4.0 Transport Implications of Development Options

4.1 Introduction

This section contains analysis of the impact of the proposed concept, as proposed by NPC and shown in **Figure 4-1**, on the road and rail networks.

The Berth Precinct is expected to contain up to seven berths to support the five land-based precincts, with the Container Terminal Precinct requiring the use of three berths and the General Purpose, Bulk and General, Bulk Liquids and the NPC Operations Precincts each requiring the use of one berth. It is possible that one of the Container Terminal Precinct berth (Berth 4) may be shared with the General Purpose Precinct.

The following maximum ship movements are anticipated:

- 100 ships per annum for the General Purpose Precinct and the Bulk and General Precinct combined;
- 40 ships per annum for the Bulk Liquids Precinct; and
- 420 ships per annum for the Container Terminal Precinct.

The turnaround time for ships to load and unload while at berth is normally between one and two days.

The waterside impact of these additional ship movements on the operations and capacity of the Port of Newcastle has not been assessed in this report, although it has been discussed in Section 5.2.6 of the EA document. However, the potential landside road and rail impacts associated with the additional cargo volumes and shipping movements have been assessed in this report and on the basis of conservative (maximum) trade volumes.

Relevant RTA guidelines, including the RTA Guide to Trip Generating Developments were consulted in association with this assessment. However, detailed trade forecasts were provided by NPC and these have been used to predict trips generated by the proposed concept.

4.2 Precinct Development Potential

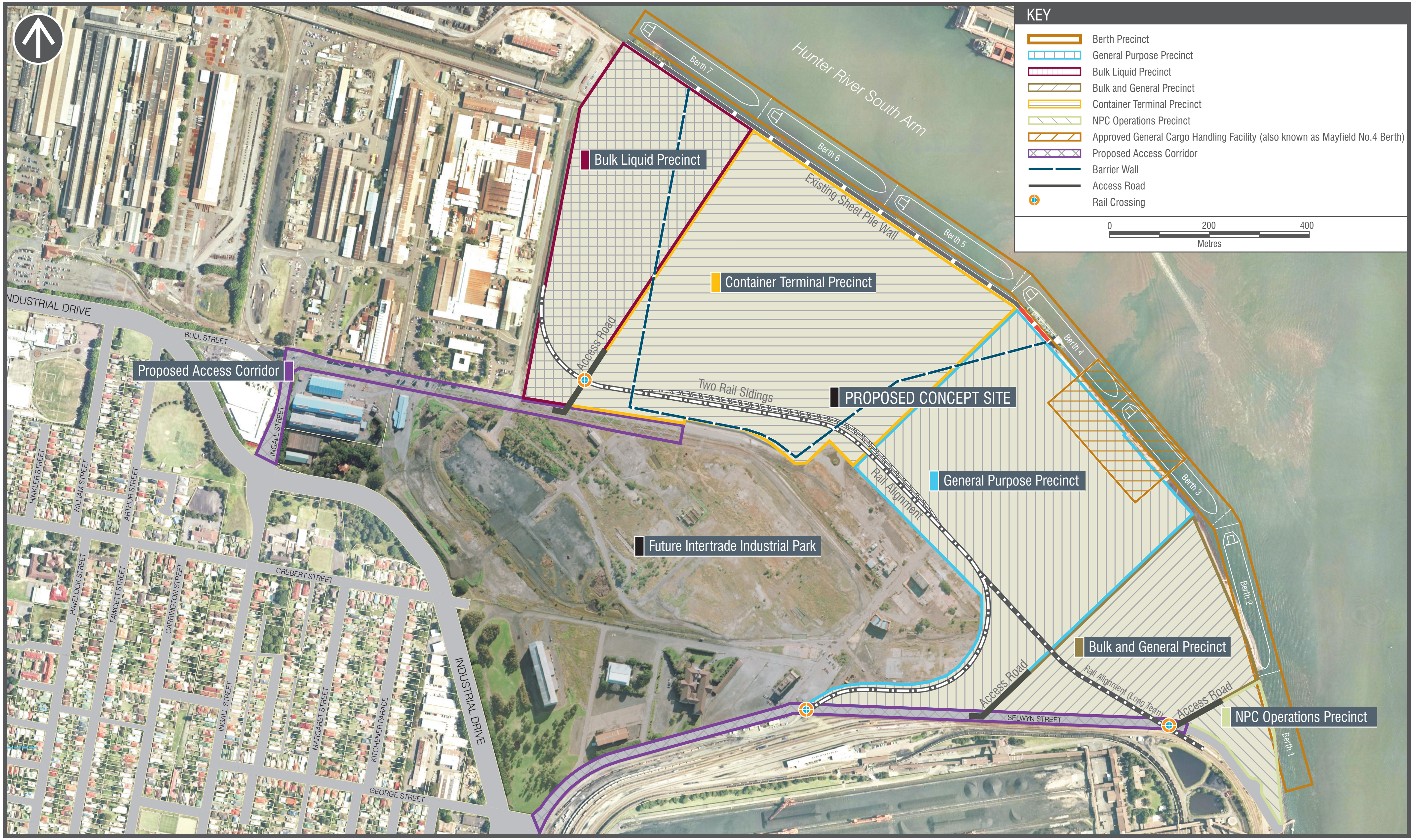
The existing and potential use for each precinct is discussed in **Table 4-1**.

Table 4-1: Precinct Development Potential

Precinct	Existing Use	Potential Use	Timing (from 2009)
NPC Operations (Berth 1)	None	NPC dredger vessel NCP Offices	5 - 10 years
Bulk & General Purpose (Berth 2)	Nothing	Use by bulk businesses including grain storage, briquettes, coke cargos and other infrastructure	2 - 10 years
General Purpose (Berth 3 and may share Berth 4 with the Container Terminal Precinct)	General cargo handling facility (Mayfield No.4 berth) – operational in 2010	Cargo; Break bulk; Containers; Heavy machinery; RO/RO	2- 25 years
Container Terminal (Berths 4, 5 & 6)	Koppers Carbon Materials & Chemicals – use of Berth facility only – tar piped to offsite facility	Containers	13 - 25 years
Bulk Liquid (Berth 7)	None	Facility for the receival, storage, blending and distribution of fuels and biofuels	2 - 5 years

Source: Newcastle Port Corporation, May 2009

"This page has been left blank intentionally"



AECOM

CONCEPT PLAN

Transport Assessment

Mayfield Site Port-Related Activities Concept Plan

Figure 4-1

"This page has been left blank intentionally"

4.3 Proposed Initial Operations (2024)

4.3.1 Precinct Trade Forecast and Likely Landside Modal Split

Table 4-2 shows the proposed initial operations for each precinct, as well as the proposed landside transportation modes.

Table 4-2: Proposed Initial Operations (2024)

Precinct	Trade and Type	Approximate Volume	Likely Landside Transport Requirements
NPC Operations (Berth 1)	NCP offices	N/A	N/A
Bulk & General Purpose (Berth 2)	Dry Bulk storage (feed grain, rice, canola etc)	0.4 MTPA	70% Road, 30% Rail
	Coke	0.25 MTPA	70% Road, 30% Rail
	Cement	0.7 MTPA	100% Road
	Boutique coal	0.5 MTPA	70% Road, 30% Rail
	Soda ash	0.1 MTPA	100% Road
	Fertiliser	0.25 MTPA	100% Road
	Meals	0.1 MTPA	100% Road
	Sand	0.1 MTPA	100% Road
	Total	**2.4 MTPA**	-
General Purpose (Berth 3 and may share Berth 4 with the Container Terminal Precinct)	Heavy machinery	0.1 MTPA	100% Road
	Roll on roll off cargo	0.1 MTPA	100% Road
	Project cargo	0.05 MTPA	100% Road
	Steel products	0.4 MTPA	70% Road, 30% Rail
	Timber products	0.1 MTPA	70% Road, 30% Rail
	Ammonia Nitrate	0.1 MTPA	100% Road
	Scrap Metal	0.2 MTPA	70% Road, 30% Rail
	Pine logs	0.3 MTPA	70% Road, 30% Rail
	Total	**1.35 MTPA**	-
Container Terminal (Berths 4, 5 and 6)	**Containers**	**600,000 TEU**	80% Road, 20% Rail
Bulk Liquid (Berth 7)	**Fuels and other bulk liquids**	**1,010 ML**	100% Road

Source: Newcastle Port Corporation, May 2009

* MTPA = Million Tonnes per Annum

** ML = Million Litres

*** TEU = Twenty-foot Equivalent Units of Containers

Of the initial proposed concept operation and associated truck movements, it is assumed that 75% are to take place during the day time, with the remaining 25% taking place at night[3].

The assumptions which underpin this road and rail assessment have been prepared based on:

- Detailed discussions with NPC in relation to expected cargo volumes and types and the likely timeframe for their introduction to the site over the 25 year timeframe of the proposed concept;
- Experience of how other major ports, such as Port Botany, operate in respect to the intensity of operations over a 24 hour period (eg. day vs night and AM/PM peaks) and the characteristics of how they manage the road and rail transport of cargos;
- The likely direction of traffic flow having regard to the geographic location of the potential markets for the various cargo types, the structure of the local and regional road networks, and the capacity of the two main local intersections;
- The limited capacity of the freight rail network between Newcastle and Sydney which means that only limited train paths will be available to the site in the short/medium term until such time as the upgrade of the North Sydney Freight Corridor is completed;
- There is limited landside area available at the site to support the number of rail sidings needed to allow for a significantly higher proportion of cargo movement by rail. This could change in the future depending on how the adjoining land to the south (Intertrade Industrial Park) is developed but at this stage the detail of this development is unknown.

4.3.2 Road Network

Road Access

For the purposes of this assessment, it has been assumed that the site will be accessed via two intersections:

- Industrial Drive / George Street; and
- Industrial Drive / Ingall Street.

As an initial assumption, the proposed access corridor connecting to the Industrial Drive / Ingall Street intersection (subject to the Hunter Development Corporation strategic planning process), has been assumed to serve the Container and Bulk Liquid Precincts. The remaining precincts (General Purpose, Bulk and General and NCP Operations) are assumed to gain access from Selwyn Street via the Industrial Drive / George Street intersection.

This assumption will be tested in the intersection analysis and, if the intersections are found to not operate satisfactorily, alternative access arrangements will be recommended.

Road Trip Generation

The trips generated by each mode are based on the landside transport requirements, as shown in **Table 4-2**. Loading assumptions for road vehicles are summarised in **Table 4-3**.

Table 4-3: Average Loading Assumptions

Per Truck	Unit	Quantity
Bulk	Tonnes	35
General Cargo	Tonnes	25
Containers	TEU	2
Bulk Liquid	ML	18

Source: AECOM, 2010 / Mark Waugh Pty Ltd, 2008

[3] Based on information provided by Newcastle Port Corporation, April 2010

All trade transported to the Bulk and General Precinct is assumed to be ‘bulk’. All trade transported to/from the General Purpose Precinct, with the exception of ammonia nitrate, is assumed to be ‘general cargo’ and all trade transported to/from the Container Terminal Precinct is assumed to be transported by ‘containers’.

