5.3 Proposed Initial Operations (2024)

5.3.1 Precinct Trade Forecast and Likely Landside Modal Split

Table 5.2 shows the proposed initial operations for each precinct, as well as the proposed landside transportation modes.

Table 5.2: 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, 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 Stage 1 of the North Sydney Freight Corridor project is completed (expected in 2015);
- There is limited landside area available at the site to support the number of rail sidings and/or the ideal length of rail sidings needed to allow for a significantly higher proportion of cargo movement by rail. This could change in the future once an exit road to the Bullock Island loop is developed and gantries are introduced for loading/unloading of cargo rather than reach stackers. This could also change 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.

5.3.2 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 5.2**. Loading assumptions for road vehicles are summarised in **Table 5.3** and are based on previous work undertaken for Port Kembla and Port Botany.

Table 5.3: Average Loading Assumptions

Per Truck	Unit	Quantity
Bulk	Tonnes	35
General Cargo	Tonnes	25
Containers	TEU	1.8
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 5.4 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 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 5.2**. 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 5.4: 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	266,667	731	37	73	110
Bulk Liquid	20,481	56	3	6	9
Total	**386,719**	**1,060**	**53**	**106**	**159**

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 day, 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 in order to encourage access by walking, cycling and public transport. Any future road infrastructure should consider pedestrians and cyclists by incorporating appropriate facilities for these users.

Table 5.5 summarises the employee vehicles movements associated with the development in 2024.

Table 5.5: Proposed Initial Operations (2024) Employee Movements

Employees per day	Employee vehicles during daytime	AM Peak Hour Vehicle Movements		PM Peak Hour Vehicle Movements	
		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. [6] The same directional split has been assumed for vehicles exiting the site in both peak hours.

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.

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 5.6 through **Table 5.9** show the peak hour truck and vehicle movements associated with the proposed concept at both intersections in 2024. These are shown graphically in **Figure 5.2**.

Table 5.6: 2024 AM Peak Hour Development Trips – Industrial Drive / Ingall Street Intersection

Precinct	In		Out	
	North	South	North	South
Container Terminal (HGV)	61	15	26	7
Bulk Liquid (HGV)	5	1	2	1
Employees (LV)	24	6	0	0
Total (HGV)	**66**	**16**	**28**	**7**
Total (LV)	**24**	**6**	**0**	**0**

Source: AECOM, 2010

Table 5.7: 2024 PM Peak Hour Development Trips – Industrial Drive / Ingall Street Intersection

Precinct	In		Out	
	North	South	North	South
Container Terminal (HGV)	35	9	53	13
Bulk Liquid (HGV)	3	1	4	1
Employees (LV)	0	0	24	6
Total (HGV)	**38**	**10**	**57**	**14**
Total (LV)	**0**	**0**	**24**	**6**

Source: AECOM, 2010

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

Table 5.8: 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 5.9:2024 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

Due to the proposed concept plan configuration, there is a greater impact on the Ingall Street intersection due to the initial assumption that all container terminal HGV traffic will be using this intersection.

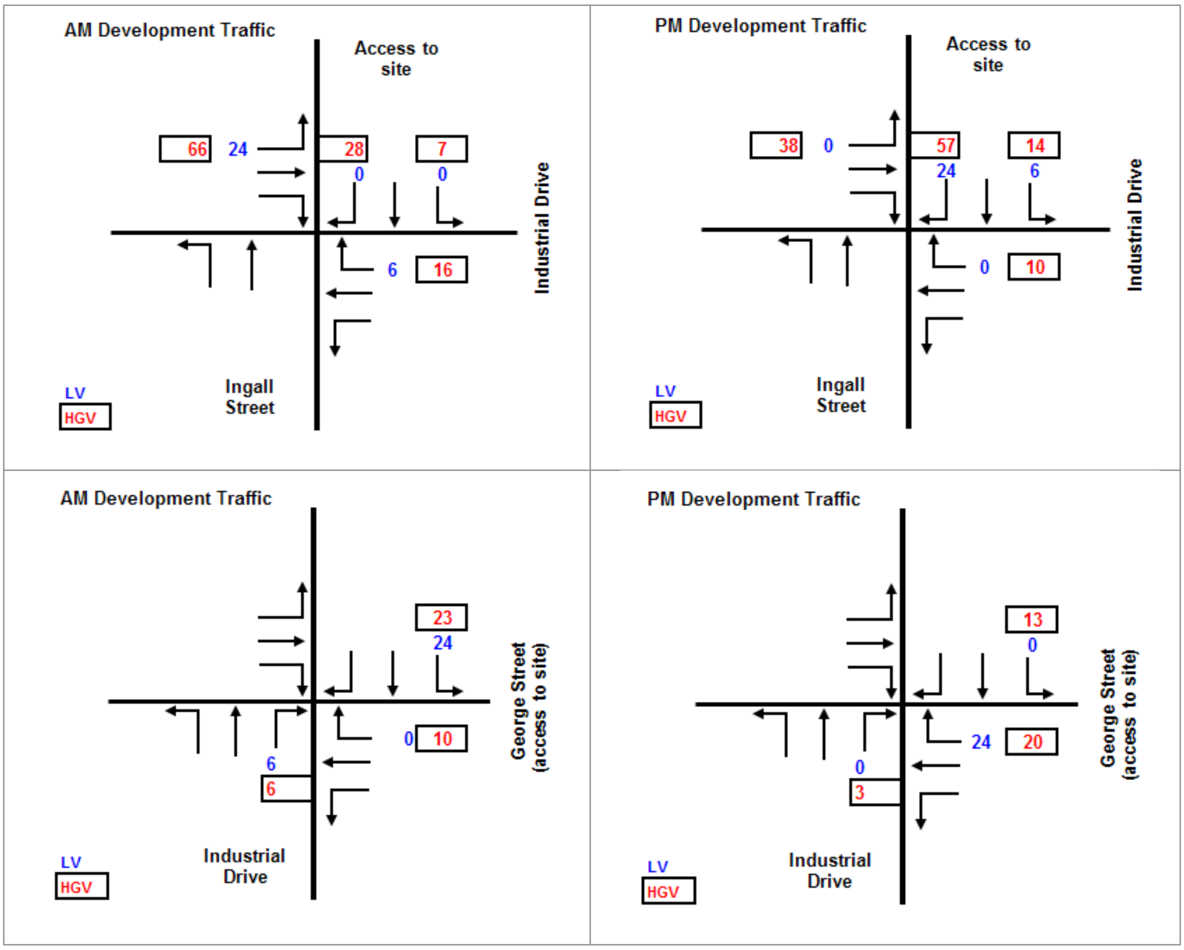

Figure 5.2: 2024 Peak Hour Development Traffic

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 159 truck movements and 60 vehicle movements in the peak hours, based on the likely modal split indicated in **Table 5.2**, and shown in **Table 5.4** and **Table 5.5**.

