - Project flows
    - APC VF Project flows

The peak cumulative traffic generation to the NSF during the Project construction phase will occur for a period of approximately 4 months from December 2014 to March 2015.

During this period, the potential exists for the Project (Bore 1 construction) to be generating a peak construction flow of 16 vtpd at the same time as the APC VF Project (Shaft Site construction) is generating a flow of 12 vtpd, and the Springvale Extension Project (Services Bore construction) is generating a flow of 16 vtpd – a total of 44 vtpd.

At other times - based on all known NSF projects - the cumulative traffic generation of the Project and other NSF projects would be lower than this peak generation of 44 vtpd. In summary: -

- Between February 2016 and August 2016, the Project (Bore 2 construction) and the Springvale Extension Project (Bore 9 construction) would generate a cumulative construction traffic generation of 32 vtpd, comprising 16 Project vtpd and 16 Springvale Extension Project vtpd.

- Between October 2017 and January 2018, the Project (Bore 3 construction) and the Springvale Extension Project (Bore 10 construction) would generate a cumulative construction traffic generation of 32 vtpd, comprising 16 Project vtpd and 16 Springvale Extension Project vtpd.

- Outside of these periods of cumulative construction traffic generation, the Project would alone generate up to 16 vtpd to the NSF road network.

The flows associated with the **peak cumulative generation** period between December 2014 and March 2015, and the total future flow estimates for this same period in the key NSF roads, are shown below.

Figure 6.2.1 Cumulative NSF Projects Traffic Generation to NSF December 2014 – March 2015