The number of trucks transporting the fuels and other bulk liquids from the Bulk Liquid Precinct is based on one truck being able to transport 18ML of liquid per day.[4]

Table 4-4 indicates the number of trucks that will be required to transport containers, bulks, general cargo and liquids to/from the various precincts based on a 24 hours per day, 7 days a week operation with 75% of truck movements occurring during the day time and 25% of truck movements occurring at night.

The number of trucks predicted is based on the percentage of material to be transported by road, as shown in **Table 4-2**. The number of associated truck movements is based on two movements per truck (one movement into site and one movement out). The peak hour truck movements are assumed to be 50% higher than a normal hour and these have been used for the peak hour assessment of the road network and intersections.

Table 4-4: Proposed Initial Operations (2024) Truck Movement Scenarios

Precinct	Trucks per year	Trucks per day	Trucks per daytime hour	Truck movements per daytime hour	Truck movements per daytime peak hour
Bulk and General	58,714	161	8	16	24
General Purpose	40,857	112	5	11	16
Container Terminal	240,000	657	33	66	99
Bulk Liquid	20,481	56	3	6	9
Total	**360,052**	**986**	**49**	**99**	**148**

Source: AECOM, 2010

It is believed that in 2024 there will be a total of approximately 200 employees on site at any one time. The assumption that 75% of movements will occur during the day and 25% at night has also been applied to employee movements. Of the 75% of movements during the daytime, it has been assumed that 40% of employee movements associated with all precincts will occur during the peak hours. This is on the basis that employees are likely to work a shift pattern with start / finish times occurring outside the peak hours experienced on the wider road network[5].

While employee access to the site by means other than private car should be actively encouraged, a scenario of a vehicle occupancy rate of 1.0 has also been assumed, i.e. one car for every employee, in order to test the worst case for the impact on intersections. Workplace travel planning should be considered in the future Project applications for the individual terminals/precincts, when these are made by the prospective operators of the facilities. Access by walking, cycling and public transport should be considered.

Table 4-5 summarises the employee vehicles movements associated with the development in 2024.

Table 4-5: Proposed Initial Operations (2024) Employee Movements

Employees per day	Employee vehicles during daytime	AM Peak Hour		PM Peak Hour	
		In	Out	In	Out
200	150	60	0	0	60

Source: AECOM, 2010

[4] *Proposed Bulk Liquid Storage Depot, Mayfield North, NSW*, Mark Waugh Pty Ltd, Sept 2008

[5] Based on information provided by Newcastle Port Corporation, April 2010

Road Trip Distribution

For the peak hour vehicle movements, it has been assumed that 70% of traffic will be entering the site and 30% will be leaving the site in the AM peak and 40% will be entering the site and 60% will be leaving the site in the PM peak. Of the vehicles entering the site in both peak hours, it has been assumed that 80% will come from the north and 20% will come from the south. The same directional split has been assumed for vehicles exiting the site in both peak hours.[6]

The current geometry of the left turn from the Bull Street slip road into Ingall Street, which includes the level crossing arrangement of the railway line, appears to be too tight for large trucks to make this turn, and so it has been assumed that trucks travelling from the north accessing the Container and Bulk Liquid precincts will not use Bull Street to access the site, but will rather use the Industrial Drive / Ingall Street intersection. This is a worst case scenario and will be discussed later in this report.

Trucks accessing the General Purpose and Bulk and General precincts are assumed to use the Industrial Drive / George Street intersection. When exiting these precincts heading south, it has been assumed that vehicles will use the slip lane adjacent to Selwyn Drive to access Industrial Drive; therefore no trucks will turn left from George Street at the intersection of Industrial Drive / George Street.

It has also been assumed that the employee vehicles accessing the site will be evenly distributed between the two intersections with 50% of employee vehicles using the Industrial Drive / Ingall Street intersection and 50% using the Industrial Drive / George Street intersection.

Table 4-6 through **Table 4-9** show the peak hour truck and vehicle movements associated with the proposed concept at both intersections in 2024. These are shown graphically in **Figure 4-2**.

Table 4-6: 2024 AM Peak Hour Development Trips – Industrial Drive / Ingall Street Intersection

Precinct	In		Out	
	North	South	North	South
Container Terminal (HGV)	55	14	24	6
Bulk Liquid (HGV)	5	1	2	1
Employees (LV)	24	6	0	0
Total (HGV)	**60**	**15**	**26**	**6**
Total (LV)	**24**	**6**	**0**	**0**

Source: AECOM, 2010

Table 4-7: 2024 PM Peak Hour Development Trips – Industrial Drive / Ingall Street Intersection

Precinct	In		Out	
	North	South	North	South
Container Terminal (HGV)	32	8	47	12
Bulk Liquid (HGV)	3	1	4	1
Employees (LV)	0	0	24	6
Total (HGV)	**34**	**9**	**51**	**13**
Total (LV)	**0**	**0**	**24**	**6**

Source: AECOM, 2010

[6] Ibid

Table 4-8: 2024 AM Peak Hour Development Trips – Industrial Drive / George Street Intersection

Precinct	In		Out	
	North	South	North	South
Bulk and General (HGV)	14	3	6	-
General Purpose (HGV)	9	2	4	-
Employees (LV)	24	6	0	-
Total (HGV)	**23**	**6**	**10**	**-**
Total (LV)	**24**	**6**	**0**	**-**

Source: AECOM, 2010

Table 4-9:2024 PM Peak Hour Development Trips – Industrial Drive / George Street Intersection

Precinct	In		Out	
	North	South	North	South
Bulk and General (HGV)	8	2	12	-
General Purpose (HGV)	5	1	8	-
Employees (LV)	0	0	24	-
Total (HGV)	**13**	**3**	**20**	**-**
Total (LV)	**0**	**0**	**24**	**-**

Source: AECOM, 2010

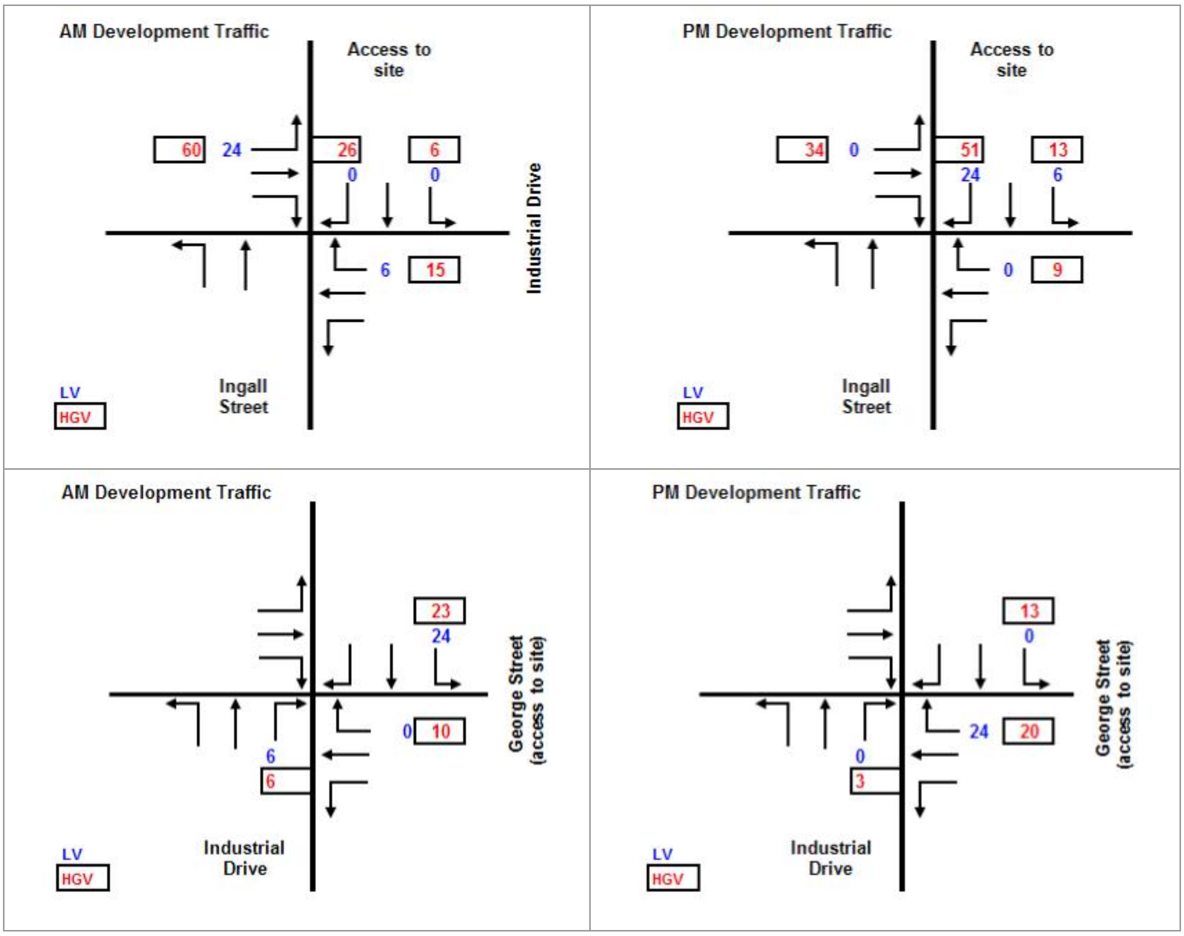


Figure 4-2: 2024 Peak Hour Development Traffic

Source: AECOM, 2010

Summary of Assumptions

The following assumptions have been made in order to assess the road network impact:

- 24 hour per day, 7 days a week operation (365 days per year);
- 75% of the proposed operations and associated truck movements will take place during the day, 25% taking place at night;
- Container trade forecasts: 600,000 TEUs – 80% transported by road / 20% by rail;
- 70% truck traffic enters and 30% exits the site in the AM peak hour;
- 40% truck traffic enters and 60% exits the site in the PM peak hour;
- 40% of all employee traffic enters and exits in the traffic peak hours;
- Of the above, all employee traffic enters in the AM peak hour and exits in the PM peak hour; and
- 80% of all traffic (trucks and vehicles) travels to/from the north and 20% travels to/from the south.

Road Impacts

It is expected that the proposed concept will generate 148 truck movements and 60 vehicle movements in the peak hours, based on the likely modal split indicated in **Table 4-2**, and shown in **Table 4-4** and **Table 4-5**.

The truck and vehicle movements generated by the proposed concept have been added to the forecast 2024 traffic flows at the intersections of Industrial Drive / George Street and Industrial Drive / Ingall Street. The intersections have again been assessed using SIDRA Intersection 3.2 using the base layouts. It should be noted that the distribution is based on the assumed internal road network and hence the Container Terminal Precinct traffic, which makes up approximately 65% of the generated traffic, is loaded onto the Industrial Drive / Ingall Street intersection. This intersection is therefore impacted to a greater degree than the Industrial Drive / George Street intersection.

Industrial Drive / George Street

The results of the assessment for the AM and PM peak hour in 2024 with the inclusion of the proposed concept traffic are shown in **Table 4-10** and **Table 4-11**.

