

ROAD TRANSPORT REVIEW

Abel Upgrade Modification Environmental Assessment

APPENDIX G

Our Ref: 12Sg024000

28 November 2012

Donaldson Coal Pty Ltd
PO Box 2275
GREENHILLS NSW 2323

Attention: Mr Tony Sutherland

Dear Tony,

RE: ABEL UNDERGROUND MINE MODIFICATION ROAD TRANSPORT REVIEW

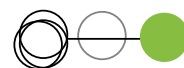
1 Introduction

GTA Consultants was commissioned by Donaldson Coal Pty Ltd (Donaldson Coal) to assess the road transport implications of the proposed Abel Upgrade Modification (the Modification) at the Abel Underground Mine. This assessment has been prepared with regard to the Director-General's Requirements for the Abel Modification, which require "a detailed assessment of the proposal on the capacity, efficiency and safety of the road and rail networks". This assessment considers only the road network implications of the Modification. In preparing this assessment, reference has been made to the following:

- *Proposed Abel Underground Mine Traffic and Transport Assessment*, Connell Wagner, 2006
- *Tasman Extension Project Road Transport Assessment*, Halcrow, 2012
- *Tasman Extension Project Addendum*, GTA Consultants, 2012
- *Lower Hunter Transport Needs Study Technical Paper 4: Traffic Analysis*, Hyder Consulting Pty Ltd, 2008
- *Guide to Road Design Part 4A: Unsignalised and Signalised Intersections*, Austroads, 2010.

2 Abel Underground Mine

The Abel Underground Mine is an underground coal mining operation located in the Newcastle Coalfield, approximately 23 kilometres (km) north-west of the Port of Newcastle. The Abel Underground Mine employs approximately 375 people, and is approved to extract up to 4.5 million tonnes per annum (Mtpa) run-of-mine (ROM) coal over a mine life of approximately 21 years, until 31 December 2028. ROM coal is transported via internal, sealed haul roads to the Bloomfield Coal Handling and Preparation Plant (CHPP) which is approved to process up to 6.5 Mtpa ROM coal from the Abel Underground Mine, Tasman Underground Mine and other sources. The CHPP currently employs 28 people. Product coal is transported from the CHPP to the Port of Newcastle via a privately-owned rail loop and spur and the Main North Railway. Fine and coarse reject material is disposed of at the Bloomfield Colliery.



3 Road Network

The Abel Underground Mine surface facilities and Bloomfield CHPP are located to the north of John Renshaw Drive and west of New England Highway. The roads and intersections relevant to this assessment are described below and are shown on Figure 1.

John Renshaw Drive

John Renshaw Drive (Main Road 588) is a State Road and provides a link between the F3 Freeway-Newcastle Link Road at Beresfield and Cessnock via Kurri Kurri. In the vicinity of the Abel Underground Mine, John Renshaw Drive typically has a single travel lane in each direction with centre linemarking and a posted speed limit of 100 kilometres per hour (km/h).

New England Highway

New England Highway (Highway 9) is a State Road and provides a link from the Pacific Highway at Hexham via Maitland, Singleton and Muswellbrook to the Queensland border. In the vicinity of the Abel Underground Mine and Bloomfield CHPP, New England Highway typically has two travel lanes in each direction, with additional turn lanes at major intersections, a wide median and posted speed limits of 90 km/h and 100 km/h.