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 proposed precinct layout and the assumed internal road network and hence the Container Terminal Precinct traffic, which makes up approximately 69% 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 5.10** and **Table 5.11**.

Table 5.10: 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)	1,444	B	0.548	14.9	178
George St (E)	64	E	0.139	62.4	26
Industrial Drive (N Leg)	2,306	B	0.870	18.5	424
George St (W)	152	F	0.522	70.5	59
All Vehicles	**3,966**	**B**	**0.870**	**19.9**	**424**

Source: AECOM, 2010

Table 5.11: 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)	1,953	B	0.861	24.8	362
George St (E)	111	D	0.268	54.2	39
Industrial Drive (N Leg)	1,926	B	0.840	21.6	330
George St (W)	92	D	0.195	54.4	27
All Vehicles	**4,082**	**B**	**0.861**	**24.8**	**361**

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 13% and 14% spare capacity in the AM and PM peak hours respectively. If an internal or external road was introduced 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 5.12** and **Table 5.13**.

Table 5.12: 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)	1,460	B	0.600	15.8	178
George St (E)	91	E	0.363	68.3	49
Industrial Drive (N Leg)	2,367	B	0.870	18.8	424
George St (W)	152	F	0.522	70.5	59
All Vehicles	**4,070**	**B**	**0.870**	**20.8**	**424**

Source: AECOM, 2010

Table 5.13: 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)	1,962	B	0.861	25.1	362
George St (E)	164	E	0.604	60.0	93
Industrial Drive (N Leg)	1,961	B	0.840	21.6	330
George St (W)	92	D	0.195	54.4	27
All Vehicles	**4,179**	**B**	**0.861**	**25.5**	**361**

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 5.14** and **Table 5.15**.

Table 5.14: 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)	192	D	0.442	46.1	57
Industrial Drive (E Leg)	1,416	C	0.942	34.2	226
Ingall St (N Leg)	162	E	0.925	64.3	93
Industrial Drive (W Leg)	2,252	C	0.925	42.4	465
All Vehicles	**4,022**	**C**	**0.942**	**40.6**	**465**

Source: AECOM, 2010

Table 5.15: 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)	208	D	0.655	48.0	91
Industrial Drive (E Leg)	1,913	F	1.107	270.9	1,199
Ingall St (N Leg)	334	F	1.088	202.1	395
Industrial Drive (W Leg)	1,656	E	1.000	56.6	431
All Vehicles	**4,111**	**F**	**1.107**	**167.7**	**1,199**

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 C but close to capacity (DoS 0.94), however it is not likely to operate satisfactorily in the PM peak at LOS F and a DOS of 1.107. 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. This scenario has been tested and analysis shows that the intersection will perform more efficiently with the redistribution of trucks however, the intersection will continue to perform at capacity (DoS 1.057) and at LOS F in the PM peak hour.

Therefore a further recommended mitigation measure, in addition to the link road, to alleviate the impact of the development on the Ingall Street intersection, is to convert the left turn lane of the southern approach on Ingall Street into an unsignalised slip lane. Based on a review of aerial photography there appears to be sufficient land area available to accommodate the slip lane although further investigation would be required to confirm the current road reserve boundary and adjoining land ownership details. This results in increased efficiency of the right turn from the Ingall Street northern approach as the right turn movement would now be unopposed. This mitigation measure is considered necessary more so in the PM peak when a higher volume of right turning traffic travelling north is experienced. This is shown in **Figure 5.3**.

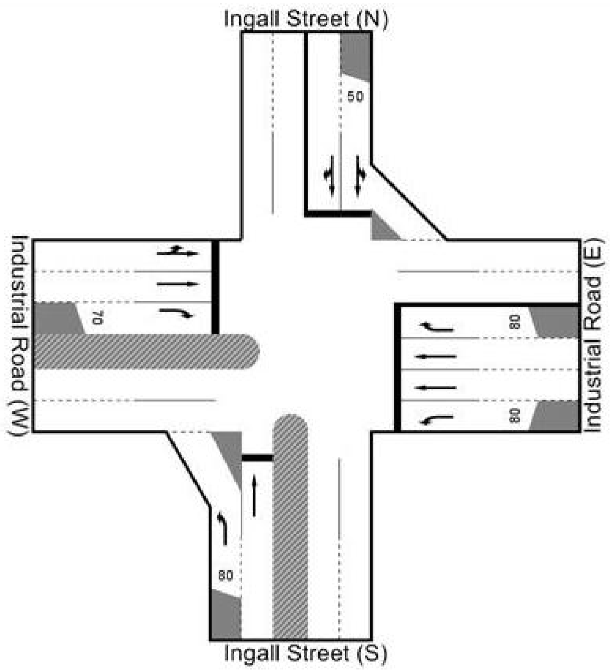

Figure 5.3: Industrial Drive / Ingall Street Schematic Layout of Left Slip Mitigation Measure

Source: AECOM, 2010

With the two mitigation measures implemented, the Ingall Street / Industrial Drive intersection is likely to operate at LOS B and C in the AM and PM peaks respectively, as shown in **Table 5.16** and **Table 5.17**.

Table 5.16: 2024 AM Peak Intersection Performance, Industrial Drive / Ingall Street – with development traffic and link road and mitigation measure

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)	192	B	0.355	24.4	29
Industrial Drive (E Leg)	1,401	B	0.740	22.5	176
Ingall St (N Leg)	130	D	0.726	45.2	44
Industrial Drive (W Leg)	2,191	B	0.803	17.6	234
All Vehicles	**3,914**	**B**	**0.803**	**20.6**	**234**

Source: AECOM, 2010

Table 5.17: 2024 PM Peak Intersection Performance, Industrial Drive / Ingall Street – with development traffic and link road and mitigation measure

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)	208	C	0.420	32.4	64
Industrial Drive (E Leg)	1,904	D	0.936	49.1	459
Ingall St (N Leg)	268	E	0.898	63.9	100
Industrial Drive (W Leg)	1,621	B	0.898	27.6	198
All Vehicles	**4,001**	**C**	**0.936**	**40.5**	**459**

Source: AECOM, 2010

5.3.3 Rail Network

Rail Access

Use of the Main North Line 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. There is likely to be significant competition for the limited number of available train paths between passenger and freight services. Substantial investments have been made into the upgrade of the North Coast Rail Line to support Intercity Freight movements, and any additional capacity created will require additional paths on the Main North between Sydney and Newcastle. This is one of the primary drivers for the Northern Sydney Freight Corridor Project.

Of the available 4 train paths per day, there 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. Theoretically this could 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 Line.

North Sydney Freight Corridor Project

In the long term, the Northern Sydney Freight Corridor (NSFC) project will create a significant number of additional train paths per day, independent of the Metropolitan Passenger Network. Access to Sydney would then be made easier.