Table 4-10: 2024 AM Peak Intersection Performance, Industrial Drive / George Street – with development traffic

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Industrial Drive (S Leg)	926	B	0.533	18.9	105
George St (E)	49	C	0.054	30.6	9
Industrial Drive (N Leg)	1,441	B	0.823	25.5	198
George St (W)	91	C	0.149	34.5	18
All Vehicles	**2,507**	**B**	**0.823**	**23.5**	**198**

Source: AECOM, 2010

Table 4-11: 2024 PM Peak Intersection Performance, Industrial Drive / George Street – with development traffic

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Industrial Drive (S Leg)	1,310	C	0.848	30.6	202
George St (E)	79	C	0.140	33.7	17
Industrial Drive (N Leg)	1,174	B	0.750	23.3	154
George St (W)	56	C	0.071	31.4	10
All Vehicles	**2,619**	**B**	**0.851**	**27.4**	**201**

Source: AECOM, 2010

The results show that in 2024, the proposed concept traffic is likely to have a negligible impact on the Industrial Drive / George Street intersection, as the intersection is likely to perform at LOS B in both peaks. There is a minimal change in the spare capacity between the future scenario without the proposed concept and the future scenario with the proposed concept and therefore no specific mitigation measures would be required.

Based on the degree of saturation, the intersection operates with approximately 17% and 15% spare capacity in the AM and PM peak hours respectively. If an internal road was present linking the various precincts it would enable a higher distribution of trips from the site to the Industrial Drive / George Street intersection. Assuming that trips generated by the Container Terminal Precinct use the Industrial Drive / George Street intersection as opposed to the Industrial Drive / Ingall Street intersection, the Industrial Drive / George Street intersection is likely to continue to perform at LOS B in the AM and PM peaks, as shown in **Table 4-12** and **Table 4-13**.

Table 4-12: 2024 AM Peak Intersection Performance, Industrial Drive / George Street – with development traffic and link road

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Industrial Drive (S Leg)	949	B	0.538	19.5	106
George St (E)	72	C	0.139	34.6	14
Industrial Drive (N Leg)	1,469	B	0.823	25.6	198
George St (W)	91	C	0.149	34.5	18
All Vehicles	**2,608**	**B**	**0.823**	**23.9**	**198**

Source: AECOM, 2010

Table 4-13: 2024 PM Peak Intersection Performance, Industrial Drive / George Street – with development traffic and link road

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Industrial Drive (S Leg)	1,318	C	0.848	30.8	202
George St (E)	126	C	0.304	36.8	36
Industrial Drive (N Leg)	1,206	B	0.750	23.4	154
George St (W)	56	C	0.071	31.4	10
All Vehicles	**2,706**	**B**	**0.851**	**27.8**	**201**

Source: AECOM, 2010

Industrial Drive / Ingall Street

The results of the assessment for the AM and PM peak hour in 2024 with the inclusion of the proposed concept traffic are shown in **Table 4-14** and **Table 4-15**.

Table 4-14: 2024 AM Peak Intersection Performance, Industrial Drive / Ingall Street – with development traffic

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Ingall St (S Leg)	171	D	0.428	43.3	47
Industrial Drive (E Leg)	1,258	B	0.764	23.6	156
Ingall St (N Leg)	145	D	0.830	49.1	58
Industrial Drive (W Leg)	2,004	B	0.841	25.3	268
All Vehicles	**3,578**	**B**	**0.841**	**26.6**	**268**

Source: AECOM, 2010

Table 4-15: 2024 PM Peak Intersection Performance, Industrial Drive / Ingall Street – with development traffic

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Ingall St (S Leg)	183	C	0.419	36.7	59
Industrial Drive (E Leg)	1,699	F	1.085	213.9	785
Ingall St (N Leg)	303	F	1.076	159.1	221
Industrial Drive (W Leg)	1,472	C	1.000	42.4	213
All Vehicles	**3,657**	**F**	**1.085**	**131.5**	**785**

Source: AECOM, 2010

The results show that in 2024 in the AM peak, the Industrial Drive / Ingall Street Intersection is likely to operate satisfactorily at LOS B, however it is not likely to operate satisfactorily in the PM peak with LOS F. The intersection is over capacity and results in long delays and queuing.

In order to alleviate the impact on the Ingall Street intersection, diverting a proportion of trucks to the George Street intersection was considered. Analysis indicated that the George Street intersection had spare capacity before the diversion.

An internal road network with a link road connecting all the precincts would ensure a strategic distribution of trucks between the two intersections. Trips generated by the Container Terminal Precinct could then use the Industrial Drive / George Street intersection as opposed to the Industrial Drive / Ingall Street intersection and this scenario has been tested below.

This mitigation measure would have the greatest impact on the Ingall Street / Industrial Drive intersection in terms of improved performance and spare capacity, with this intersection likely to operate at LOS B in the AM and PM peaks, as shown in **Table 4-16** and **Table 4-17**.

Table 4-16: 2024 AM Peak Intersection Performance, Industrial Drive / Ingall Street – with development traffic and link road

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Ingall St (S Leg)	171	D	0.600	48.3	51
Industrial Drive (E Leg)	1,244	B	0.657	21.4	150
Ingall St (N Leg)	115	D	0.738	44.9	37
Industrial Drive (W Leg)	1,949	B	0.740	17.0	196
All Vehicles	**3,479**	**B**	**0.745**	**21.0**	**196**

Source: AECOM, 2010

Table 4-17: 2024 PM Peak Intersection Performance, Industrial Drive / Ingall Street – with development traffic and link road

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Ingall St (S Leg)	183	D	0.800	54.5	74
Industrial Drive (E Leg)	1,691	B	0.854	26.5	264
Ingall St (N Leg)	244	B	0.542	28.3	46
Industrial Drive (W Leg)	1,440	B	0.839	23.1	145
All Vehicles	**3,558**	**B**	**0.854**	**26.7**	**264**

Source: AECOM, 2010

4.3.3 Rail Network

Rail Access

Use of the Main North Corridor depends very much on the price of petrol (and hence rail's share of the freight demand), coal, and demand for import and export for goods. The corridor is heavily utilised; however, initial discussions with RailCorp and ARTC indicate that there may currently be 4 available train paths per day. This is likely to be one prior to the morning curfew, one post morning curfew, one prior to the afternoon curfew, and one post the afternoon curfew. This would mean that two trains may arrive at the port in short succession (post morning and prior to afternoon curfew) and a holding road may be required at the port to hold the next incoming train while the loading and unloading takes place.

A joint discussion needs to take place with ARTC and RailCorp, in order to verify the exact paths that would be available on the Main North Corridor.

It is important to note that in the long term, the Northern Sydney Freight Corridor project will create 80 train paths per day, independent of the Metropolitan Passenger Network, and the notion of curfews would disappear. Access to Sydney would then be virtually unrestricted.

Rail Demand Generation and Distribution

For the purposes of this study, the following is assumed:

- Calculations are based on the trade forecasts given in **Table 4-2.** It is assumed 60% of containers are exported and 40% are imported.[7]
- The source and destination for all trade is Sydney, except for coal which is assumed to be the Hunter Region. At this point no trade from the North Coast or the Hunter Region has been identified, other than boutique coal.
- Train loads are based on the operating manual for the Main North Line. Class 81/82 locomotives will be used, pulling a maximum load of 1,130 tonnes per locomotive. Given the restriction in operating space within the port, a typical train length of around 800m is likely to be operated (this has been discussed and agreed with ARTC).
- The current standard train consist for both Queensland Rail Freight and Pacific National is a 1,244m freight train consisting of 2 x 600m wagon rakes and 2 locomotives. Due to the gradients around Cowan, this length of train is not actually achievable on the Main North Line; therefore the facilities will also be designed to cope with shorter more frequent services. See below for train lengths by trade type.

The demand can be split into Bulk, General and Container freight. Bulk freight typically operates at the maximum axle load limit for the rail line, which in this case is 25 tonnes per axle. General freight typically operates at around half that figure. Container freight tends to include a lot of empty container transfers, so the loads are mixed. Typical average container weights are 15 tonnes export, and 10 tonnes import. The number of trips has been assumed based on a typical train consist.

Using the above, the predicted number of train paths required is:

- Boutique Coal from Hunter Region – 150,000 tonnes per annum, by rail via the Hunter. A typical Hunter Region train is 3 locomotives and 91 wagons, and can move 6,825 tonnes per train, therefore the number of trains is negligible at 0.08 trains per day (2 trains per month).
- Bulk from Sydney (coke and dry bulk storage) – 187,500 tonnes per annum by rail via Sydney and the Main North Line. A bulk freight train will be shorter than a container train because of the higher axle load per wagon. It is assumed that a bulk train will be made up of 3 locomotives and 33 wagons (the train consist is limited by the 1,130 tonnes load per locomotive limit on the Cowan Bank), the train length is approximately 700m and a freight load is 2,516 tonnes per train, therefore this requires 0.25 trains per day (75 trains per year).
- General freight from Sydney – 300,000 tonnes per annum via the Main North Line. Trains are likely to be 2 locomotives and 39 wagons, for a total length of 787m, with a total load per train of 1,462 tonnes. This requires 0.65 trains per day (157 trains per annum).

---

[7] Based on existing trade movement at Port Botany.

- Container Export – The freight demand for initial operations in 2024 is 600,000 TEU, 20% are moved by rail. Therefore 120,000 TEU to be imported and exported. Assume 60% export, therefore 72,000 TEU per annum move via the Main North Line. Train size is likely to be 766m (38 wagons and 2 locomotives), which can take 114 TEUs per train. Therefore 2.01 trains per day are required to move the containers to and from Sydney (631 trains per annum).
- Container Import – 48,000 TEU per annum via the Main North Line. Assuming the same train as before therefore requires 1.33 trains per day. It is assumed that this is incorporated into the units going to Newcastle Port for exports to save on paths as well as loading and unloading times.

For the proposed concept there would need to be approximately 3 trains per day running into the port for the initial operations scenario in 2024. All of the above is calculated assuming 315 operating days per year for rail (due to track closures, possessions etc).

Rail Impacts

Train loading and unloading time for the proposed concept will be based on the worst case train configuration, which is a 766m train. This is as follows:

- Train break in half into 2 x 520m long sidings = 0.5 hours
- Unload 114 containers = 1.2 hour
- Load 76 containers = 0.8 hours
- Inspect Wagons = 1 hour
- Test locomotive = 0.5 hours
- Test brakes = 0.25 hours
- Reform train to 766m = 0.5 hours
- Shunting manoeuvres = 0.5 hours

Therefore, the total time each train would be in the siding = 5.25 hours.

Based on the fact that there are 3 trains per day required for the initial operations scenario in 2024, and that time must be allowed for OneSteel trains (three per day) to move in and out of their facility, there needs to be a minimum of two new rail sidings provided within the site. In order to cut down the impact on OneSteel, the locomotives need to be stored in the sidings during loading and unloading, so the minimum siding length should be:

Rake length + 2 x locomotive length + 15m = 464m minimum.

Figure 4-3 provides a visual representation of the potential train operation. This shows that two sidings of around 520m length can be accommodated within the site.