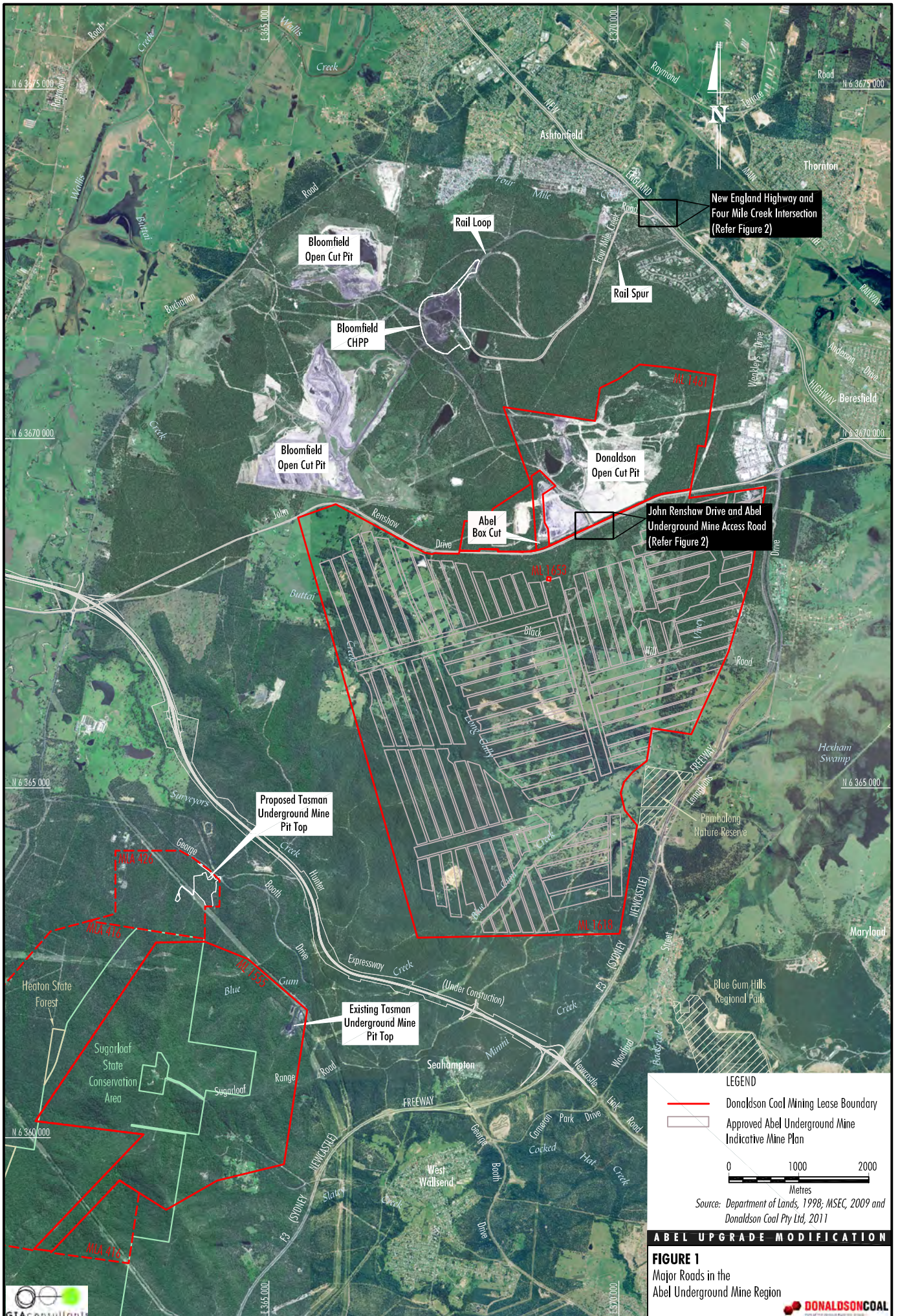
Abel Underground Mine Access Road

The Abel Underground Mine is accessed from John Renshaw Drive via a private road known as the Donaldson Access Road. The intersection is a "seagull" intersection with dedicated deceleration and acceleration lanes for vehicles turning in and out of the private road (Figure 2). Vehicles turning right out of the access road are not required to immediately merge with westbound through traffic on John Renshaw Drive; rather they use a dedicated lane which merges with the westbound through lane approximately 1 km to the west of the intersection.

Four Mile Creek Road

The Bloomfield CHPP is accessed from New England Highway and Four Mile Creek Road to the north of the site. Four Mile Creek Road is a two-way sealed road with no linemarking, which intersects with New England Highway at an unsignalised T-intersection, with a break in the wide median New England Highway to allow for left and right turns into and out of Four Mile Creek Road (Figure 2). The speed limit on New England Highway past Four Mile Creek Road is 90 km/h. The speed limit reduces to 80 km/h for northbound traffic from approximately 300 metres (m) to the north-west, and for southbound traffic changes from 80 km/h approximately 450 m to the north-west of Four Mile Creek Road.

A right turn lane approximately 80 m long is provided for vehicles turning from New England Highway to Four Mile Creek Road. An acceleration lane approximately 250 m long is provided for vehicles turning left from Four Mile Creek Road to New England Highway to allow these vehicles to increase speed before joining the northbound New England Highway traffic. A short turn lane is also provided for northbound traffic to allow for vehicles to u-turn at the break in the median at this intersection with minimum disruption to the through traffic. A storage area is provided in the median for the u-turning vehicles and for vehicles turning right from Four Mile Creek Road into New England Highway, so drivers are not required to immediately merge with the southbound traffic on New England Highway. A deceleration lane is provided for the vehicles turning left from New England Highway to Four Mile Creek Road to do so with minimum delay to the northbound through traffic on New England Highway.