The NSFC project has been designed to resolve the constraints between Strathfield in Sydney and Broadmeadow in Newcastle. It will contribute to a more efficient freight rail network, connecting Australia's three largest cities on the east coast by;

- Relieving the most serious bottleneck on the east coast interstate rail network;
- Improving freight train access through northern Sydney to the metropolitan freight network, Port Botany and intermodal (container) terminals;
- Reducing freight transport operating costs;
- Easing peak hour restrictions on freight services;
- Improving reliability of passenger services on the Main North Line;

Due to its size the NSFC project will be delivered in three stages with each stage representing the least investment required to achieve a step increase in rail freight capacity.

The NSW Government has recognised the NSFC project as a priority transport project and has sought federal funding for its implementation through a recent Updated Submission to Infrastructure Australia dated July 2010. Key details of the NSFC project are summarised in **Table 5-18** below.

Table 5-18: Summary of North Sydney Freight Corridor Project

Project Staging & Status	Summary of Proposed Works	Estimated Increase in Capacity	Estimated Timing	Estimated Cost
Stage 1 – Ready to Proceed	Signalling enhancements; Passing loops at Hexham, Islington and Gosford North; 3rd track Epping to Thornleigh; Rail underpass at North Stathfield.	Increase from 16 to 26 freight trains per day (each way) Sufficient to meet anticipated capacity thru till 2021.	2015	$1,234 million
Stage 2 - Threshold	Signalling enhancements; Hornsby freight bypass; 3rd track Rhodes to West Ryde; 3rd track Thornleigh to Hornsby; 3rd track Berowra to Hawkesbury River	Increase in freight capacity by a further 50% over Stage 1. Sufficient to meet anticipated capacity thru till 2030.	2018	$3.447 million
Stage 3 - Threshold	Signalling enhancements; Passing loops at Wyong; 4th track North Strathfield to Epping, 4th track Epping to Hornsby; 3rd track Hornsby to Berowra Modify train turnaround at Epping; Strathfield Junction passenger underpass.	Sufficient to meet anticipated capacity beyond 2038.	2024	$3.252 million

It is noted that the forecast freight demand in the Infrastructure Australia Updated Submission did not make any allowance for rail freight transport from the Port of Newcastle until 2020. This assumption was based on outdated information which has since been superseded by the Concept Plan application.

Based on the information detailed above it seems that there is reasonable alignment between the proposed timetable for implementation of the NSFC project and the timeframe for development of the Concept Plan over the period through to 2034. The following points are noted:

- Stage 1 of the NSFC project is anticipated for completion by 2015 which is within the early stages of anticipated development of the Concept Plan;
- Stage 2 of the NFSC project is anticipated for completion by 2018 which is well before the Concept Plan initial operations scenario is to be reached in 2024;
- Stage 3 of the NFSC project is anticipated for completion by 2024 which is well before the Concept Plan final operations scenario is to be reached in 2034.

On this basis the key issue in relation to capacity of the regional rail network will be the potential development of the Concept Plan in the short/medium term ie. prior to anticipated completion of Stage 1 of the NSFC project in 2015. In this period there will continue to be limited freight train paths available on the Main North Line to service the port. It is worth noting that Stage 1 of the NFSC Project is also planned to accommodate the increase in traffic expected on the Inter-city route.

As a result there may need to be a greater reliance on road transport in this initial period of the Concept Plan to move goods to/from the port while Stage 1 of the NSFC is completed. It should be noted that during this period (prior to 2015) container freight volumes associated with the Concept Plan should be limited. After this date there should be no significant impediment on the regional rail network to achieving the forecast modal split to rail (20%) or possibly to exceed it over time.

It is appropriate for there to be on-going discussions between NPC, Transport NSW, ARTC and RailCorp to ensure that the staging of the NSFC is aligned as far as practicable with the anticipated development of the portside land at Mayfield over the timeframe of the Concept Plan.

One factor that might create additional short term rail capacity for the port is the fact that much of the goods exported from the Hunter region are taken to Botany by train (Wool, wine etc). These goods are therefore using up train paths that could be freed up by the development of the port side land at Mayfield and the export of this regional product through Newcastle Port rather than Port Botany. This would potentially free up some capacity on the Main North Line for other freight to be hauled to Sydney.

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 5.2.** 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, the rail sidings that can initially be created or be of limited length and therefore 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 rail freight services between Newcastle and Sydney (not including Inter-city services) is a 1,244m freight train consisting of 2 x 600m wagon rakes and 2 locomotives. However, given the limited number and length of rail sidings that can be created within the port land ,this length of train is not actually achievable to service the port in the short term. 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).

- 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).

[7] Based on existing trade movement at Port Botany. This number fluctuates during the year from 58 percent in one direction to 45 percent in the other.

- 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 5.4 provides a visual representation of the potential train operation. This shows that two sidings of around 520m length can be accommodated within the site in the limited area available between the new western rail crossing and the curvature of the rail line to the east.

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.

This is by no means the most efficient operation for a train. A loop arrangement where the locomotives are never detached would be ideal, however the site is not configured to allow this to happen.

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 more efficiently with the increase in train operations.

This will allow trains leaving the port to leave without having to make the reversing move back to the number 6 road in the Morandoo Sidings. By developing the exit road there is also the potential for the 520m rail sidings to be extended in length thereby allowing larger trains to service the port.

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.

Developing the exit road 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 if required 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. It should be noted that the need to hold a train in the Morandoo Sidings is not a likely scenario given the limited number of trains expected to service the port during initial operations (2024) and therefore train movements should be able to be scheduled to avoid this scenario.
- 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;
- In the short-medium term this may result in additional road traffic being generated by the Concept Plan until such time as Stage 1 of the NSFC project is completed (expected in 2015). This freight train curfew will be removed when the NSFC 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.