Operation

The envisaged operation is that a maximum length of 766m train will be arrive via the number 6 road in the Morandoo Sidings and will cross over to the number 7 road via a new crossover and then onto the old BHP Billiton rail road, now called the OneSteel Arrival Road. Note that the number 7 road is currently disconnected in Morandoo Siding and therefore a new linking crossover will need to be constructed.

The train will enter the first of the loading sidings, such that the back of the train is clear of the Selwyn Street level crossing, but with the break point of the wagons still short of the siding points (i.e. still on the OneSteel access road). The back half of the train will then be broken off and temporarily parked, and the front half will be moved forward clear of the points and into the siding and parked. The locomotives will detach and leave the siding and run back around to pick up the back half of the rake, and that will be dragged into the second siding and parked.

This leaves the OneSteel Arrival Road clear for OneSteel trains to enter and leave while the port train is being loaded and unloaded. Given that there will be 2 trains in this section at any one time (i.e. one train in the One Steel facility and one train in the port sidings), it is possible that the OneSteel Arrival Road will need to be signalled.

The train is then reformed after loading by the reverse move carried out on entry. The entire consist is then reversed back over the Selwyn Street level crossing into the number 6 road in Morandoo Sidings, before leaving via the Port Waratah loop.

The above operation can be undertaken for the initial years of the proposed concept, while the freight task builds up. Once the freight task requires more than 2 trains per day (approximately 66% of initial capacity and 50% of final capacity), an exit road will need to be installed connecting to the Bullock Island Loop in order to deal with the increase in train operations.

The Main North Line has limited available paths, and there will increasingly be a risk that trains entering the port are forced to arrive before the loaded trains have left and therefore they will need to be stored in the Morandoo Sidings. This will increase the risk of blockages to OneSteel, grain and coal trains as the entry road to Port Waratah becomes congested and as a result scheduling of these train movements will be needed.

By the time the freight task increases to a point where 3 trains per day are required, an exit road connecting to the Bullock Island Loop will need to be installed to allow trains leaving the port to leave without having to make the reversing move back to the number 6 road in the Morandoo Sidings.

This has two advantages. Firstly, it will reduce train cycling times by 30 minutes as the reversing move is removed, and trains can exit by going straight out of the loop, and secondly it allows two trains to arrive and be held in the Morandoo Sidings. One train will arrive and be broken into its two halves and stored in the number 4 and 5 roads, and the other can then wait on the number 6 (entry) road. This has huge operational advantages for ARTC and for the port, as use of the port loading facility can be maximised by ensuring that there is always a train waiting to enter.

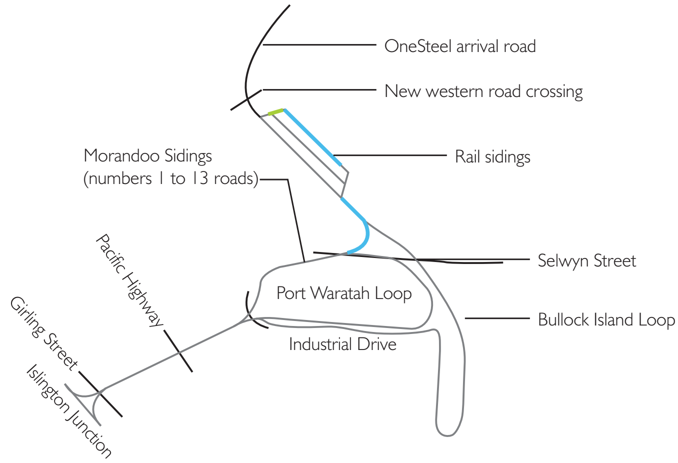
The only issue with holding trains in the number 6 road is that it blocks OneSteel's access to its arrival road. Given that there are some hours between trains entering and leaving, this can be co-ordinated with OneSteel.

Operational Constraints

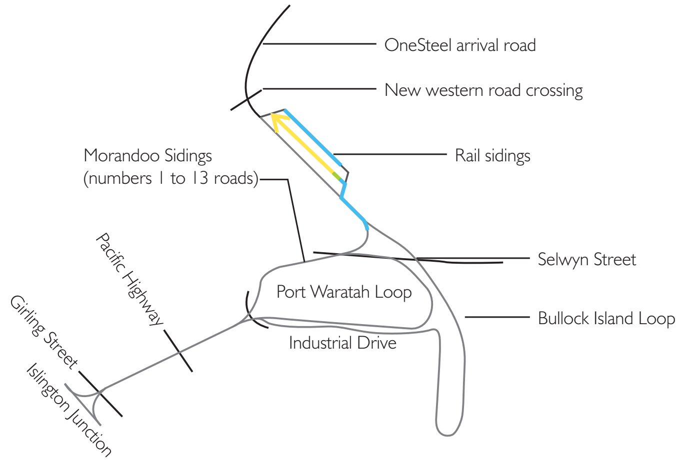
There are several constraints to be looked at:

- OneSteel requires access to their facility, therefore the Morandoo Arrival Road (road number 13) and the OneSteel Arrival Road need to be kept clear. This means that trains cannot be parked in the number 6 road on arrival for any length of time, as they are too long for the siding and will block access and egress for OneSteel trains. If a Port train needs to be held in Morandoo Sidings for some hours while it waits for entry into the port site, then it will be broken in two and parked in the number 4 and 5 roads in the Morandoo Sidings. If it is only a short term park, then the number 6 road can be used and potential conflict with One Steel trains can be easily managed by scheduling these train movements.
- Selwyn Street level crossing sits between the Morandoo siding and the port. The level crossing will be closed for only relatively short periods of time (5-6 minutes per train movement) while trains enter and exit the port. The impact on Selwyn Street is that the level crossing will close for 5-6min at a time, up to 10 times per day. This is 3 OneSteel trains entering and leaving, and 2 Port trains, entering and leaving. This crossing will likely need to become a full barrier as a minimum and an ALCAM assessment should be undertaken once vehicle numbers have been properly identified;
- The new western road crossing of the railway line that will be required to service the Container Terminal and Bulk Liquid Precincts may also require treatment to separate road and rail movements. If this crossing is kept more than 65m from the toes of points for the siding (on the western side), then the port train locomotives shunting back on the OneSteel Arrival Road will turn back prior to reaching the level crossing, meaning that the only rail traffic crossing the new level crossing will be OneSteel trains (3 trains per day).
- The Main North Line operates under a freight train curfew during the peak hours. This means that running trains between Newcastle and Sydney needs to be carefully planned. It is quite possible that this curfew will cause path restrictions to Newcastle. This issue should be discussed with ARTC and RailCorp;
- This freight train curfew will be removed when the North Sydney Freight Corridor Upgrade project is completed but this is likely to occur in a medium/longer term timeframe; and
- Use of the Morandoo Arrival Road will require a discussion to take place with Pacific National to ensure that the siding is available for use.

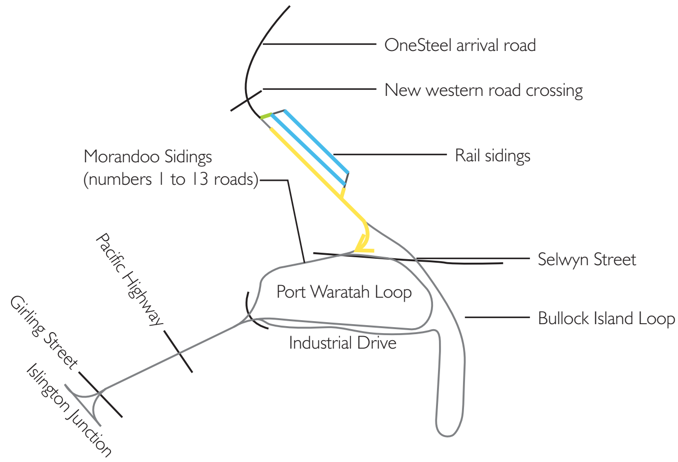
STEP 1
Break train
First half in outer siding



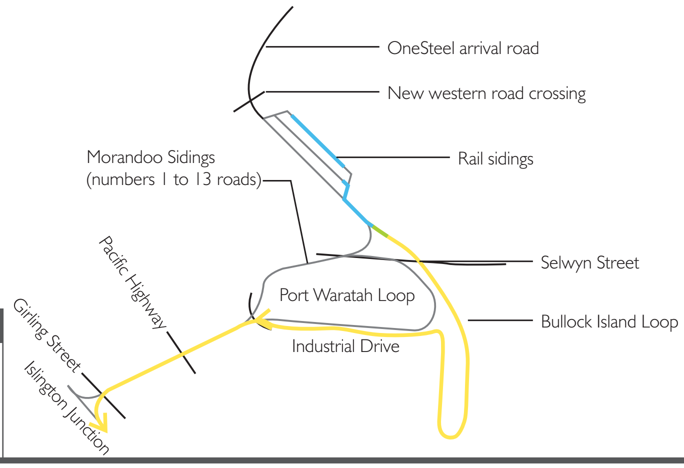
STEP 2
Move second half into inner siding

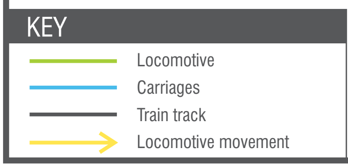


STEP 3
Move locomotive to the opposite end of the siding



STEP 4
Reform train and proceed onto Sydney





AECOM

TRAIN MOVEMENTS
Transport Assessment
Mayfield Site Port-Related Activities Concept Plan

Figure 4-3

“This page has been left blank intentionally”

Rail Mode Share Sensitivity Testing

This sensitivity analysis will be based on testing the percentage road and rail mode shares as proposed in **Table 4-2.**

Assumptions:

- For the modal split for various cargo types, it is assumed wherever the roads total is not 100% that the remainder is moved by rail.
- The following loads apply to trains.
  Bulk Freight – 1,900 tonnes per train
  Containers – 114 TEU per train
- It is assumed that there are 315 operating days per year.

The sensitivity of rail impact can be viewed in **Table 4-18** where the top left cell is the base case for the freight task (i.e. 20% of containers by rail and 30% of bulk by rail), and an increase in the rail mode share for containers to 40% and for bulk to 50% is tested in the other cells. The numbers presented are trains per day based on the above assumptions.

Table 4-18: 2024 Rail Mode Share Sensitivity Testing

600,000 TEU	Bulk 30% By Rail	Bulk 50% by Rail	Notes
Container 20% by Rail	3.1#	3.8	No new infrastructure required within the port. North Sydney Freight Corridor would be required for 50% bulk.
Container 40% by Rail	5.1	5.8	Additional sidings, gantries and North Sydney Freight Corridor required)

This is the base case modelled scenario

Source: AECOM, 2010

Assessing the infrastructure within the Mayfield site, there is room for 2 sidings, long enough to each take half a train. The marshalling, load and unload times for a single train is around 5.25 hours. Therefore, the Mayfield site can theoretically handle a maximum of 4.6 trains per day.

There are operational difficulties associated with increasing the number of sidings at the site. Firstly, running a third siding in parallel means that reach stackers cannot be used, and the port will be forced to invest in gantries. If rail is to move more than the base case modal split, then a second set of sidings would need to be installed, and gantries would be used for all 4 sidings rather than reach stackers.