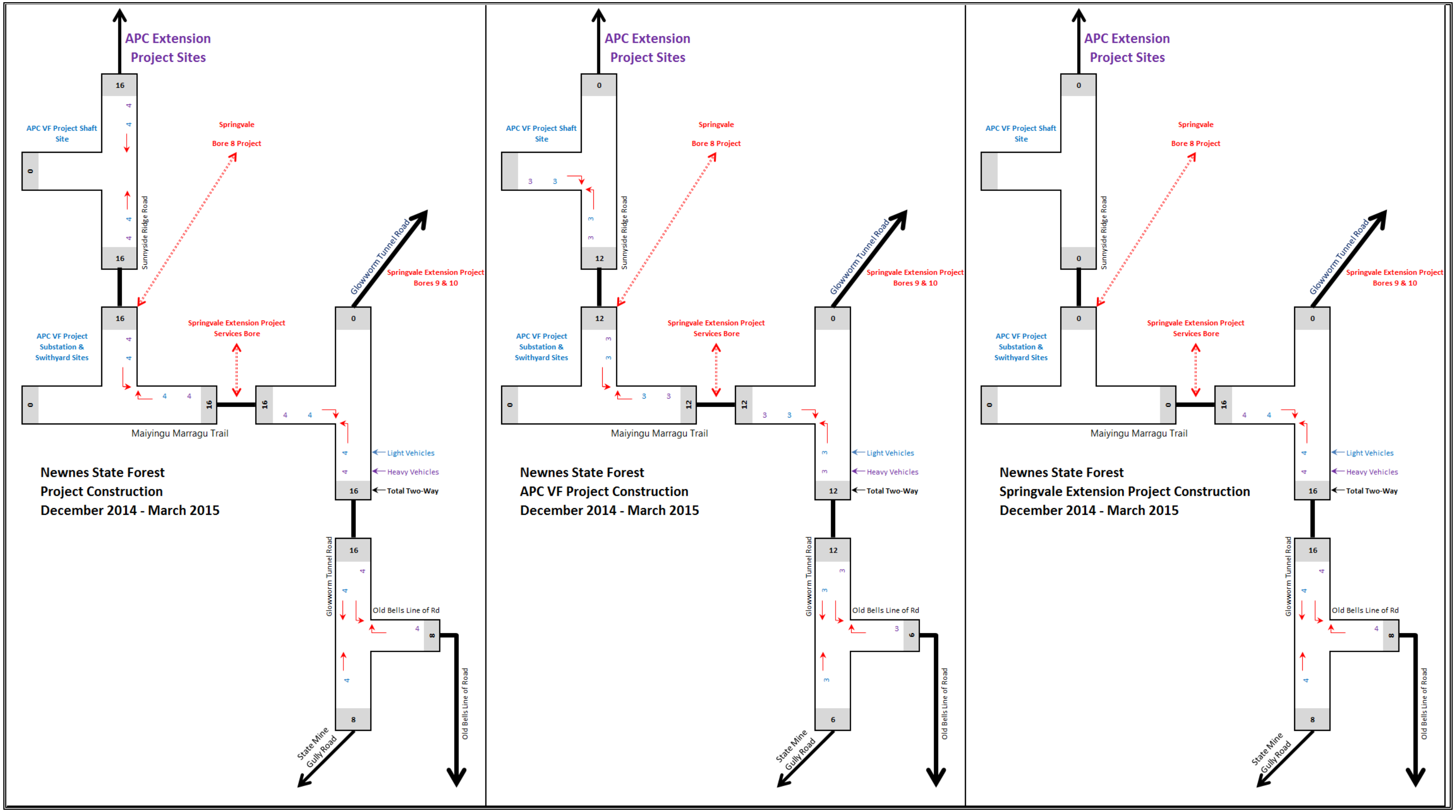
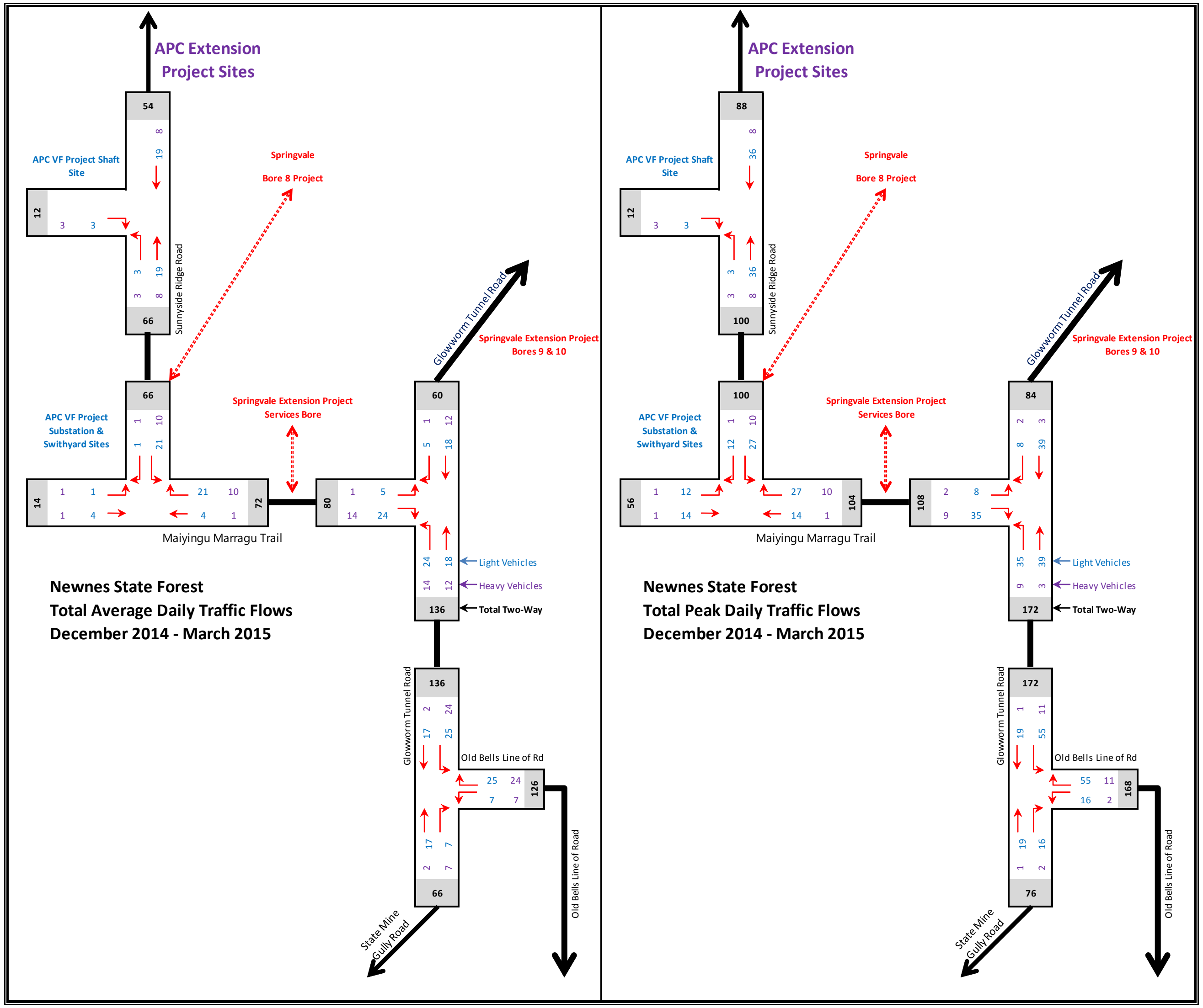