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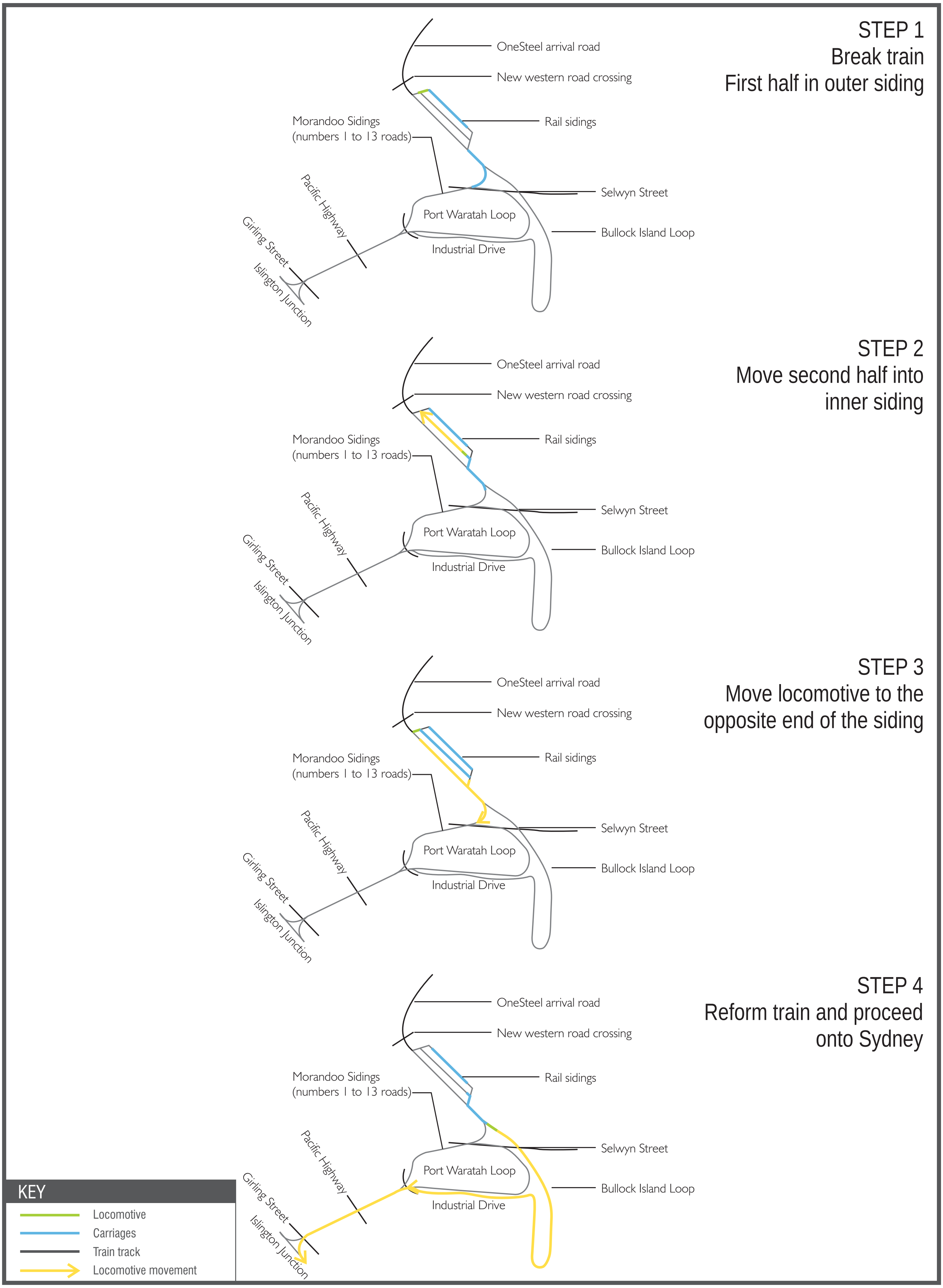

AECOM

TRAIN MOVEMENTS

Transport Assessment

Mayfield Site Port-Related Activities Concept Plan

Figure 5-4

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Rail Mode Share Sensitivity Testing

This sensitivity analysis will be based on testing the percentage road and rail mode shares as proposed in **Table 5.2.**

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 5.19** 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 30% and 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 5.19: 2024 Rail Mode Share Sensitivity Testing

Containers 600,000 TEU	Bulk 30% By Rail	Bulk 50% by Rail	Notes
Container 20% by Rail	3.1#	3.8	Exit road to Bullock Island loop required but no other new infrastructure required within the port. First stage of NSFC project would be required for 50% bulk.
Container 30% by Rail	4.1	4.8	Exit road to Bullock Island loop required. Additional and/or longer sidings required, gantries possibly required. First stage of NSFC project would be required.
Container 40% by Rail	5.1	5.8	Exit road to Bullock Island loop required. Additional and/or longer sidings required, gantries possibly required. First and possibly second stage of NSFC project would be 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.

After the new exit road to the Bullock Island loop is constructed, it will also be possible to lengthen the 520m sidings and thereby increase the size of trains that can service the port. This is a desirable outcome which improves the efficiency of port operations and should be pursued as soon as possible once the new exit road is constructed.

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 but would also require further investigation.

In conclusion, servicing the required number of trains per day would likely require construction of the first stage of the NSFC project, and would trigger the need for additional and/or longer rail sidings in the port area to be built, to assist with the freight. Alternatively more freight could be handled by road in the short/medium term until Stage 1 of the NSFC project is completed in 2015. There should be adequate capacity on the road network to handle an increase in traffic from the port over such a timeframe.

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

5.4 Proposed Final Operations (2034)

5.4.1 Precinct Trade Forecast and Likely Landside Modal Split

Table 5.20 shows the final operations for the proposed concept for each precinct within the site, as well as the likely landside transportation modes. The differences between the final and initial operations are 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 5.20: 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

Precinct	Trade and Type	Approximate Volume	Likely Landside Transport Requirements
	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 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 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 cargo;
- 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 Stage 1 of the North Sydney Freight Corridor project is completed (expected in 2015);
- There is limited landside area available at the site to support the number of rail sidings and/or the ideal length of rail sidings needed to allow for a significantly higher proportion of cargo movement by rail. This could change in the future once an exit road to the Bullock Island loop is developed and gantries are introduced for loading/unloading of cargo rather than reach stackers. This could also change 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 5.21 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 159 to 232 per peak hour. Employee movements have increased from 60 to 90 per peak hour as shown in **Table 5.21**.

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.

In addition to this, the intersection upgrade required in 2024 at the Ingall Street intersection to accommodate port generated traffic (left turn slip lane on the southern leg), has also been carried forward for this assessment.

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 5.21: 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	444,444	1,218	61	122	183
Bulk Liquid	20,481	56	3	6	9
Total	**564,496**	**1,547**	**77**	**155**	**232**

Source: AECOM, 2010

Table 5.22: Proposed Final Operations (2034) Employee Vehicle Movements

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

Source: AECOM, 2010

Table 5.23 through Table 5.26 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 5.5**.