New England Highway and Four Mile Creek Road Intersection

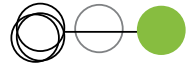


John Renshaw Drive and Abel Underground Mine Access Road Intersection

ABEL UPGRADE MODIFICATION

FIGURE 2
Key Intersections





Four Mile Creek Road provides vehicular access to a limited number of local properties, including a retail nursery near its intersection with New England Highway. Traffic volumes on Four Mile Creek Road are therefore likely to be low, which is evidenced by observation that it operates under free flow conditions in which individual drivers are virtually unaffected by the presence of others in the traffic stream.

Observations of the operation of the intersection of New England Highway and Four Mile Creek Road during a weekday (28 June 2012) evening peak period indicate that it operates satisfactorily, with only short delays to turning traffic. Sight distances for turning drivers are satisfactory. The right turn lane length is satisfactory although at the shorter end of the range specified by Austroads guidelines for the prevailing speed of the southbound traffic.

Other Roads and Intersections

Once road traffic from the Modification disperses beyond the roads and intersections described above, the contribution of this traffic would be negligible compared with background traffic, given the high volumes of traffic on the major roads in the Abel Underground Mine region and relatively modest traffic associated with the Modification (Section 6).

As such, assessment of potential impacts from the Modification on roads and intersections in the Abel Underground Mine region, other than those described above, is not considered to be required.

4 Background Traffic Conditions

An assessment of the surrounding road system was recently undertaken on behalf of Donaldson Coal for the Tasman Extension Project, *Tasman Coal Project Road Transport Assessment* (Halcrow, 2012) and GTA Consultants prepared an Addendum to that assessment which reviewed an alternative construction waste rock protocol for year 2013, *Tasman Extension Project Addendum* (GTA Consultants, April 2012).

Those assessments considered the cumulative impacts of planned developments and changes to the road system, including the Tasman Extension Project, the opening of the Hunter Expressway (expected in late 2013), the Ammonium Nitrate Emulsion production facility at Orica's Technology Park on Echidna Drive at Richmond Vale, and general background growth in traffic based on long term traffic forecasts prepared for the Lower Hunter Transport Needs Study (Hyder, 2008).

The Halcrow study assessed the morning and evening peak hour operation of the intersection of John Renshaw Drive and the Donaldson Access Road using SIDRA Intersection, an analysis programme which determines characteristics of an intersection's operating conditions, including the degree of saturation, average delays and levels of service. The degree of saturation, or X-value, is the ratio of the arrival rate of vehicles to the capacity. The operating conditions can be compared with the performance criteria set out in Table 1, noting that at unsignalised intersections, the reported average delays per vehicle is for the movement with the highest average delay per vehicle.

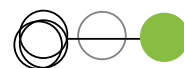


Table 1: Level of Service Criteria

Level of Service (LOS)	Average Delay per vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Sign
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Near capacity	Near capacity, accident study required
E	57 to 70	At capacity, at signals incidents will cause excessive delays	At capacity, requires other control mode
F	Greater than 70	Extra capacity required	Extreme delay, major treatment required

Note: secs/veh = seconds per vehicle

Table 2 summarises the key characteristics of the operation of the intersection of John Renshaw Drive and the Donaldson Access Road under the traffic demands forecast as part of the Tasman Extension Project assessment. It is noted that the future traffic demands used in that assessment were considered to be conservatively high as they assumed a high peak hour growth rate on John Renshaw Drive, combined with maximum coal haulage from the Tasman Underground Mine being matched by an equal number of empty trucks in the same hour, and coinciding with the peak hour background traffic.

Table 2: Summary of Background Intersection Operation – John Renshaw Dr and Donaldson Access Rd

	Year 2011	Year 2013	Year 2017	Year 2028
AM Peak Degree of Saturation	0.25	0.27	0.33	0.56
AM Peak Average Delay per Vehicle	32.2	34.6	50.2	>100
AM Peak Level of Service	C	C	D	F
PM Peak Degree of Saturation	0.25	0.27	0.33	0.47
PM Peak Average Delay per Vehicle	20.1	21.4	27.3	44.1
PM Peak Level of Service	B	B	B	D

Source: Halcrow (2012)

The results indicate that in the long term, conditions on John Renshaw Drive are anticipated to decline, and excessive delays are forecast during the morning peak hour at the intersection of John Renshaw Drive and the Donaldson Access Road. These delays would be to vehicles turning right out of the Donaldson Access Road against the increasingly heavy eastbound flows on John Renshaw Drive. The key driver of the decline in conditions on John Renshaw Drive is background growth not associated with Donaldson Coal traffic.