If the site is set up to include additional space for reach stackers, then valuable land is lost to the port side, and the port operation becomes restricted. Also the reach stackers will need to run around the trains in the siding, thereby increasing dramatically the amount of traffic within the port (equal to probably double the number of TEU's to be moved per annum). Gantries can reach over 5 sidings and therefore solve the operational problems, however, they are more expensive to install and operate.

A second issue for discussion is the Main North Line capacity. The Main North Line only has 4 paths available per day, until the North Sydney Freight Corridor Project is built. This means that many of the cases can only work if the freight is not sent to Sydney, but rather inland or up north. This could drive development of a small yard outside of Newcastle, to bring the trains in and reform them as 1,500m Superfreighters, for the trip to Sydney. Four of these trains could service the equivalent of 7.6 of the port trains which are 766m in length. This would provide a good level of capacity for the port. There may be potential to do this in the Broadmeadow Yard, however, this would also require further investigation.

In conclusion, servicing more than 4.6 trains per day would require construction of the North Sydney Freight Corridor, and would trigger the need for additional rail sidings in the port area to be built, to assist with the freight.

There is also a growing risk of operational clashes with entry and exit to the Port Waratah Loop, and a more detailed investigation would need to be undertaken into the rail operation, and discussions should be held with stakeholders.

4.4 Proposed Final Operations (2034)

4.4.1 Precinct Trade Forecast and Likely Landside Modal Split

Table 4-19 shows the final operations for the proposed concept for each precinct within the site, as well as the likely landside transportation modes. The difference between the final and initial operations is the increase in the amount of containers from 600,000 TEUs to 1,000,000 TEUs per annum, the increase in number of precinct employees from 200 to 300 employees and the future year for completion of 2034.

Table 4-19: Proposed Final Operations (2034)

Precinct	Trade and Type	Approximate Volume	Likely Landside Transport Requirements
NPC Operations (Berth 1)	NCP offices	N/A	N/A
Bulk & General Purpose (Berth 2)	Dry Bulk storage (feed grain, rice, canola etc)	0.4 MTPA	70% Road, 30% Rail
	Coke	0.25 MTPA	70% Road, 30% Rail
	Cement	0.7 MTPA	100% Road
	Boutique coal	0.5 MTPA	70% Road, 30% Rail
	Soda ash	0.1 MTPA	100% Road
	Fertiliser	0.25 MTPA	100% Road
	Meals	0.1 MTPA	100% Road
	Sand	0.1 MTPA	100% Road
	Total	**2.4 MTPA**	**-**
General Purpose (Berth 3 and may share Berth 4 with the Container Terminal Precinct)	Heavy machinery	0.1 MTPA	100% Road
	Roll on roll off cargo	0.1 MTPA	100% Road
	Project cargo	0.05 MTPA	100% Road
	Steel products	0.4 MTPA	70% Road, 30% Rail
	Timber products	0.1 MTPA	70% Road, 30% Rail
	Ammonia Nitrate	0.1 MTPA	100% Road
	Scrap Metal	0.2 MTPA	70% Road, 30% Rail
	Pine logs	0.3 MTPA	70% Road, 30% Rail
	Total	**1.35 MTPA**	**-**
Container Terminal (Berths 4, 5 and 6)	**Containers**	**1,000,000 TEU**	80% Road, 20% Rail
Bulk Liquid (Berth 7)	**Fuels and other bulk liquids**	**1,010 ML**	100% Road

Source: Newcastle Port Corporation, May 2009

* MTPA = Million Tonnes per Annum
** ML = Million Litres
*** TEU = Twenty-foot Equivalent Units of Containers

The assumptions which unpderpin this road and rail assessment have been prepared based on:

- Detailed discussions with NPC in relation to expected cargo volumes and types and the likely timeframe for their introduction to the site over the 25 year timeframe of this Concept Plan;
- Experience of how other major ports, such as Port Botany, operate in respect to the intensity of operations over a 24 hour period (eg. day vs night and AM/PM peaks) and the characteristics of how they manage the road and rail transport of cargos;
- The likely direction of traffic flow having regard to the geographic location of the potential markets for the various cargo types, the structure of the local and regional road networks, and the capacity of the two main local intersections;
- The limited capacity of the freight rail network between Newcastle and Sydney which means that only limited train paths will be available to the site in the short/medium term until such time as the upgrade of the North Sydney Freight Corridor is completed;
- There is limited landside area available at the site to support the number of rail sidings needed to allow for a significantly higher proportion of cargo movement by rail. This could change in the future depending on how the adjoining land to the south (Intertrade Industrial Park) is developed but at this stage the detail of this development is unknown.

Road Network

Road Traffic Access, Generation and Distribution

The loading assumptions and landside modal split for the proposed final operations are unchanged from the proposed initial operations (discussed in **Section 4.3.2**).

Table 4-20 shows the number of truck movements associated with the proposed concept final operation. The main change has been the increase in the container terminal trucks movements from 148 to 214 per peak hour. Employee movements have increased from 60 to 90 per peak hour as shown in **Table 4-20**.

As the intersection of Industrial Drive / Ingall Street only performed satisfactorily with the addition of an internal road link under the 2024 scenario with development, the 2034 with development scenario for both intersections has only been modelled with the link road in place. The assumptions with regards to distribution associated with the link road remain unchanged from the 2024 scenario, namely that all of the Container Terminal truck movement access and egress through the Industrial Drive / George Street intersection.

It has been assumed that the road traffic distribution pattern will remain unchanged to that of the initial operations of the proposed concept, i.e. 80% of all traffic travels to/from the north and 20% travels to/from the south.

Table 4-20: Proposed Final Operations (2034) Truck Movement Scenarios

Precinct	Trucks per year	Trucks per day	Trucks per daytime hour	Truck movements per daytime hour	Truck movements per daytime peak hour
Bulk and General	58,714	161	8	16	24
General Purpose	40,857	112	5	11	16
Container Terminal	400,000	1,096	55	110	165
Bulk Liquid	20,481	56	3	6	9
Total	**520,052**	**1,425**	**71**	**142**	**214**

Source: AECOM, 2010

Table 4-21: Proposed Final Operations (2034) Employee Vehicle Movements

Employee vehicles per day	Employee vehicles during daytime	AM Peak Hour		PM Peak Hour	
		In	Out	In	Out
300	225	90	0	0	90

Source: AECOM, 2010

Table 4-24 through **Table 4-27** show the AM and PM peak hour truck and car movements associated with the proposed concept at both intersections, and this is shown graphically in **Figure 4-4**.

Table 4-22: 2034 AM Peak Hour Development Trips – Industrial Drive / Ingall Street Intersection – with link road

Precinct	In		Out	
	North	South	North	South
Container Terminal (HGV)	0	0	0	0
Bulk Liquid (HGV)	5	1	2	1
Employees (LV)	36	9	0	0
Total (HGV)	**5**	**1**	**2**	**1**
Total (LV)	**36**	**9**	**0**	**0**

Source: AECOM, 2010

Table 4-23: 2034 PM Peak Hour Development Trips – Industrial Drive / Ingall Street Intersection – with link road

Precinct	In		Out	
	North	South	North	South
Container Terminal (HGV)	0	0	0	0
Bulk Liquid (HGV)	3	1	4	1
Employees (LV)	0	0	36	9
Total (HGV)	**3**	**1**	**4**	**1**
Total (LV)	**0**	**0**	**36**	**9**

Source: AECOM, 2010

Table 4-24: 2034 AM Peak Hour Development Trips – Industrial Drive / George Street Intersection – with link road

Precinct	In		Out	
	North	South	North	South
Container Terminal (HGV)	92	23	39	-
Bulk and General (HGV)	14	3	6	-
General Purpose (HGV)	9	3	4	-
Employees (LV)	36	9	0	
Total (HGV)	**115**	**29**	**49**	**-**
Total (LV)	**36**	**9**	**0**	**-**

Source: AECOM, 2010

Table 4-25: 2034 PM Peak Hour Development Trips – Industrial Drive / George Street Intersection – with link road

Precinct	In		Out	
	North	South	North	South
Container Terminal (HGV)	53	13	79	-
Bulk and General (HGV)	8	2	12	-
General Purpose (HGV)	5	1	8	-
Employees (LV)	0	0	36	
Total (HGV)	**66**	**16**	**99**	**-**
Total (LV)	**0**	**0**	**36**	**-**

Source: AECOM, 2010

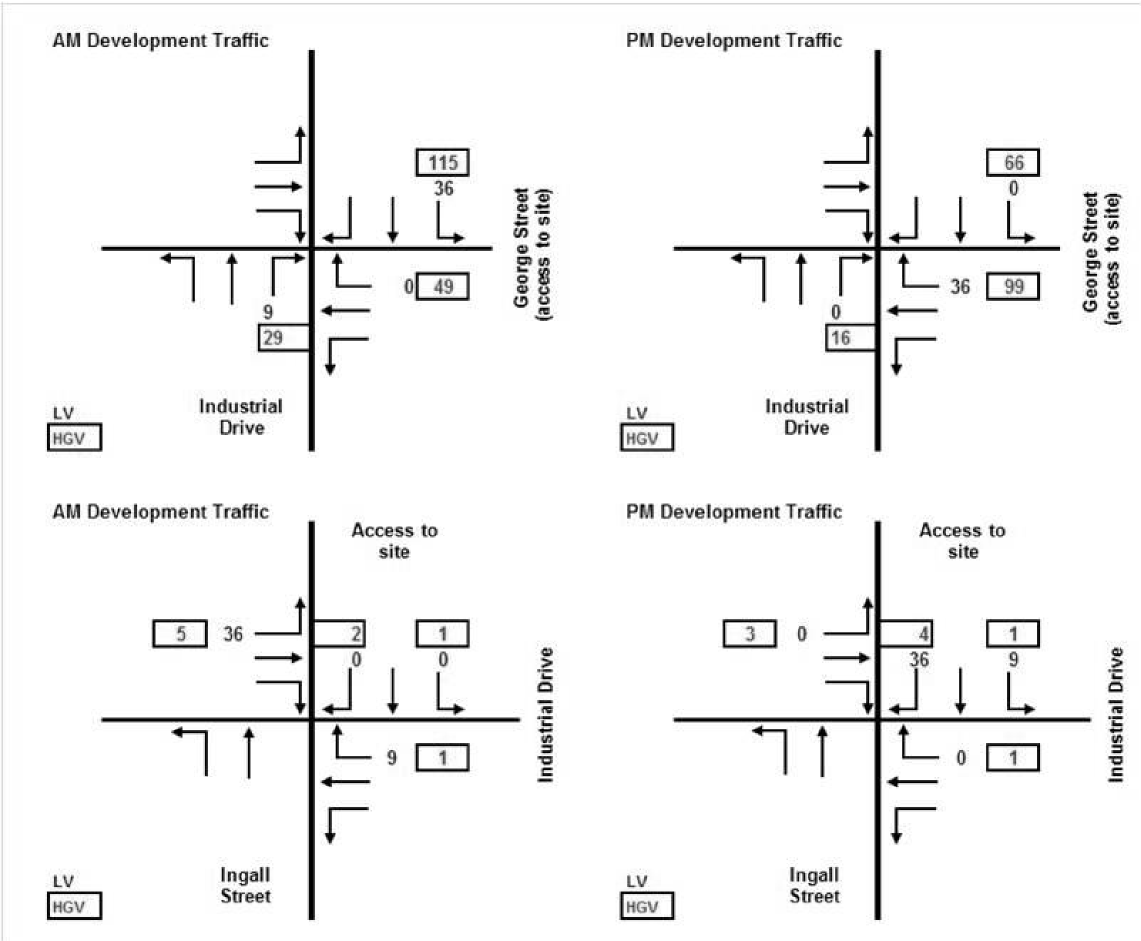


Figure 4-4: 2034 Peak Hour Development Trips – with link road

Source: AECOM, 2010

Road Impacts

It is expected that the proposed concept will generate 214 truck movements and 90 vehicle movements in the peak hours.