Table 5.23: 2034 AM Peak Hour Development Trips – Industrial Drive / Ingall Street Intersection – with link road and slip lane

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 5.24: 2034 PM Peak Hour Development Trips – Industrial Drive / Ingall Street Intersection – with link road and slip lane

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 5.25: 2034 AM Peak Hour Development Trips – Industrial Drive / George Street Intersection – with link road

Precinct	In		Out	
	North	South	North	South
Container Terminal (HGV)	102	26	44	-
Bulk and General (HGV)	14	3	6	-
General Purpose (HGV)	9	3	4	-
Employees (LV)	36	9	0	
Total (HGV)	**125**	**32**	**54**	**-**
Total (LV)	**36**	**9**	**0**	**-**

Source: AECOM, 2010

Table 5.26: 2034 PM Peak Hour Development Trips – Industrial Drive / George Street Intersection – with link road

Precinct	In		Out	
	North	South	North	South
Container Terminal (HGV)	58	15	88	-
Bulk and General (HGV)	8	2	12	-
General Purpose (HGV)	5	1	8	-
Employees (LV)	0	0	36	
Total (HGV)	**71**	**18**	**108**	**-**
Total (LV)	**0**	**0**	**36**	**-**

Source: AECOM, 2010

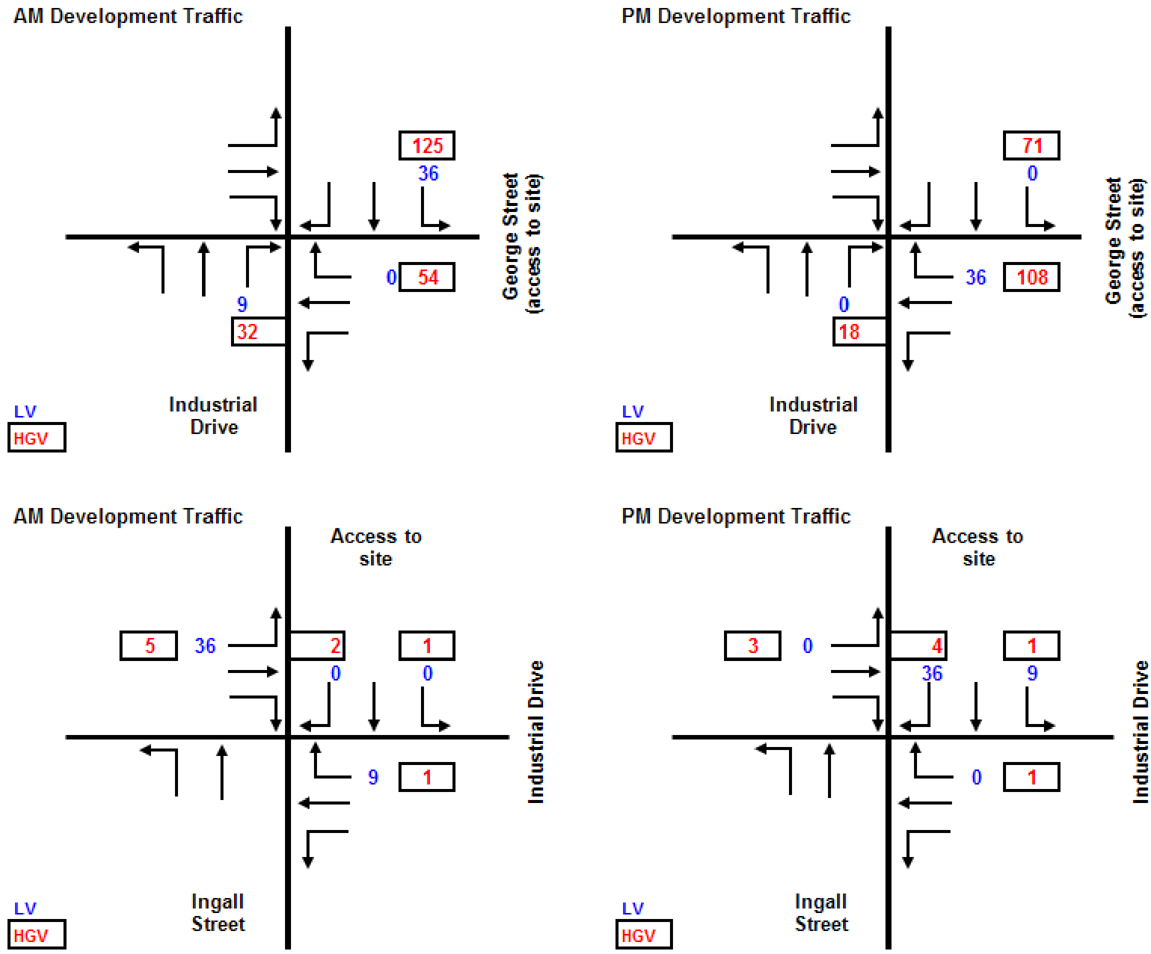

Figure 5.5: 2034 Peak Hour Development Trips – with link road

Source: AECOM, 2010

Road Impacts

It is expected that the proposed concept will generate 232 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 2024 with development scenario intersection 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 internal road link are shown in **Table 5.27** and **Table 5.28**.

Table 5.27: 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)	1,622	B	0.806	16.7	207
George St (E)	114	F	0.570	77.5	73
Industrial Drive (N Leg)	2,656	C	0.933	32.6	642
George St (W)	168	F	0.634	77.7	69
All Vehicles	**4,560**	**C**	**0.933**	**29.7**	**642**

Source: AECOM, 2010

Table 5.28: 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)	2,173	C	0.905	31.8	525
George St (E)	217	F	0.883	87.1	183
Industrial Drive (N Leg)	2,184	B	0.881	25.4	465
George St (W)	102	E	0.222	64.1	37
All Vehicles	**4,676**	**C**	**0.905**	**32.1**	**525**

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 C in the AM and PM peak hours. 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 and slip lane

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 5.29** and **Table 5.30**.

Table 5.29: 2034 AM Peak Intersection Performance, Industrial Drive / Ingall Street – with development traffic, link road and slip lane

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)	213	C	0.395	28.5	38
Industrial Drive (E Leg)	1,551	C	0.849	33.7	258
Ingall St (N Leg)	141	D	0.842	53.0	52
Industrial Drive (W Leg)	2,429	B	0.857	22.4	320
All Vehicles	**4,334**	**B**	**0.861**	**27.7**	**320**

Source: AECOM, 2010

Table 5.30: 2034 PM Peak Intersection Performance, Industrial Drive / Ingall Street – with development traffic, link road and slip lane

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)	229	D	0.606	48.0	89
Industrial Drive (E Leg)	2,102	F	1.002	106.9	865
Ingall St (N Leg)	308	F	0.989	112.7	174
Industrial Drive (W Leg)	1,790	C	1.000	33.2	321
All Vehicles	**4,429**	**F**	**1.002**	**74.4**	**865**

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 at capacity and at LOS F.

A proposed mitigation measure to reduce the impact of the proposed development in 2034 on the Ingall Street intersection is to provide an additional short right turn lane of 50m from the Ingall Street northern approach; hence have double right turns out of Ingall Street (north) onto Industrial Drive. Based on a review of aerial photography there appears to be sufficient land area available to accommodate the second right turn lane although further investigation would be required to confirm the current road reserve boundary and adjoining land ownership details This is shown in **Figure 5.6**.