Halcrow (2012) recommended long term monitoring of the intersection be undertaken to review the impacts of increasing through traffic on the intersection performance, particularly if the Black Hill site to the east of the intersection is developed. A decline in the midblock level of service experienced on John Renshaw Drive was also anticipated in the Halcrow study, demonstrated in Table 3.

In response to these recommendations, Donaldson Coal proposes to implement performance monitoring of the intersection, initially at 5 yearly intervals, with the monitoring interval to be reviewed based on measured intersection performance and in consultation with the New South Wales Roads and Maritime Service (as described in the *Tasman Extension Project Environmental Impact Statement* [Donaldson Coal, 2012]).

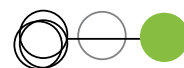


Table 3: Background Traffic Characteristics of John Renshaw Drive West of Donaldson Access

	Year 2013	Year 2017	Year 2028
Daily Traffic Volume (vehicles/day)	11,514	13,799	19,945
AM Peak Hour Volume (vehicles/hour)	906	1,293	2,521
PM Peak Hour Volumes (vehicles/hour)	1,030	1,431	2,796
AM Peak Midblock Level of Service	C	D	E
PM Peak Midblock Level of Service	C	D	E

Source: Halcrow (2012)

The Hyder (2008) study also provides data on traffic forecasts for New England Highway west of Thornton Road at Thornton, which is close to the Four Mile Creek Road intersection. The daily forecasts are summarised below.

Table 4: Daily Traffic Forecasts New England Hwy West of Thornton Rd, Thornton (vehicles per day)

Year	Base Case	With Hunter Expressway
2006	43,500	43,500
2016	51,500	-
2026	61,100	-
2031	64,300	41,600

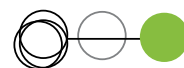
Source: Hyder (2008)

The results demonstrate that in the long term, construction of the Hunter Expressway is expected to result in lower two-way traffic volumes on New England Highway than occurred in 2006. Traffic growth over that period would be taken up by the Hunter Expressway, with an overall 5 percent (%) reduction in traffic from 2006 to 2031.

5 The Modification

The proposed Modification to the Abel Underground Mine would involve internal modifications and upgrades to accommodate:

- the introduction of shortwall and longwall mining in some areas within the approved mining area (Mining Lease 1618) and the approved seams (Upper Donaldson and Lower Donaldson seams)
- increased ROM coal production of up to 6.1 Mtpa
- an increase in the amount of ROM coal received from the Tasman Underground Mine (per annum and in total)
- increased internal haulage of the ROM coal from the Abel Underground Mine and the Tasman Extension Project to the Bloomfield CHPP
- the construction and use of an approved overland conveyor transporting ROM coal from the Abel Underground Mine to the Bloomfield CHPP, should financial circumstances permit
- increased processing ROM coal at the Bloomfield CHPP, requiring associated upgrades and modification to the Bloomfield CHPP
- increased annual and total quantity of fine and coarse rejects for disposal at the Bloomfield Colliery
- an extension of the life of the mine by approximately one year to 31 December 2029.



ROM coal production is expected to vary year-to-year, with a peak of 6.1 Mtpa in 2015. With the Modification, ROM production is expected to be above the current maximum of 4.5 Mtpa from 2014 to 2020 inclusive, after which production would decline and remain below the current maximum.

With respect to road network implications of the Modification, the Modification would involve the following additional traffic:

Abel Underground Mine Access Road:

- approximately 25 additional employees working at the Abel Underground Mine when ROM coal production from the Abel Underground is at the maximum rate of 6.1 Mtpa
- an increase in general delivery and visitor traffic as a result of increased activity.

Four Mile Creek Road:

- approximately 25 construction employees during 2013 for the upgrades and modification to the Bloomfield CHPP
- approximately 23 additional employees working at the Bloomfield CHPP when ROM coal production from the Abel Underground is at the maximum rate of 6.1 Mtpa.

The increased ROM coal haulage movements on public haul roads associated with the Tasman Extension Project were assessed in the *Tasman Extension Project Road Transport Assessment*, Halcrow, 2012.

The construction and use of the overland conveyor transporting ROM coal from the Abel Underground Mine entrance to the Bloomfield CHPP is approved as per Project Approval 05_0136 for the Abel Underground Mine, however the overland conveyor has not been constructed.

Should financial circumstances permit, the overland conveyor would be constructed during the life of the Modification. However, as the construction of the overland conveyor is already approved, any associated traffic movements would be within the maximum movements assessed and approved for the Abel Underground Mine.