The truck and vehicle movements generated by the proposed concept have been added to the forecast 2034 traffic flows at the intersections of Industrial Drive / George Street and Industrial Drive / Ingall Street. The intersections have again been assessed using SIDRA Intersection 3.2 using the base layouts.

Industrial Drive / George Street – with link road

The results of the assessment for the AM and PM peak hour in 2034 with the inclusion of the proposed concept traffic and internaload link are shown in **Table 4-26** and **Table 4-27**.

Table 4-26: 2034 AM Peak Intersection Performance, Industrial Drive / George Street – with development traffic and link road

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Industrial Drive (S Leg)	988	B	0.553	20.1	109
George St (E)	90	C	0.200	36.2	21
Industrial Drive (N Leg)	1,584	B	0.845	27.7	213
George St (W)	94	C	0.154	34.5	19
All Vehicles	**2,756**	**B**	**0.845**	**25.5**	**213**

Source: AECOM, 2010

Table 4-27: 2034 PM Peak Intersection Performance, Industrial Drive / George Street – with development traffic and link road

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Industrial Drive (S Leg)	1,358	C	0.871	33.8	218
George St (E)	172	C	0.436	38.1	51
Industrial Drive (N Leg)	1,260	B	0.770	24.4	162
George St (W)	58	C	0.074	31.4	10
All Vehicles	**2,848**	**C**	**0.871**	**29.9**	**217**

Source: AECOM, 2010

The results show that the proposed concept traffic is likely to have a negligible impact on the Industrial Drive / George Street intersection as the intersection is likely to perform at LOS B and LOS C in the AM and PM peak respectively. The intersection continues to operate with spare capacity in the future scenarios with the proposed concept and the internal link road and therefore no specific mitigation measures would be required.

Industrial Drive / Ingall Street – with link road

The results of the assessment for the AM and PM peak hour in 2034 with the inclusion of the proposed concept traffic are shown in **Table 4-28** and **Table 4-29**.

Table 4-28: 2034 AM Peak Intersection Performance, Industrial Drive / Ingall Street – with development traffic and link road

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Ingall St (S Leg)	176	D	0.622	48.6	53
Industrial Drive (E Leg)	1,282	B	0.660	21.0	153
Ingall St (N Leg)	118	D	0.767	45.3	37
Industrial Drive (W Leg)	2,013	B	0.765	17.6	207
All Vehicles	**3,589**	**B**	**0.769**	**21.2**	**207**

Source: AECOM, 2010

Table 4-29: 2034 PM Peak Intersection Performance, Industrial Drive / Ingall Street – with development traffic and link road

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Ingall St (S Leg)	190	D	0.563	49.9	79
Industrial Drive (E Leg)	1,742	F	0.965	72.4	518
Ingall St (N Leg)	264	F	0.938	73.0	108
Industrial Drive (W Leg)	1,478	C	0.947	34.3	211
All Vehicles	**3,674**	**D**	**0.965**	**56.0**	**518**

Source: AECOM, 2010

The results indicate that the Industrial Drive / Ingall Street intersection is likely to operate satisfactorily at LOS B and with approximately 23% spare capacity in the AM peak hour under the proposed concept scenario. In the PM peak, the intersection is likely to perform close to capacity and at LOS D, which is still considered to be operating acceptably, although this will need to be monitored in the future.

To reduce the impact of the proposed concept on the Ingall Street intersection, diverting employee vehicles exiting the site in the PM peak to the George Street intersection should be considered. Analysis indicates that the Industrial Drive / George Street intersection has spare capacity and therefore this is a viable option.

With this management system in place the Ingall Street intersection is likely to continue to perform at LOS D in the PM peak, however the Ingall Street northern approach and Industrial Drive eastern approach experience improved level of service and increased spare capacity. Diverting all employee traffic to the George Street intersection in the PM peak has a negligible impact on the intersection as this intersection continues to perform satisfactorily at LOS C and with spare capacity. **Table 4-30** and **Table 4-31** show the intersection performance results with this additional management system in place in the PM peak hour.

Table 4-30: 2034 PM Peak Intersection Performance, Industrial Drive / George Street – with link road and employee traffic diversion

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Industrial Drive (S Leg)	1,358	C	0.871	33.8	218
George St (E)	208	C	0.497	38.3	58
Industrial Drive (N Leg)	1,260	B	0.770	24.4	162
George St (W)	58	C	0.074	31.4	10
All Vehicles	**2,884**	**C**	**0.871**	**30.0**	**217**

Source: AECOM, 2010

Table 4-31: 2034 PM Peak Intersection Performance, Industrial Drive / Ingall Street – with link road and employee traffic diversion

Location	Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
Ingall St (S Leg)	190	D	0.547	50.2	77
Industrial Drive (E Leg)	1,742	D	0.934	51.6	420
Ingall St (N Leg)	228	E	0.916	62.4	81
Industrial Drive (W Leg)	1,478	C	0.922	31.7	189
All Vehicles	**3,638**	**D**	**0.934**	**44.1**	**420**

Source: AECOM, 2010

4.4.2 Broader Road Network Impact Analysis

The impact of the proposed concept generated traffic on the broader road network has been considered at the locations shown in **Figure 4.5**. These are locations where the RTA has annual traffic volume data enabling a comparison to be made between with and without the proposed concept traffic.

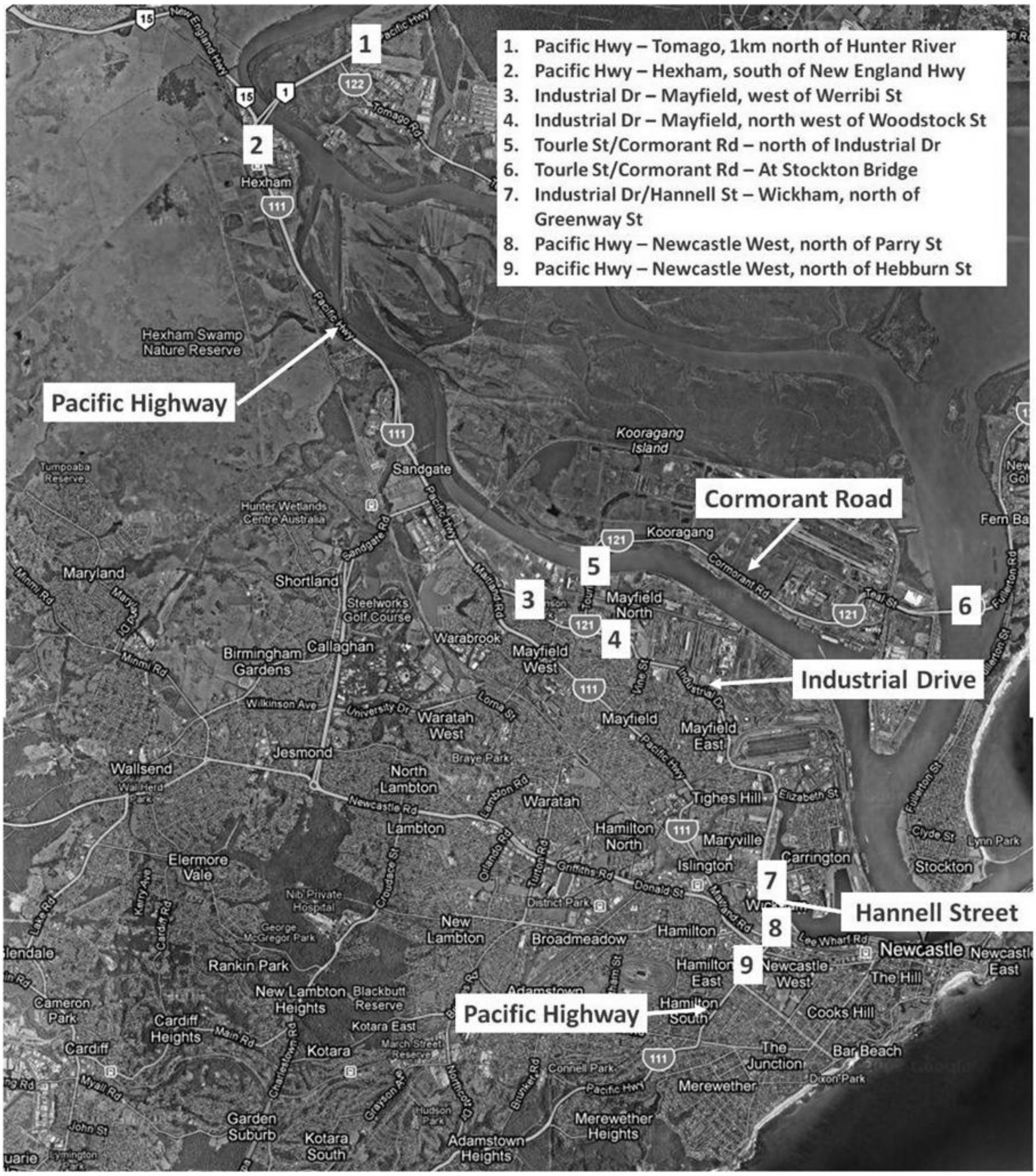


Figure 4-5: Broader Road Network Locations

Source: AECOM, 2009

The proposed concept is expected to generate 1,425 trucks per day (2,850 truck movements per day) and 300 employee vehicles per day (600 employee vehicle movements per day) when complete in 2034, as shown in **Table 4-20**. **Table 4-32** shows the additional truck and vehicle movements as a proportion of the 2034 two-way AADT along roads in the broader road network.

The 2034 two-way AADT was calculated by applying the historical growth factor at each count location. It has been assumed that 80% of truck movements will originate from north of the site and 20% of truck movements will originate from south of the site, as per the assumed distribution in the intersection impact assessment. It has also been assumed that 50% of traffic will access/egress Kooragang Island via Tourle Street and Cormorant Road.