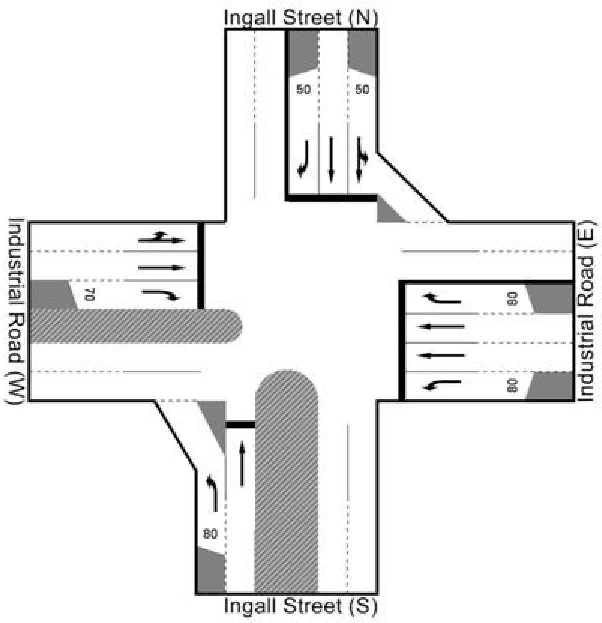

Figure 5.6: Industrial Drive / Ingall Street Schematic Layout of Right Turn Mitigation Measure

Source: AECOM, 2010

The intersection performance results with the mitigation measure implemented are shown in **Table 5.31** and **Table 5.32.**

Table 5.31: 2034 AM Peak Intersection Performance, Industrial Drive / Ingall Street – with link road slip lane and mitigation measure

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)	213	C	0.395	28.5	38
Industrial Drive (E Leg)	1,551	C	0.849	33.7	258
Ingall St (N Leg)	141	D	0.842	53.4	52
Industrial Drive (W Leg)	2,429	B	0.857	22.4	320
All Vehicles	**4,334**	**B**	**0.861**	**27.7**	**320**

Source: AECOM, 2010

Table 5.32: 2034 PM Peak Intersection Performance, Industrial Drive / Ingall Street – with link road slip lane and mitigation measure

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)	229	D	0.546	43.3	81
Industrial Drive (E Leg)	2,102	F	0.988	86.8	736
Ingall St (N Leg)	308	E	1.000	58.8	101
Industrial Drive (W Leg)	1,790	C	1.000	28.8	266
All Vehicles	**4,429**	**E**	**1.000**	**59.2**	**736**

Source: AECOM, 2010

With this intersection upgrade implemented, the intersection performs satisfactory at LOS B in the AM peak hour. However, the intersection continues to operate at capacity (DoS 1.000) and at a LOS E in the PM peak hour, although there is improvement in the average delay and queue length on all legs of the intersection.

To further reduce the impact of the proposed concept on the Ingall St intersection, diverting employee vehicles exiting the site in the PM peak hour to the George St. Intersection should be considered. The analysis in **Table 5.28** indicates that the Industrial Drive/George Street intersection has some limited spare capacity at this time and therefore this should be a viable option.

The results therefore suggest that by 2034 an upgrade to the strategic road network is required to provide additional capacity along Industrial Drive. This upgrade would be required regardless of port generated traffic in 2034 as the assessment results in 2034 without port generated traffic show that the intersection performs at LOS F and at DOS of 1.048 in the PM peak hour with a queue of almost one kilometre in length (see **Table 4.8**).

The RTA has advised that Industrial Drive is fully developed and no further upgrades are planned at this time. The existing road reserve for Industrial Drive has no provision for future widening except for a small parcel opposite the Tourle Street junction, therefore land acquisition and/or dedication of land as part of future developments would in all likelihood be needed to support future widenings.

It should be noted that the 2034 assessment is based on likely future development rates over a 20+ year design horizon and background traffic growth of 1% per annum. Future regional road upgrades, such as the Hunter Expressway (F3 – Branxton) and the F3 – Raymond Terrace may reduce some of the traffic on Industrial Drive. It is therefore recommended that the long term scenario be reassessed in the future as part of the detailed Project Applications and when more current traffic data becomes available.

5.4.2 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 5.7**. These are locations where the RTA has annual traffic volume data enabling a comparison to be made between scenarios with and without the proposed concept traffic.