Figure 6.2.2 Total NSF Traffic Flows December 2014 – March 2015

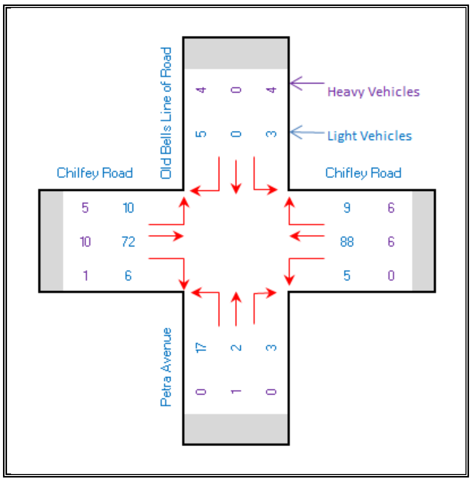


As discussed above, the peak cumulative traffic generation to the NSF during the Project construction phase will occur for a period of approximately 4 months from December 2014 to March 2015, where the Project, the APC VF Project and the Springvale Extension Project would cumulatively generate 44 vtpd to the NSF road network.

As a worst case for assessment, 50% of this total generation has been assigned to the surveyed AM peak hour at the intersection of Chifley Road & Old Bells Line of Road & Petra Avenue, a total of 22 vtph comprising 10 light vtph and 12 heavy vtph. These trips have been assigned with reference to the surveyed distribution of trips at the intersection, while the flows in Chifley Road have been increased by [a worst case in our opinion annual average increase of] 1.5% per year.

The resulting flows for the peak cumulative period December 2014 to March 2015 are shown in **Figure 6.2.3**.

Figure 6.2.3 AM Peak Future Flows, Chifley Road & Old Bells Line of Road & Petra Avenue



7 Future Traffic Operations

7.1 Pit Top Road Network

7.1.1 Intersection Operations

The results of SIDRA analysis for the forecast years 2015 and 2024 at the intersection of Castlereagh Highway & Wolgan Road & Main Street are provided in **Table 7.1.1**.

Table 7.1.1 Future Performance, Castlereagh Highway & Wolgan Road & Main Street

Intersection Castlereagh Highway & Wolgan Road & Main Street	Level of Service		Average Delay (s)		Worst Delay (s)		Degree of Saturation	
	AM	PM	AM	PM	AM	PM	AM	PM
2015 + Sub-Regional Growth	A	B	<10	<10	12.4	14.9	0.12	0.14
2024 + Sub-Regional Growth	A	B	<10	<10	12.6	16.4	0.11	0.15

Notwithstanding the fact that the Project will not generate additional flows to this intersection, the SIDRA analysis shows that the intersection will continue to operate at a good LoS through 2024. A very minor increase in the average delay to the right turn movement from Wolgan Road to Castlereagh Highway is reported, increasing by some 3 - 4 seconds over 11 years between 2013 and 2024 to move from LoS from "A" to "B". In practice, this right turn is not strictly opposed to the 'through' movement from Main Street to Wolgan Road (as modelled in the 4-way priority intersection) and as such it is the opinion of ARC that the intersection would generally operate at a LoS "A" across the day through 2024.

As discussed in **Section 2.2.2**, there is no information to suggest that traffic flows would increase in Wolgan Road (nor in Ian Holt Drive, Skelly Road or in Lidsdale in general). As such, this intersection will continue to operate at a good LoS "A" through 2024.