Table 4-32: Development Traffic Movements as a Proportion of 2034 AADT

No.	Road	Location	2034 two-way AADT	Development two-way vehicle movements per day	% of 2034 AADT
1	Pacific Highway	Tomago, 1km north of Hunter River	101,756	690	0.7
2	Pacific Highway	Hexham, south of New England Hwy	86,768	1,380	1.6
3	Industrial Drive	Mayfield, west of Werribi Street	59,641	1,380	2.3
4	Industrial Drive	Mayfield, north-west of Woodstock St	34,188	2,760	8.1
5	Tourle St / Cormorant Rd	Mayfield, north of Industrial Drive	26,386	1,380	5.2
6	Tourle St / Cormorant Rd	At Stockton Bridge	32,158	1,380	4.3
7	Industrial Drive / Hannell St	Wickham, north of Greenway St	51,307	690	1.3
8	Pacific Highway	Newcastle West, north of Parry St	43,737	690	1.6
9	Pacific Highway	Newcastle West, north of Hebburn St	26,175	690	2.6

Source: AECOM, 2010

The table indicates that the trucks and vehicles generated by the proposed concept would be a small proportion (<10%) of the AADT on the broader road network in 2034 and so is considered to have a minimal impact on the broader road network.

4.4.3 Local Road Network Impact Analysis

A detailed assessment of the impact of the Concept Plan on the condition and geometry of the local road network has not been undertaken at this stage. It is recommended that such an assessment should be carried out as part of detailed project applications and that precinct operators be required to demonstrate the impact of heavy goods vehicles on the pavement condition and geometry of the local road network. This would include swept path testing of the type of heavy vehicles that the operators are proposing to use on the access routes in and out of the Concept site.

In regard to the lane capacities of the local road network, in 2034 the maximum predicted peak hour one way traffic flow is in the order of 240 vehicles (150 trucks and 90 employee vehicles) entering the site in the morning peak hour. Using Austroads, Guide to Traffic Management Part 3: Traffic Studies and Analysis 2009, the theoretical capacity of a single traffic lane on the local road is approximately 1,100 vehicles per hour (assuming level grade, 3.7m wide lanes, 2m lateral clearance on each side and 62.5% HGV traffic composition 150 trucks out of 240 vehicles).

With minimal existing traffic on the local roads such as Selwyn Street, the total predicted volume of traffic generated by the proposed concept in 2034 is within the mid-block capacity of the existing local road network and capacity exists to accommodate additional traffic generated by proposed concept of adjoining sites such as Intertrade Industrial Park that may occur in the future.

4.4.4 Impact on Road Network Due to Rail Crossing Closure

The railway line proposed through the site crosses the local road network at locations on Selwyn Street and a new western road / rail level crossing, which would provide access to the north west portion of the site.

Provided the new western level crossing is located more than 65m from the toes of the points for the new rail siding (on the western side), then the locomotives shunting back on the OneSteel road will turn back prior to reaching the level crossing, meaning that the only rail traffic crossing the new level crossing will be OneSteel traffic. This crossing will be closed for approximately 2-3 minutes while trains enter or leave the OneSteel site.

For the Selwyn Street level crossings, two scenarios are possible. Approximately 80% of the time, it is expected that trains entering Mayfield would travel through the level crossing and be broken up in the new rail sidings within the port site. This will mean a closure of approximately 5-6 mins while trains enter or leave the Mayfield site. For the other 20% of the time, if the new rail sidings are occupied, then trains may have to be held and broken up in the Morandoo Sidings (number 4 and 5 roads) outside of the Mayfield site, and brought in one half at a time, as follows:

- locomotives will bring in the first half of the train, (closing the level crossings for approximately 2-3 minutes);
- crossing will be open for at least 10-15 minutes;
- locomotives will return to Morandoo Sidings (closure of 2-3 minutes),
- crossing will be open for at least 10-15 minutes;
- locomotives will pull in the second half (closure of 2-3 minutes); and
- after the train has been loaded (which could take up to 5 hours, during which the crossing will be open), the train will be reformed within the Mayfield site and the whole train shunted back out again (shunting manoeuvres are expected to close the crossings for approximately 5-6 minutes).

Queues will build up during these closures; however, the gap between closures is expected to be in excess of 10 to 15 minutes, which will allow the queue to dissipate before the next closure occurs. As a worst case scenario, a maximum closure time of 6 minutes has been assumed and tested.

The redevelopment is expected to generate a total of 71 truck movements per day time hour and 214 truck movements per peak hour. Of the AM and PM peak hour truck movements, 121 and 69 respectively are assumed to use the Ingall Street / Industrial Drive intersection, while 29 truck movements are assumed to use the George Street / Industrial Drive intersection in the AM peak hour and 16 truck movements in the PM peak hour. This is based on the initial assumption that the Container Terminal truck traffic will use the Ingall Street intersection, which is a worst case scenario for the new western crossing.

As a worst case scenario for the Selwyn Street crossing, it was re-analysed with the link road in place and the Container Terminal truck traffic using the George Street intersection. The impact on the western crossing would be greatly reduced as the traffic volume is greatly reduced by redirection of the Container Terminal truck traffic.

Table 4-33 shows the resulting number of trucks per minute at each intersection during the peak hours and associated queue lengths assuming the rail crossings are blocked for a maximum of 6 minutes and a standard truck length of 12.5m.

Table 4-33: Rail Crossing Queue Lengths

Intersection	Truck Movements per peak hour	Truck Movements per minute [1]	Queue length (trucks)	Queue length (m)
New western crossing AM peak hour	121	2	12	150
New western crossing PM peak hour	69	2	12	150
Selwyn Street AM peak hour	29	1	6	75
Selwyn Street PM peak hour	16	1	6	75
Selwyn Street AM peak hour (with link road)	144	3	18	225
Selwyn Street PM peak hour (with link road)	82	2	12	150

Source: AECOM, 2010

[1] Truck movements per minute are rounded up to the nearest whole truck.

From the above table the maximum queue length at the Selwyn Street and western crossings are expected to be 75m and 150m respectively, although the queue length at Selwyn Street would increase to 225m if a link road was introduced. On the basis of this analysis the closing of the rail crossings is not expected to have an impact on the George Street / Industrial Drive intersection and Ingall Street / Industrial Drive intersection in either peak hour as they are 600m and 750m from the rail crossings respectively, as seen in **Figure 4-6**.

Queuing within the site will need to be managed within the internal road network. Traffic planning for the proposed Intertrade Industrial Park will also need to be cognisant of queuing traffic from the level crossings in terms of access in and out of this site. This may be managed through road markings, lane widening to accommodate truck queues or active traffic management.

Figure 4-6: Rail Crossing and Distance from Intersections

Source: AECOM, 2009

4.4.5 Rail Network

Rail Impacts

This section should be read in conjunction with **Section 4.3.3** and **Table 4.19**.

The increase in container freight operations to 1 million TEU under the final operations condition (2034) requires the addition of 1.3 additional freight trains per day into the port. The total number of trains now entering the sidings will be 4.4 trains per day. This means that the sidings will be occupied for 21 hours of each day.

There is an increased risk that, due to the curfew on the Main North line, trains will stack up at the port. A likely scenario is that a train arrives before the morning curfew (7am) and enters the sidings. A second arrives 4 hours later (11am) and holds for 2 hours waiting to enter the sidings. A third then arrives 4 hours later (3pm) and holds for 2 hours waiting to enter the sidings. This last train of the day will load up and leave after the curfew.

Once the Northern Sydney Freight Corridor (NSFC) is in operation, this will no longer be an issue, as trains can be timetabled to arrive at the correct time of day for entry into the port without holding on the Morandoo Siding.

It is worth noting that the NSFC is currently being implemented, therefore it is likely that this project will be in place before the port facility reaches the 1 million TEU case in 2034.

Rail Mode Share Sensitivity Testing

It is assumed for the purposes of the 2034 case that the NSFC has been built. The number of trains able to access the port becomes (to all intents and purposes) unrestricted, and train lengths improve up to the limit of the siding space available in the Mayfield site. This is because the gradients on the Cowan Bank will be improved and the trains can be lengthened. This equates to a 12% increase in handling capacity per train.

The sensitivity test of the 1 million TEU per annum case is shown in **Table 4-34**. The numbers presented are trains per day based on the above assumptions. The base case of 4.4 trains has been improved to 3.9 trains due to the above 12% increase in handling capacity per train.

Table 4-34: 2034 Rail Mode Share Sensitivity Testing

1,000,000TEU (NSFC built)	Bulk 30% by Rail	Bulk 50% by Rail	Notes
Container 20% by Rail	3.9#	4.6	Intertrade Industrial Park required for 50% bulk.
Container 40% by Rail	6.9	7.5	Intertrade Industrial Park required. Will substantially affect delivery of coal to Port Waratah Loop, and grain to Bullock Island and Carrington. Large infrastructure investment required to accommodate.

This is the base case modelled scenario

All figures in the above table assume a 12% increase in handling capacity per train after completion of the NSFC

Source: AECOM, 2010

The base case for the 1 million TEU can be moved by rail after completion of the NSFC. However, it is clear that changing modal splits for freight demand associated with the 1 million TEU case presents significant difficulty for the rail infrastructure within the port site and for other local rail operators.

Increasing the container task to 40% and the bulk tasks to 50% of the demand would require substantial capital investment in the infrastructure side. Further study and discussions would be required in order to properly define the impacts to all local rail operators (Port Waratah, Bullock Island, Morandoo, OneSteel, and Carrington).

5.0 Summary and Conclusions

5.1 Introduction

AECOM has been engaged to provide input in regards to road and rail traffic for an Environmental Assessment of the Concept Plan for the proposed redevelopment of Newcastle Port Corporation (NPC) land in Mayfield, Newcastle over the next 25 years.

The proposed development consists of five precincts: General Purpose, Bulk Liquid, Bulk and General Purpose, Container and NPC Operations.

5.2 Road Network Impacts

5.2.1 Operational Traffic

It has been assumed that the proposed development will be accessed from the Industrial Drive / George Street and Industrial Drive / Ingall Street intersections.

Based on the expected trade forecasts and modal splits provided by NPC, the development as a whole is predicted to produce 148 truck movements and 60 vehicle (car) movements in the day time peak hour under the proposed initial operations (2024) and 214 truck movements and 90 vehicle (car) movements in the day time peak hour under the proposed final operations (2034). The breakdown of truck and vehicle movements per precinct is shown in **Table 5-1**.

Table 5-1: Truck and Car Movements per Precinct

Precinct	Truck movements per peak hour (daytime)		Car movements per peak hour (daytime)	
	Initial Operations (2024)	Final Operations (2034)	Initial Operations (2024)	Final Operations (2034)
Bulk and General	24	24	-	-
General Purpose	16	16	-	-
Container Terminal	99	165	-	-
Bulk Liquid	9	9	-	-
Employees	-	-	60	90
Total	**148**	**214**	**60**	**90**

Source: AECOM, 2010

The road access intersections have been initially assessed under four scenarios to determine the impact of the development generated traffic on the road network:

- Existing conditions (2008);
- Future conditions without development traffic (2024 and 2034);
- Future conditions with development traffic (2024) – Proposed initial operations; and
- Future conditions with development traffic (2034) – Proposed final operations.

Based on the concept plan, it was initially assumed that the Container Terminal Precinct and Bulk Liquid Precinct will be accessed via the Industrial Drive / Ingall Street intersection and the General Purpose Precinct, Bulk and General Precinct and NCP Operations Precinct will be accessed via the Industrial Drive / George Street intersection. However, initial analysis indicated that in the PM peak under the future 2024 scenario with development, the Industrial Drive / Ingall Street intersection did not perform satisfactorily (LOS F and a degree of saturation greater than 1). This was mainly due to the large number of vehicles from the Container Terminal Precinct predicted to use the Ingall Street / Industrial Drive intersection for access.