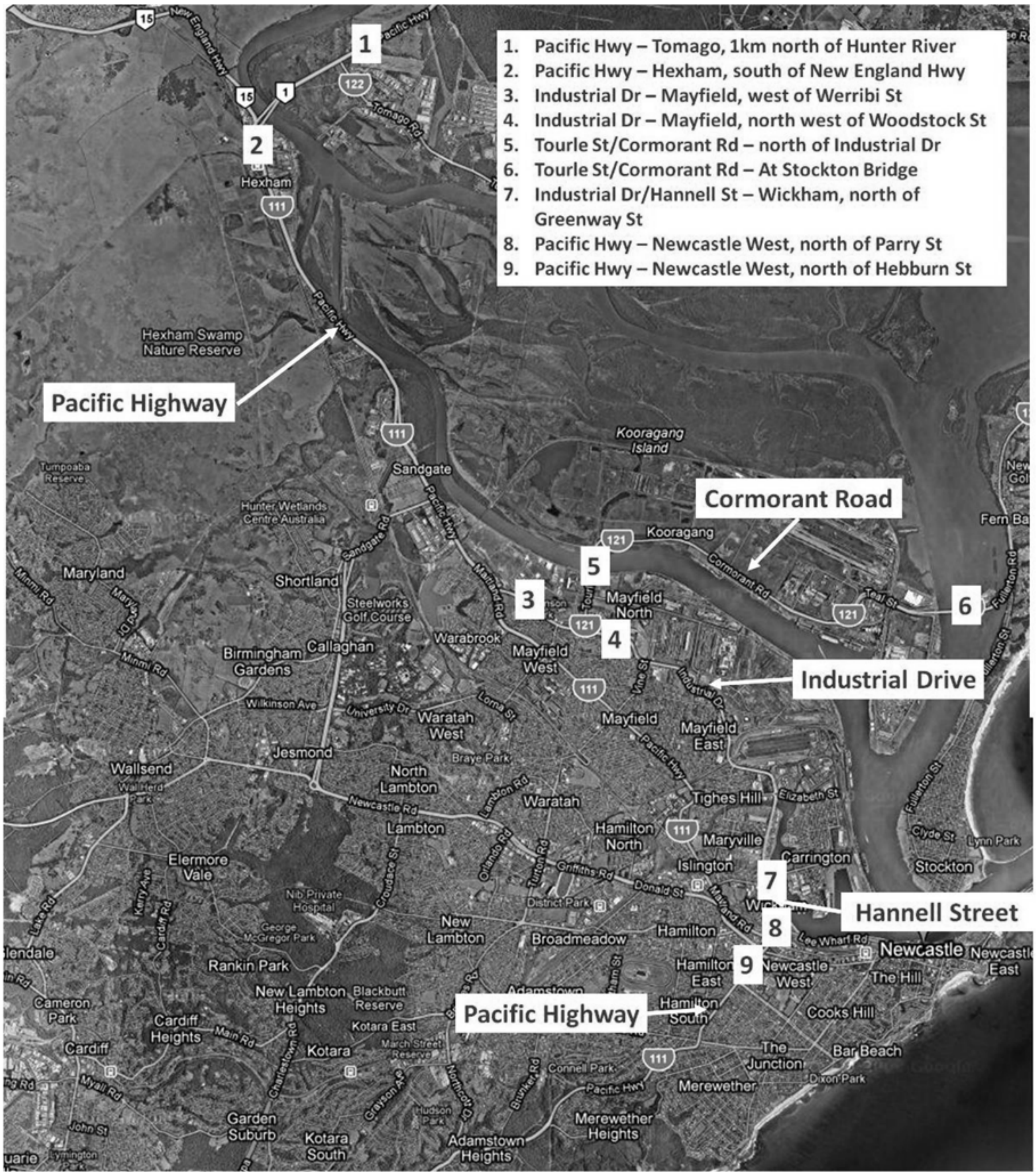

Figure 5.7: Broader Road Network Locations

Source: AECOM, 2009

The proposed concept is expected to generate 1,547 trucks per day (3,094 truck movements per day) and 300 employee vehicles per day (600 employee vehicle movements per day) when complete in 2034, as shown in **Table 5.21**. **Table 5.33** 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 RTA recommended growth rate of 1% on Industrial Drive and historical rates at the other count locations. 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 20% of traffic will access/egress Kooragang Island via Tourle Street and Cormorant Road.

Table 5.33: 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	1,182	1.2%
2	Pacific Highway	Hexham, south of New England Hwy	86,768	2,364	2.7%
3	Industrial Drive	Mayfield, west of Werribi Street	31,457	2,364	7.5%
4	Industrial Drive	Mayfield, north-west of Woodstock St	41,402	2,955	7.1%
5	Tourle St / Cormorant Rd	Mayfield, north of Industrial Drive	26,386	591	2.2%
6	Tourle St / Cormorant Rd	At Stockton Bridge	32,158	591	1.8%
7	Industrial Drive / Hannell St	Wickham, north of Greenway St	33,273	739	2.2%
8	Pacific Highway	Newcastle West, north of Parry St	43,737	739	1.7%
9	Pacific Highway	Newcastle West, north of Hebburn St	26,175	739	2.8%

Source: AECOM, 2010

The table indicates that the trucks and vehicles generated by the proposed concept would be a small proportion (<8%) of the AADT on the broader road network in 2034 and so is considered to have a minimal impact on the broader road network.

5.4.3 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 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 252 vehicles (162 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 64% HGV traffic composition 162 trucks out of 252 vehicles).

With minimal existing traffic on the local roads, 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 development of adjoining sites such as Intertrade Industrial Park that may occur in the future.

5.4.4 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. While the expected closure time for the new western crossing is only 2-3 minutes, as a worst case scenario, a maximum closure time of 6 minutes has been assumed and tested for both.

The redevelopment is expected to generate a total of 77 truck movements per day time hour and 232 truck movements per peak hour. Of the AM and PM peak hour truck movements, 134 and 76 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 5.34 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 an average truck length of 19 m.

Table 5.34: Rail Crossing Queue Lengths 2034

Intersection	Truck Movements per peak hour	Truck Movements per minute [1]	Queue length (trucks)	Queue length (m)
New western crossing AM peak hour	134	3	18	342
New western crossing PM peak hour	76	2	12	228
Selwyn Street AM peak hour	29	1	6	114
Selwyn Street PM peak hour	16	1	6	114
New western crossing AM peak hour (wtih link road)	7	1	6	114
New western crossing PM peak hour (with link road)	3	1	6	114
Selwyn Street AM peak hour (with link road)	156	3	18	342
Selwyn Street PM peak hour (with link road)	89	2	12	228

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 with no link road in place are expected to be 114m and 342m respectively. With a link road in place the maximum queue length at Selwyn Street would increase to 342m and the queue length at the western crossing would reduce to 114m. 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 5.8**.

Please note that the queue length assessment for the western crossing is conservative as it is estimated that this crossing will only be closed for a maximum of 3 minutes at a time whereas a maximum closure time of 6 minutes has been assumed as a worst case scenario (as per the Selwyn Street crossing).

Queuing within the site will need to be managed within the internal road network. As the Concept Plan operations ramp up over time and both truck and rail traffic is increase it is likely that grade separation of at least one rail crossing will be required to ensure that truck queuing does not unduly impinge on the efficiency of port operations. It is suggested that monitoring of tuck traffic generated by the port, truck queuing and intersection performance at regular intervals (e.g. every 3-4 years) during the period of the concept plan will guide details of when grade separation works will be required.

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 5.8: Rail Crossing and Distance from Intersections

Source: AECOM, 2009

5.4.5 Road/Rail Modal Split

There may be scope for a higher model modal split towards rail by comparison with the scenario presented in **Table 5.20**. As an indicative assessment, the predicted trade volumes and truck generation for the 2034 final development scenario was re-analysed using the following modal split scenarios for the container terminal:

- An 80/20 road/rail split as per **Table 5.19;**
- A 70/30 road/rail split;
- A 60/40 road/rail split.

The road/rail split for the bulk and general, general purpose and bulk liquid precincts remain unchanged from the modal split assessed in **Table 5.19**. The sensitivity analysis focused on the container terminal as containers are clearly the most significant generator of truck traffic. The results are presented in **Table 5.35** below.

Table 5.35: Rail/Road Modal Split Sensitivity

Precinct	Original Modal Split 80/20 Containers		Revised Modal Split 70/30 Container			Revised Modal Split 60/40 Container		
	Trucks per year	Trucks per day	Trucks per year	Trucks per day	% change in truck numbers	Trucks per year	Trucks per day	% change in truck numbers
Bulk and General	58,714	161	58,714	161	0%	58,714	161	0%
General Purpose	40,857	112	40,857	112	0%	40,857	112	0%
Container Terminal	444,444	1,218	388,889	1,066	-12.5%	333,333	914	-25%
Bulk Liquid	20,481	56	20,481	56	0%	20,481	56	0%
Total	**564,496**	**1,547**	**508,941**	**1,395**	**-9.8%**	**453,385**	**1,243**	**-19.7%**

Source: AECOM, 2010

The implication is that a greater shift towards rail would have a significant impact on the generated traffic with overall truck numbers reducing by 9.8% for a 70/30 container modal split and reducing by 19.7% for a 60/40 container modal split. This has significant potential to improve the performance of the two key intersections and also to reduce traffic impacts on the arterial road network.

Changes in the modal split to favour rail as outlined above are feasible in the medium/long term subject to completion of the NSFC project and also subject to upgrades of local rail infrastructure such as the exit road to the Bullock Island loop, increased length and/or number of rail sidings, and the use of gantries rather than reach stackers for loading/unloading.