7.1.2 Castlereagh Highway & Local Access Roads

The Project would not increase traffic flows in the Castlereagh Highway or the local access roads providing for the Pit Top.

In the Castlereagh Highway, annual growth and short term construction peaks associated with other sub-regional projects would increase traffic flows such that for a small number of hours per day flows would approach LoS "B" limits (with reference to AustRoads GTEP2) particularly south-east of Wolgan Road, but more broadly total two-way flows through 2024 would continue to allow the Castlereagh Highway to operate at a LoS "B".

In Wolgan Road north of Castlereagh Highway, traffic volumes in 2024 would not be significantly different to those 2013; simply, there is no development potential identified that could lead to higher Wolgan Road flows through 2024. Similarly, no significant changes are expected in Ian Holt Drive or Main Street, and as such all of these roads would continue to operate well within RMS environmental capacity goals.

7.1.3 Pit Top Road Network Impact Mitigation

The Project does not provide for any changes to the approved (until 2024) generation of traffic to and from the Pit Top in accordance with PA 06_0021 MOD 1. The assessment above confirms that that approved Pit Top traffic generation will be accommodated by the local and sub-regional network without significant impact.

ARC has not identified any traffic impacts associated with the continued Pit Top operations that would require specific mitigation; coal is and will continue to be transported along private haul roads; parking capacity to accommodate the unchanged peak staff demand at the Pit Top is provided on-site; and there is nothing within the Project to suggest any changes in current or future staff trip generation or distribution to a sub-regional access network that provides significant spare capacity.

7.2 NSF Road Network

7.2.1 Intersection of Chifley Road & Old Bells Line of Road & Petra Ave

Further to consideration of the maximum additional traffic generation of the Project to the sub-regional NSF access intersection at Clarence, **it is the conclusion of ARC that this intersection would not be significantly impacted by the Project**.

With reference to **Section 6.2.2**, 50% of the December 2014 – March 2015 peak daily flow has been assigned to the AM peak hour at the intersection of Chifley Road & Old Bells Line of Road & Petra Avenue. The results of this assignment are virtually unchanged from the existing conditions, with LoS remaining at LoS "B" (based on a worst movement average delay of 16.1 seconds) and DoS 0.056. **The intersection will therefore continue to operate at a good LoS with significant spare capacity**.

With regard to the local intersections through north Lithgow, it is the conclusion of ARC that the potential generation of up to 8 light vtpd through these intersections would have no significant impact on their operation, simply as a function of such low flow potential. Importantly, the designation of the heavy vehicle route via Old Bells Line of Road at Clarence would ensure no Project heavy vehicle generation through these intersections or along local town centre or residential streets.

7.2.2 NSF Road Network Operations

Further to consideration of the maximum additional traffic generation of the Project, and accounting for cumulative traffic increases during the Project construction, **it is the conclusion of ARC that the NSF road network would not be significantly impacted by the Project**. This conclusion is based on the following: -

- All NSF Project Site access tracks will be designed as per the agreement with FCNSW, and would appropriately accommodate the peak generation of each NSF Project Site.

- With reference to the highest period of cumulative traffic generation – December 2014 to March 2015 –average daily flows would not exceed 150 vtpd on any of the key NSF roads.

- With reference to the highest period of cumulative traffic generation – December 2014 to March 2015 - peak Sunday flows would exceed 150 vtpd in Old Bells Line of Road east of Glowworm Tunnel Road (168 vtpd); and in Glowworm Tunnel Road between Old Bells Line of Road and Maiyingu Marragu Trail (172 vtpd). These sections of road are perhaps the widest and best prepared within the NSF, and provide well for two-way traffic, such that even these cumulative peak flows would represent only a minor percentage of the actual traffic carrying capacity of these sections of the NSF road network.

- Once operational, the NSF Project Sites would generate less than 10 vtpw to the NSF road network, which would have no significant impact.

Notwithstanding these conclusions in regard to general traffic capacity, it is acknowledged that the unsealed NSF road network may require additional remediation works/general maintenance so as to appropriately provide for the traffic generated by the Project. Centennial has throughout its past works in the NSF complied fully with the requirements of the *Forestry Act 2012* (and the previous *Forestry Act 1916*) and FPC4, and has committed to continue to provide such compliance through the Project. A review of mitigation provisions is provided in below, and more thoroughly addressed in the broader Project EIS.