Therefore, it is recommended that a link road within or external to the site be created (in conjunction with a traffic management system) which allows traffic from the Container Terminal Precinct to be redirected to the Industrial Drive / George Street intersection which has additional capacity.

Table 5-2 and **Table 5-3** show a comparison of the intersection performances under different scenarios with the internal link road present, and the Container Terminal Precinct traffic using the Industrial Drive / George Street intersection.

Table 5-2: Industrial Drive / George Street Intersection – Scenario Analysis

Scenario		Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
AM Peak	Existing Conditions	2,152	B	0.722	19.9	151
	Future conditions without development (2024)	2,246	B	0.754	20.7	164
	Future conditions without development (2034)	2,304	B	0.773	21.3	172
	Future conditions with development (and link road) (2024)	2,608	B	0.823	23.9	198
	Future conditions with development (and link road) (2034)	2,756	B	0.845	25.5	213
PM Peak	Existing Conditions	2,244	B	0.748	22.6	154
	Future conditions without development (2024)	2,343	B	0.785	23.6	167
	Future conditions without development (2034)	2,404	B	0.800	24.3	175
	Future conditions with development (and link road) (2024)	2,706	B	0.851	27.8	201
	Future conditions with development (and link road) (2034)	2,848	C	0.871	29.9	217

Source: AECOM, 2010

The results indicate that while the initial and final operations development generated traffic has a slight impact in terms of DoS, average delay and queue length, the overall LOS in the AM and PM peaks remains acceptable at the Industrial Drive / George Street intersection.

Table 5-3: Industrial Drive / Ingall Street Intersection – Scenario Analysis

Scenario		Demand Flow (veh/h)	Level of Service	Deg of Satn (v/c)	Aver Delay (sec)	95% Back of Queue (m)
AM Peak	Existing Conditions	3,073	B	0.651	19.6	160
	Future conditions without development (2024)	3,208	B	0.708	19.7	166
	Future conditions without development (2034)	3,287	B	0.714	20.2	177
	Future conditions with development (and link road) (2024)	3,479	B	0.745	21.0	196
	Future conditions with development (and link road) (2034)	3,589	B	0.769	21.2	207
PM Peak	Existing Conditions	3,141	B	0.818	26.9	223
	Future conditions without development (2024)	3,280	C	0.873	30.9	268
	Future conditions without development (2034)	3,361	C	0.894	33.2	293
	Future conditions with development (and link road) (2024)	3,558	B	0.854	26.7	264
	Future conditions with development (and link road) (2034)	3,674	D	0.965	56.0	518

Source: AECOM, 2010

With an internal link road and Traffic Management Plan (TMP), the level of service remains at LOS B in the future 2024 AM peak scenario with proposed initial operations development traffic and in the 2034 AM peak scenario with proposed final operations. In the PM peak, the level of service is predicted to be LOS B in 2024 and to decline to LOS D in 2034 with proposed final operations and the intersection will operate close to capacity. This is satisfactory in terms of intersection performance; however, by introducing a TMP in the PM peak to divert employee traffic towards the George Street intersection, the intersection would perform with greater spare capacity.

While the above TMP allows the intersection to function satisfactorily, there may be other management options that would still allow the intersections to operate within satisfactory performance criteria. Precinct operators should not be prohibited from deviating from the above TMP, as long as they can demonstrate that the intersections operate satisfactorily under a different management option.

The volume of traffic predicted from the development has shown to be within the mid-block lane capacity of the surrounding road network and capacity exists to accommodate additional traffic generated by development of adjoining sites such as Intertrade Industrial Park that may occur in the future.

The truck queueing associated with operation of the railway crossings has also been demonstrated to be within the capacity of the local road network, although impacts on the local road network and access to adjoining properties in the Mayfield precinct will need to be managed.

5.2.2 Construction Traffic

The impact of construction traffic has not been assessed as part of this assessment due to details of the exact nature of the infrastructure required on site being unknown. However, it is anticipated that daily construction traffic would not exceed daily traffic predicted for the proposed 2024 initial operations, which are shown to be within the capacity of the access intersections and are not predicted to have a significant impact on the proximal road network.

Further detailed assessment should be dealt with as part of the future project applications for the construction and operation of the individual terminals/precincts, when these are made by the prospective operators of the facilities. Construction Management Plans should be implemented to ensure impact of construction traffic to the road network is limited.

5.3 Rail Network Impacts

Given the train loading and unloading times and based on the fact that there are 3.9 trains per day for final operations in 2034 (up to 1 million TEU of containers per annum) then sufficient time must be allowed for OneSteel trains to move in and out of their facility. As a result, there needs to be a minimum of two 520m sidings created within the port site.

The envisaged operation is that a maximum length of 766m train will be pulled into the site, and then broken into two and shunted into the two 520m sidings for loading and unloading. The train is then reformed after loading, in the same manner, before leaving via the new exit road to the Bullock Island Loop.

In this configuration the train can be pulled into the site and internal shunting manoeuvres can occur without unduly impacting on the Selwyn Street railway crossing or the new western road crossing of the railway line that will be required to service the Container Terminal Precinct and Bulk Liquid Precinct.

At the final operations scenario in 2034 (up to 1 million TEU per annum) and 3.9 trains per day, it may be necessary to use the Morandoo Siding to park a train while waiting for the above shunting and loading and unloading operations to be completed. As the use of this siding may temporarily block rail access to the OneSteel site, it is suggested that this should be discussed and agreed with OneSteel.

Alternatively the timeframe for reaching the final operations scenario may be such that the North Sydney Freight Corridor project has been completed and therefore the current curfew restrictions on the operation of the Main North Line would be removed. If so, this is likely to remove the need to use the Morandoo Siding to park a train.

At initial operations scenario in 2024 (up to 600,000 TEU of containers per annum) and 3 trains per day, similar infrastructure requirements to those described above will be required but there should be no need to block the Morandoo Arrival Road.

For the initial operations scenario in 2024 up to 2 trains per day can be handled at the port by trains exiting the site via a reverse manoeuvre back over the Selwyn Street level crossing and into the Morandoo Sidings (number 6 road). From there they would then leave in a forward direction via the Port Waratah Loop.

Once more than 2 trains per day are required, then it is likely than an exit road from the Mayfield site to the Bullock Island Loop will be required to allow more efficient operation of the train movements.

Constraints that exist are:

- OneSteel requires access to their facility, therefore the Morandoo Arrival Road and the OneSteel Arrival Road (number 13 road) need to be kept clear;
- Within the Morandoo Sidings the number 6 and 7 roads need to be connected via a new crossover so as to provide access to the OneSteel Arrival Road;
- Selwyn Street level crossing sits between the Morandoo siding and the site. The level crossing will be closed for only relatively short periods of time (5-6 minutes per train movement) while trains enter and exit the port. The design of the internal sidings means that this crossing will not be impacted by shunting manoeuvres. This crossing will likely need to become a full barrier as a minimum;
- The new western road crossing of the railway line that will be required to service the Container Terminal and Bulk Liquid Precincts may also require a suitable treatment to separate road and rail movements (OneSteel trains);

- The Main North Line operates under a freight train curfew during the peak hours. This means that running trains between Newcastle and Sydney needs to be carefully planned. It is quite possible that this curfew will cause path restrictions to Newcastle. This issue should be discussed with ARTC and RailCorp;
- This freight train curfew will be removed when the Main North Corridor Upgrade project is completed but this is likely to occur in a medium/longer term timeframe; and
- Use of the Morandoo Arrival Road will require a discussion to take place with Pacific National to ensure that the siding is available for use.

5.4 Conclusion

The likely future road network impacts are:

- Industrial Drive / George Street intersection appears to operate satisfactorily in the future under both initial (600,000 TEU per annum) and final operations development (1 million TEU per annum) scenarios;
- Industrial Drive / Ingall Street intersection is likely to exceed capacity in the PM peak hour under the proposed initial operations development scenario (2024), while operating satisfactorily in the AM peak hour;
- Industrial Drive / Ingall Street intersection appears to operate satisfactorily in the future under initial and final operation development scenarios (2024 and 2034) if an internal link road between the precincts and a Traffic Management Plan (TMP) is implemented to channel more traffic to the Industrial / George Street intersection which has available capacity.

These conclusions are based on the assumptions on trip generation, distribution and assignment available at the concept plan phase. These assumptions can be reviewed to test their appropriateness at the more detailed project application phase once more detailed information is available.

The majority of thel impact on the Ingall Street intersection is due to all of the Container Terminal traffic using the intersection for access. It is recommended that a link road in the internal or external road network be introduced to enable this traffic to be redirected to the George Street intersection, allowing use of the available road capacity. It is recommended that a TMP is developed for the entire site to ensure that this distribution is enforced. Alternative management options may also be viable provided that it can be demonstrated that the intersections can still operate satisfactorily.

The volume of traffic from the proposed Concept Plan is predicted to be within the mid-block capacity of the local road network. The truck queueing associated with operation of the railway crossings has also been demonstrated to be within the capacity of the local road network, although impacts on the local road network and access to adjoining properties in the Mayfield precinct will need to be managed.

It is recommended that as part of detailed project applications, precinct operators should be required to assess the impact of heavy goods vehicles on the road pavement condition of the local road network and confirm that the types of vehicles proposed for use can be accommodated with the road geometry.

Workplace Travel Plans should be considered in the future project applications for the individual terminals/precincts, when these are made by the prospective operators of the facilities, with attention given to access by walking, cycling and public transport. This would reduce the impact made by employee traffic.

The likely future rail impacts are:

- Two new 520m rail sidings will be required in the port separated to allow reach stacker movement either side of wagons and the sidings need to be connected at both ends to allow shunt manoeuvres (initial operations);
- A new crossover to be installed between number 6 and 7 roads in the Morandoo Sidings (required for initial operations);
- The existing OneSteel siding may need to be re-signalled to allow multiple train movements (required for initial operations);
- The Selwyn Street railway crossing will need to be assessed for treatment to separate rail and road movements, although a full barrier will likely be required (required for initial operations);

- The new western road crossing of the railway line that will be required to service the Container Terminal and Bulk Liquid Precincts may also require a suitable treatment to separate road and rail movements (required for initial operations);
- It is likely that an exit road from the Mayfield site onto the Bullock Island Loop will be required once more than 2 trains per day can be run.

There is no impact to the current operation of the Port Waratah rail facilities, or to OneSteel, in the initial operations scenario (600,000 TEU per annum), and minor impacts to OneSteel in the final operations scenario (1 million TEU per annum). These impacts can be overcome by agreeing a timetable of operation within the Morandoo Siding and OneSteel Arrival Road, and no further infrastructure is likely to be required.

Should there be changes to the modal splits for freight demand beyond the base cases that have been modelled then further assessment of the rail impacts will be required and further upgrades to rail infrastructure within the Mayfield site and on the local rail network would in all likelihood be required.