6 Modification Traffic Generation and Distribution

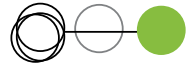
Operational Employees – Abel Underground Mine and Bloomfield CHPP

Employees at the Abel Underground Mine enter the site via the Abel Underground Mine Access Road, and employees at the Bloomfield CHPP enter the site via Four Mile Creek Road (Figure 1). This would continue for the Modification.

Donaldson Coal has advised that operational employees at the Abel Underground Mine typically travel by car, with an average of 1.1 people per car. It is expected that the travel characteristics of operational employees for the Modification would be similar, and thus the same rate has been adopted for this assessment. For the purpose of this assessment, it is conservatively assumed that all of the additional operational employees would be on site each day.

Donaldson Coal has provided the following information regarding the distribution of employees' residences by postcode for employees at the Abel Underground Mine:

- 13% Central Coast
- 20% Western Newcastle
- 24% Central Newcastle



- 12% Dungog/Port Stephens
- 11% Maitland/Beresfield
- 19% Kurri Kurri/Cessnock
- 1% Mid North Coast.

It is expected that the general distribution of the additional employees for the Modification, including those associated with the Bloomfield CHPP, would be similar. The opening of the Hunter Expressway may have an impact on the approach and departure routes of a small number of employees. The locations of the interchanges however suggest that any impacts would be minor, as the general approach and departure directions would remain unchanged in most cases.

The employee traffic is likely to be concentrated into distinct peaks at the start and end of shifts, and it is assumed that the additional operational employees at the Abel Underground Mine would be spread across the existing shifts:

- Daytime Shift – 6.30 am to 4.30 pm – 55% of employees
- Afternoon Shift – 2.30 pm to 10.30 pm – 22.5% of employees
- Night Shift – 9.30 pm to 7.30 am – 22.5% of employees.

When the Bloomfield CHPP moves to 7 days per week operations, the shift times and employee distribution are assumed to be consistent with those for the Abel Underground Mine described above.

The spread of the shifts results in little interaction between employees arriving and departing from different shifts, spreading the traffic load into six peaks throughout the day.

Notwithstanding the above, for the purpose of this analysis it is conservatively assumed that the employees arriving for the daytime shift (starting 6.30 am) would travel in the same hour as the employees leaving from the night shift (ending 7.30 am), and that this would coincide with the on-street peak hour. It is assumed that the evening peak hour would consist of employees leaving from the daytime shift (ending 4.30 pm) which would coincide with the on-street peak hour.

The ROM coal production rate is expected to increase above the currently approved rate of 4.5 Mtpa from 2014 to 2020 inclusive, thus it is anticipated that the additional operational employees would only be required in that period. From 2021 to 2029, it is assumed that the existing number of employees would be maintained on the site, therefore there would be no additional employee traffic after 2020.

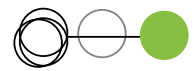
Construction Employees – Bloomfield CHPP Upgrades and Modifications

Construction employees for the Bloomfield CHPP upgrades and modifications would enter the site via Four Mile Creek Road.

It is conservatively estimated that there would be no carpooling for construction employees, and that all construction employees would be on site each day. Construction employees are assumed to use the same approach and departures routes as operational employees.

Construction shift times for the Bloomfield CHPP upgrades and modifications are:

- 6.30 am to 6.00 pm Monday to Friday (activity starting at 7.00 am)
- 7.30 am to 1.00 pm Saturdays (activity starting at 8.00 am)
- No work on Sundays or public holidays.



The construction employee traffic is therefore likely to be concentrated into distinct peaks as employees arrive just prior to the start of shifts, and depart after the end of the shift. For the purpose of this analysis, it is assumed that these peaks would coincide with the on-street peak hours.

Operational Deliveries and Visitors

The increase in operational activity associated with the Modification is likely to result in an increase in the number of visitors and deliveries made for consumables and the like to the site.

It is estimated that the Abel Underground Mine presently attracts approximately 20 visitors per day and 20 deliveries per day, resulting in some 40 light and 40 heavy vehicle trips per day entering the site via the Abel Underground Mine Access Road. For the purpose of this assessment, it is estimated that the Modification would result in an increase in the operational visitor activity at a similar rate to the increase in production.

The Modification is expected to increase ROM coal production up to a maximum of 6.1 Mtpa in 2015, which represents a 36% increase above the existing maximum. A similar increase in operational visitors and deliveries would result in an additional 14 light and 14 heavy vehicle trips per day entering the site via the Abel Underground Mine Access Road. For the purpose of this assessment, it is assumed that these additional trips would occur during years 2014 to 2020 inclusive. After 2020, production would remain below the current maximum of 4.5 Mtpa, and no additional visitor or delivery traffic above the existing rates is anticipated.