7.2.3 NSF Road Network Impact Mitigation

- **NSF Access Intersections**

  ARC has not identified any specific impacts relating to the generation of Project traffic through the NSF access intersections at Clarence or through the north of Lithgow. The impact mitigation measures provided in general for these intersections - including **the designation of the heavy vehicle route to the NSF Project Sites via Old Bells Line of Road at Clarence** and the generally low traffic generation of the Project – will allow these intersections to continue to operate at a good LoS through the Project.

- ***Forestry Act 2012***

The provisions of the *Forestry Act 2012* have been applied to all aspects of the construction and operation of the NSF Project Sites. Detailed environmental protection measures, rehabilitation plans and bushfire plans will also be developed and implemented consistent with those used during previous mining and associated activities undertaken by Centennial, as detailed in other sections of the Project EIS.

- **Construction Traffic Management Plan**

Recommendation It is the recommendation of ARC that a Construction Traffic Management Plan (**CTMP**) be prepared in consultation with FCNSW and implemented for the duration of the construction phase at each NSF Project Site. The CTMP would include:

- Details of the induction process to be undertaken by all Angus Place staff and contractors working at NSF Project Sites.
- Designated access routes for heavy vehicles.
- Defined hours of construction, including general construction hours on-site and any restrictions applying to heavy vehicle operating hours.
- Strict speed limits for all Project vehicles in line with FCNSW 60 km/h limits in the NSF.
- Strict adherence to the safety, signage and general access requirements as outlined in the RTA Traffic Control at Worksites guidelines for each of the NSF Project Sites.
- Clear guidelines in regard to the movement of all Project vehicles in and following adverse weather conditions.
- A Code of Conduct for all contractors and staff detailing traffic routes, behavioural requirements and speed limits.

- **Operational Traffic Management Plan**

Recommendation It is the recommendation of ARC that a Traffic Management Plan (**TMP**) be prepared in consultation with FCNSW and implemented for the duration of the operational phase at each NSF Project Site. The TMP would include:

- Details of the induction process to be undertaken by all Angus Place staff and contractors working at NSF Project Sites.
- Designated access routes for heavy vehicles.
- Defined hours of construction, including general construction hours on-site and any restrictions applying to heavy vehicle operating hours.
- Strict speed limits for all Project vehicles in line with FCNSW 60 km/h limits in the NSF.
- Clear guidelines in regard to the movement of all Project vehicles in and following adverse weather conditions.
- A Code of Conduct for all contractors and staff detailing traffic routes, behavioural requirements and speed limits.

➢ NSF Road Network Maintenance

Recommendation It is the recommendation of ARC that any NSF road network remedial tasks arising from the construction or operation of the NSF Project Sites be appropriately managed in conjunction with FCNSW.

8 Conclusions & Recommendations

8.1 The Pit Top Road Network

8.1.1 Local & Sub-Regional Access Roads

The Project will not alter the characteristics of the existing Pit Top traffic generation. **No additional traffic would be generated by the Project to the local and sub-regional traffic network which provides access to the Pit Top in Wolgan Road north of Lidsdale**.

While the Project would not generate additional traffic to the Castlereagh Highway, annual average traffic growth and other sub-regional traffic generating projects would increase traffic flows over existing levels through the life of the Project. Notwithstanding, the Castlereagh Highway south-east and north-west of Lidsdale would continue to operate well below traffic capacity through an appropriate 10 year forecast horizon of 2024.

There is no information to suggest any significant potential for traffic growth in local access roads - including Wolgan Road and Ian Holt Drive, Lidsdale; and Main Street, Wallerawang - through 2024. Traffic flows in these roads would remain well within RMS environmental capacity limits.

8.1.2 Local & Sub-Regional Intersections

Further to SIDRA intersection modelling, the key access intersections of the Castlereagh Highway & Wolgan Road, and Castlereagh Highway & Main Street, will continue to operate at a good level of services in both the AM and PM peak periods, with significant spare capacity and consistently low average delays through 2024.