Visitor and delivery traffic tends to be spread throughout the day, and for the purpose of this assessment, it is assumed that the additional visitors and deliveries would generate 4 light and 4 heavy vehicle trips during the morning and evening peak hours.

It is estimated that the Modification would result in an additional 10 deliveries and 10 visitors per day to the Bloomfield CHPP during years 2014 to 2020 inclusive. This would result in an additional 20 heavy and 20 light vehicle trips per day accessing the site via Four Mile Creek Road.

Construction Deliveries and Visitors

The construction activity associated with modifications and upgrades to the Bloomfield CHPP is likely to result in additional visitor and delivery trips entering the site via Four Mile Creek Road.

At the peak of construction activity, it is estimated that the Modification would attract some 10 deliveries and 10 visitors per day. This would result in 20 heavy and 20 light vehicle trips per day.

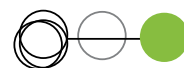
Visitor and delivery traffic tends to be spread throughout the day, and for the purpose of this assessment, it is assumed that the additional visitors and deliveries would generate 5 light and 5 heavy vehicle trips during the morning and evening peak hours.

Total Modification Traffic

The road transport implications of the Modification can therefore be considered for two scenarios:

1. construction – Year 2013
2. operation – Year 2014 to 2020 inclusive.

Although the Abel Underground Mine would continue to operate after 2020, the Modification is not predicted to result in any additional traffic above its current approved operations from 2021. After 2020, ROM coal production would remain below the current maximum, thus delivery and visitor traffic would also remain below the current maximum levels, and the number of employees would be



maintained at the current level. The extension of the life of the mine by approximately one year to the end of 2029 is not expected to result in any new traffic issues, as ROM coal production during the additional one year would be less than the currently approved maximum. It is expected that the number of trips made by employees, deliveries and visitors would also be less than the currently approved maximum in the additional year, thus it has not been considered further in this assessment.

Table 5 and Table 6 summarise the anticipated generation and distribution of additional daily and peak hour Modification traffic during the construction activities associated with the Bloomfield CHPP and the operational phase of the Modification.

Table 5: Modification Additional Daily Traffic Generation and Distribution (vehicles/day)

Road and Location	Employee	Visitor	Delivery	Total
Construction Year 2013				
Donaldson Access Road	0	0	0	0
Four Mile Creek Road Access	50	20	20	90
John Renshaw Dr West of Donaldson Access Rd	0	0	0	0
John Renshaw Dr East of Donaldson Access Rd	0	0	0	0
New England Hwy North of Four Mile Creek Rd	14	6	6	26
New England Hwy South of Four Mile Creek Rd	36	14	14	64
Operational Years 2014 to 2020				
Donaldson Access Road	46	14	14	74
Four Mile Creek Road Access	42	20	20	82
John Renshaw Dr West of Donaldson Access Rd	8	2	2	12
John Renshaw Dr East of Donaldson Access Rd	38	12	12	62
New England Hwy North of Four Mile Creek Rd	16	8	8	32
New England Hwy South of Four Mile Creek Rd	34	16	16	66

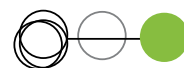
Note: no additional traffic from 2021 to 2029 inclusive

Table 6: Modification Additional Peak Hour Traffic Generation and Distribution (vehicles/hour)

Road and Location	Employee		Visitor		Delivery		Total	
	AM	PM	AM	PM	AM	PM	AM	PM
Construction Year 2013								
Donaldson Access Road	0	0	0	0	0	0	0	0
Four Mile Creek Road Access	25	25	5	5	5	5	35	35
John Renshaw Dr West of Donaldson Access Rd	0	0	0	0	0	0	0	0
John Renshaw Dr East of Donaldson Access Rd	0	0	0	0	0	0	0	0
New England Hwy North of Four Mile Creek Rd	7	7	1	1	1	1	9	9
New England Hwy South of Four Mile Creek Rd	18	18	4	4	4	4	26	26
Operational Years 2014 to 2020								
Donaldson Access Road	18	14	4	4	4	4	26	22
Four Mile Creek Road Access	16	16	5	5	5	5	26	26
John Renshaw Dr West of Donaldson Access Rd	3	3	1	1	1	1	5	5
John Renshaw Dr East of Donaldson Access Rd	15	11	3	3	3	3	21	17
New England Hwy North of Four Mile Creek Rd	7	7	1	1	1	1	9	9
New England Hwy South of Four Mile Creek Rd	13	13	4	4	4	4	21	21

Note: no additional traffic assumed from 2021 to 2029 inclusive

With respect to additional traffic on public roads, the greatest increase in traffic as a result of the Modification construction is expected to occur on Four Mile Creek Road between New England Highway and the Bloomfield CHPP access, where the Modification would generate up to go vehicles per



day and up to 35 vehicles per hour. The greatest increase in traffic as a result of the Modification operational phase would occur on Four Mile Creek Road between New England Highway and the Bloomfield CHPP access, where the Modification would generate up to 82 vehicles per day and up to 26 vehicles per hour.