Local intersections in Lidsdale will also continue to operate at good levels of service based on very low traffic flows and no additional Project traffic generation

8.2 The Newnes State Forest Project Sites

8.2.1 Access to the NSF Project Sites

During both the construction and operational phase of the Project, access into the NSF for Project heavy vehicles will be restricted to a route from Chifley Road to Old Bells Line of Road at Clarence. Light vehicles could utilise this route via Clarence or the route via State Gully Mine Road north of Lithgow. Within the NSF, access to the **NSF Project Sites** for both light and heavy vehicles will be via Glowworm Tunnel Road, Maiyingu Marragu Trail and Sunnyside Ridge Road.

From Sunnyside Ridge Road, the Project provides for extensions and upgrades of existing access tracks to the NSF Project Sites. As agreed with FCNSW, an access track (5 m) and adjacent Infrastructure Corridor (5 m) will be provided during the construction phase of each NSF Project Site. Each Infrastructure Corridor would then be remediated after the installation of required infrastructure, retaining a 5 m access track.

Recommendation That heavy vehicle trips to/from the NSF Project Sites be undertaken during daylight hours, which would generally require them to occur between 6:00am and 6:00pm.

8.2.2 Construction Traffic Generation

During the construction phase, up to 16 vtpd would be generated to each NSF Project Site. On average, 8 heavy vtpd would be generated in Old Bells Line of Road, and 8 light vtpd would be generated in State Mine Gully Road. All 16 vtpd would then be generated in Glowworm Tunnel Road between Old Bells Line of Road and Maiyingu Marragu Trail; in Maiyingu Marragu Trail between Glowworm Tunnel Road and Sunnyside Ridge Road; and in Sunnyside Ridge Road between Maiyingu Marragu Trail and the NSF Project Site access tracks.

8.2.3 Construction Traffic Impacts & Impact Mitigation

The additional traffic generated during the Project construction phase would not significantly impact the operation of the NSF road network or the NSF access intersections at Clarence and north Lithgow. This is a function of the low traffic generation potential of the construction phase of the Project and the available capacity within the NSF road network and the NSF access intersections at Clarence and north Lithgow. This conclusion appropriately considers periods where Project construction will coincide with the generation of other projects within the NSF.

Construction vehicle access at each of the NSF Project Sites will be provided with consideration of sight distance, gradient and carriageway width so as to ensure the safety of other NSF road network users, and construction parking demands will be met within NSF Project Site compounds.

Recommendation That a Construction Traffic Management Plan be prepared in consultation with FCNSW and Lithgow City Council and implemented for the duration of the construction phase at each NSF Project Site.

8.2.4 Operational Traffic Generation

During the operational phase, up to 10 vtpw would be generated to each NSF Project Site. On average, 6 heavy vtpw would be generated in Old Bells Line of Road, and 4 light vtpw would be generated in State Mine Gully Road. All 10 vtpw would be then be generated in Glowworm Tunnel Road between Old Bells Line of Road and Maiyingu Marragu Trail; in Maiyingu Marragu Trail between Glowworm Tunnel Road and Sunnyside Ridge Road; and in Sunnyside Ridge Road between Maiyingu Marragu Trail and the access tracks to the NSF Project Sites.

8.2.5 Operational Traffic Impacts & Impact Minimisation

The additional traffic generated during the Project operational phase would not significantly impact the operation of the NSF road network or the NSF access intersections at Clarence and north Lithgow. This is a function of the very low traffic generation potential of the operational phase of the Project and the available capacity within the NSF road network and the NSF access intersections at Clarence and north Lithgow. This conclusion appropriately considers periods where Project operations will coincide with the generation of other projects within the NSF.

Operational parking demands will be met within the NSF Project Site compounds.

Recommendation That a Traffic Management Plan be prepared in consultation with FCNSW and Lithgow City Council and implemented for the duration of the operational phase at each NSF Project Site.

8.2.6 General Newnes State Forest Impact Mitigation

Further to the remediation proposals detailed in the Project EIS for the NSF Project Sites following decommission - the potential exists for minor remedial works to be required within the NSF prior to or during the construction and operational phase of each NSF Project Site as a result of wear caused by Project vehicles; by significantly adverse weather conditions within the NSF; or a combination of these or other factors.

Recommendation That any NSF road network remedial tasks arising from the construction or operation of the NSF Project Sites be appropriately managed in conjunction with FCNSW.