7 Impacts of Modification Traffic – Traffic Volumes

Table 7 summarises the impact that the Modification traffic can be expected to have on daily traffic volumes on John Renshaw Drive. The daily volume in 2020 has been estimated from the Halcrow (2012) forecasts. As noted in that assessment, these are considered conservatively high estimates of future traffic on John Renshaw Drive, as they are based on long term traffic forecasts prepared for the Lower Hunter Transport Needs Study (Hyder, 2008). They also do not specifically take into account the implications of the closure of the Donaldson Open Cut which is expected to occur at the end of 2013.

Table 7: Daily Traffic on John Renshaw Drive (vehicles/day)

	Year 2013	Year 2020
No Modification (includes other developments)		
East of Donaldson Access	11,373	13,885
West of Donaldson Access	11,514	14,270
Modification Traffic		
East of Donaldson Access	0	62
West of Donaldson Access	0	12
Total Traffic		
East of Donaldson Access	11,373	13,947
West of Donaldson Access	11,514	14,282

Note: no additional Modification traffic from 2021 to 2029 inclusive

The increases in traffic on John Renshaw Drive as a result of the Modification would be very low during the operational phase (i.e. less than 0.5%) and would not alter the level of service perceived by drivers on John Renshaw Drive. The additional Modification traffic would be well within the day-to-day variations which would occur on this road regardless of the Modification.

Traffic growth on Four Mile Creek Road is limited, because it provides access to a limited number of properties, and does not provide through access. The Modification would increase daily traffic on Four Mile Creek Road by 90 vehicles per day during the one year construction phase, and by 82 vehicles per day during operations thereafter. It is anticipated that these small increases in daily traffic would have negligible impact on the levels of service perceived by drivers on Four Mile Creek Road.

Based on interpolation between the Hyder (2008) forecasts of traffic on New England Highway (Table 4), Table 8 summarises the existing and forecast daily traffic volumes on New England Highway, and the impact that the Modification would be expected to have on those volumes.

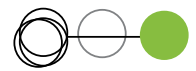


Table 8: Estimated Daily Traffic on New England Highway (vehicles/day)

	Year 2012	Year 2013	Year 2020
No Modification			
With Hunter Expressway (end 2013)	48,300	49,100	35,800
Modification Traffic			
North of Four Mile Creek Road	-	26	32
South of Four Mile Creek Road	-	64	66
Total Traffic			
North of Four Mile Creek Road	48,300	49,026	35,832
South of Four Mile Creek Road	48,300	49,064	35,866

The Modification would have a negligible impact on the traffic volumes on New England Highway (i.e. an increase of less than 0.2%), with the additional traffic being well within the day-to-day variations which would occur on this road regardless of the Modification.

8 Impacts of Modification Traffic – Intersection Operation

John Renshaw Drive and Donaldson Access Road

The additional traffic associated with the Modification has been added to the movements at the intersection of John Renshaw Drive and the Donaldson Access Road to assess the impact it is likely to have on operating conditions. A background scenario for 2020 was generated using the background traffic conditions and growth rates adopted in Halcrow (2012). It is noted again that these results are considered to be conservatively high with regard to traffic volumes occurring during a single hour, both with regard to the background (non-Modification) traffic and the Modification traffic.

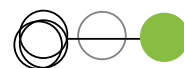
The results of the SIDRA Intersection analyses are presented in Table 9.

Table 9: Future Intersection Operation John Renshaw Drive and Donaldson Access Road

	No Modification		With Modification	
	2013	2020	2013	2020
AM Peak Hour				
Degree of Saturation	0.27	0.36	0.27	0.36
Average Delay per Vehicle ^A	34.6	60.1	34.6	60.3
Level of Service	C	E	C	E
PM Peak Hour				
Degree of Saturation	0.27	0.36	0.27	0.36
Average Delay per Vehicle ^A	21.4	30.5	21.4	29.6
Level of Service	B	C	B	C

^A For movement with highest average delay per vehicle

The results indicate that the Modification traffic would have no effect on the operation of the intersection of John Renshaw Drive and the Donaldson Access Road during the construction phase, and negligible effect during the operational phase. The slight decrease in average delay per vehicle in the evening peak hour is the result of the change in proportion of light and heavy vehicles on the critical right turn movement. Heavy vehicles require longer gaps in traffic to turn than light vehicles, so the decrease in the proportion of heavy vehicles on the critical right turn movement as a result of the Modification would lead to marginally more favourable conditions when delays to all turning vehicles are considered.



The ongoing monitoring of the performance of the intersection of John Renshaw Drive with the Donaldson Access Road proposed as part of the Tasman Extension Project would identify any need for road improvements with regard to capacity and/or safety when growth in through traffic occurs.

New England Highway and Four Mile Creek Road

Table 10 summarises the additional traffic expected to be generated by the Modification at the intersection of New England Highway and Four Mile Creek Road during the morning and evening peak hours.

Table 10: Modification Traffic at New England Hwy and Four Mile Creek Rd Intersection (vehicles/hour)

Turning Movement	Construction 2013		Operational 2014 to 2020	
	AM Peak	PM Peak	AM Peak	PM Peak
From Four Mile Creek Rd to New England Hwy				
Left	0	9	1	7
Right	4	22	7	15
From New England Hwy to Four Mile Creek Rd				
Left	22	4	12	4
Right	9	0	6	0
New England Hwy				
Northbound	0	0	1	2
Southbound	0	0	1	0

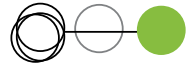
Note: no additional traffic from 2021 to 2029 inclusive

Table 10 indicates that the Modification would have its greatest impact on the turning movements at the intersection of New England Highway and Four Mile Creek Road during the construction phase, with forecasts of an additional 22 vehicles per hour turning left into Four Mile Creek during the morning peak hour, and 22 vehicles per hour turning right out of Four Mile Creek Road during the evening peak hour.

These additional vehicles would be those light vehicles driven by construction employees arriving prior to their shift commencing at 6.30 am and departing after their shift ends at 6.00 pm. The additional traffic is therefore expected to occur earlier than the typical on-street morning peak hour, and later than the typical on-street evening peak hour.

The additional 22 vehicles turning left into Four Mile Creek in the morning would have negligible impact on the operation of the intersection, as they have priority and can use the deceleration lane to minimise any delay to following vehicles. The additional 22 vehicles turning right into New England Highway in the evening would be required to wait for gaps in the northbound traffic, and can wait in the median area before selecting a gap in the southbound traffic on New England Highway. The increase in turning vehicles is small, and would occur outside of the typical on-street peak hour, thus is expected to have little impact on the operation of the intersection over the Modification construction period.

The forecast increases during the operational phase of the Modification are also very low on any one movement, with a maximum increase of 15 vehicles turning right out of Four Mile Creek Road after the conclusion of the shift. This is a low volume and is expected to be within the day-to-day variations in traffic on the New England Highway which would be experienced regardless of the Modification. Furthermore, the through traffic on New England Highway in both directions is expected to decrease significantly with the opening of the Hunter Expressway, such that volumes in 2031 are below those in 2006 (Table 4). The Hunter Expressway opening is likely to occur prior to commencement of



Modification operations. This would provide additional capacity for turning vehicles at this intersection.

As the impacts of the Modification on the operation of intersections would be minor, no measures to provide additional capacity are warranted.

9 Impacts of Modification Traffic – Road Safety

The two key intersections of relevance to the Modification are those of John Renshaw Drive with the Donaldson Access Road, and New England Highway with Four Mile Creek Road. These two intersections are constructed to suitable standards for the likely future traffic demands, with acceleration and deceleration lanes already provided to minimise the interaction between turning and through traffic.

Donaldson Coal would implement ongoing performance monitoring of the intersection of John Renshaw Drive with the Donaldson Access Road for the Tasman Extension Project (and for the Modification) to review the impacts of the increasing through traffic. Such monitoring would identify any need for road improvements with regard to capacity and/or safety.

No additional measures to improve the safety of the road network are considered to be warranted for the Modification.

10 Conclusions

This study has found that the proposed Modification at the Abel Underground Mine would result in very minor increases in traffic on the surrounding roads during the construction phase in 2013 and the operational phase from 2014. The additional traffic can be satisfactorily accommodated on the road network with negligible perceivable impact on operating conditions. No specific measures to provide additional capacity, nor to improve the safety of the road network are considered to be warranted for the Modification, when considering that Donaldson Coal proposes to implement ongoing performance monitoring for the intersection of John Renshaw Drive with the Donaldson Access Road.

I trust the above clearly sets out our assessment. Naturally, should you have any questions or require any further information, please do not hesitate to contact me in our Sydney office on (02) 8448 1800.

Yours sincerely

GTA Consultants

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