5.4.6 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 understood that all 3 Stages of the NFSC project will be completed prior to 2024 well before the port facility is expected to reach the 1 million TEU case for containers 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 5.36**. 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 5.36: 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	Exit road to Bullock Island loop required. Additional and/or longer sidings required, gantries possibly required. First stage of NSFC project would be required.
Container 30% by Rail	5.4	6.1	Exit road to Bullock Island loop required. Additional and/or longer sidings required, gantries possibly required. First and possibly second stage of NSFC project would be required.
Container 40% by Rail	6.9	7.5	Exit road to Bullock Island loop required. Additional and/or longer sidings required, gantries possibly required. All stages of NSFC project would be required.

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 efficiency of rail operations servicing the port can be significantly improved by development of the exit road to the Bullock Island loop, the introduction of additional and/or longer rail sidings and the introductions of gantries rather than reach stackers. If these works were carried out larger trains could access the port and the handling capacity per train would increase well beyond the 12% increase modelled above as a result of the change in gradients on the Cowan Bank.

The base case for the 1 million TEU can be moved by rail after completion of the NSFC project which is expected to occur by 2024 approximately 10 years prior to the final operations scenario for the Concept Plan. It is clear that changing modal splits for freight demand associated with the 1 million TEU case presents some 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).

5.5 Impact to Public Transport

There is currently one bus route (route 104) that operates in the vicinity of the site along Industrial Drive and George Street; however this bus route does not run in conflict with future development generated traffic at the main accesses to the site. Whilst an increase in traffic could cause an increase in congestion in the vicinity of the site, the relatively low frequency of buses on this route would mean that there would not be a significant impact to bus operations.

There is the potential for Newcastle Buses to alter and/or increase the routing and services to the NPC and Intertrade Industrial Park site given the significant employment generation potential.

5.6 Recommendations

The following sections highlight recommendations with regards to transport infrastructure and safety resulting from the impact assessment undertaken.

5.6.1 Local Road and Intersection Upgrades

Assessment of the accesses to the site has indicated that a link road within or external to the site (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 be implemented in 2024.

In addition to this the intersection of Industrial Drive and Ingall Street requires upgrading in 2024 to accommodate the traffic generated by the Initial Operations and again in 2034 for the Final Operations, with the following measures:

- 2024 – addition of short left turn slip lane from the Ingall Street southern approach; and
- 2034 – addition of short right turn lane from the Ingall Street northern approach.

These upgrades should be able to be undertaken within the existing road reserve. If no property acquisition may be required to accommodate the road widening and/or land may be dedicated for road widening as future developments take place on properties fronting Industrial Drive.

5.6.2 Industrial Drive

The analysis indicates that Industrial Drive may be reaching capacity by 2034. However, the RTA has advised that Industrial Drive is fully developed and no further upgrades are planned. The existing road reserve for Industrial Drive has no provision for future widening, except for a small parcel opposite the Tourle Street junction.

It should be noted that the 2034 assessment is based on likely future development rates over a 20+ year design horizon and background traffic growth of 1% per annum. Future regional road upgrades, such as the Hunter Expressway (F3 – Branxton) and the F3 – Raymond Terrace may also reduce some of the traffic on Industrial Drive. It is therefore recommended that the long term scenario be reassessed in the future as part of the detailed Project Applications and when more current traffic data becomes available. This is not a requirement of this application.

5.6.3 Traffic Safety

To ensure minimum impact on local residents, it is recommended that all heavy goods vehicles should travel on approved B-Double routes and no truck traffic should be allowed to use the local residential road network. The approved B-Double route in the vicinity of the site is Industrial Drive. Designated truck routes, with restrictions on use of local residential roads, should be included in the Traffic Management Plans.

It is also recommended that Local Area Traffic Management (LATM) plans be prepared for the adjoining residential areas, once more details around the Project are known during the detailed Project Application stage. This will ensure that local area traffic management works and road improvements are identified and implemented in the future.

5.6.4 Pedestrians and Cyclists

It is recommended that construction of any future road infrastructure should consider pedestrians and cyclists by incorporating appropriate facilities for these users, where appropriate for access to employment areas. This would obviously need to be balanced against the proposed operation of the road within the port facility.

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6.0 Cumulative Impacts of Uncommitted Developments

6.1 Development Potential of Adjoining Land

The Department of Planning (DoP) has requested that NPC undertake an assessment of the cumulative traffic impact of uncommitted development land located immediately southwest of the proposed Concept Plan, namely the Intertrade Industrial Park (IIP) which is being developed by Buildev.

At this stage no approval has been granted for development of the land and no formal application has been lodged. Based on the draft Master Plan for the IIP site dated 2008 and contained on teh HDC website it is proposed that the IIP will be developed with a general industrial precinct, intermodal and port support precinct and technology and commercial precinct.

Assumptions on the floor space and traffic generation for the uncommitted development land have been formulated based on the draft Master Plan to guide the assessment as the exact nature of the development to be constructed on site is unknown at this stage. These assumptions are listed below:

- In lieu of any existing approval or formal application for the Buildev site (IIP), the calculations in **Table 6.1** are based on the draft Masterplan for the IIP site dated 2008 as displayed on the HDC website. This is the only plan for the site in the public domain;
- The analysis has assumed a floorspace ratio of 1.5 for the industry/manufacturing and warehouse/distribution uses which allows for some limited mezzanine or first floor level development;
- The analysis has assumed a floorspace ratio of 4.0 for commercial office uses which allows for 4 storey development reasonably consistent with the existing building form;
- The analysis has assumed that all of the IIP development will be completed by 2024;
- The analysis has assumed that 60% of the Buildev traffic will use Selwyn Street and 40% will use Ingall Street; and
- The analysis has assumed that 50% of the Buildev traffic will head north and 50% will head south.

The estimated floor space and traffic generation potential of the IIP has been summarized in **Table 6.1**.

Table 6.1: Intertrade Industrial Park potential floor space and traffic generation

Land Use	Estimated Ground Floor Area (m^2)	Floor Space Ratio	Estimated Total Floor Area (m^2)	Peak Hour Traffic Generation Rate (RTA Guideline)	Peak Hour Trips Generated
Industry / manufacturing	30,000	1.5	45,000	1.0 trips/100 m^2	450
Warehouse / distribution	70,000	1.5	105,000	0.5 trips/100 m^2	525
Commercial office	10,000	4.0	40,000	2.0 trips/100 m^2	800
Total	**110,000m^2**		**190,000m^2**		**1,775 trips**

Source: AECOM, 2010

On the basis of the above figures the IIP will significantly increase peak hour traffic generation on the surrounding road network and through the two key intersections.

6.2 Intersection Performance

The intersections of Industrial Drive / George Street and Industrial Drive / Ingall Street have been assessed using SIDRA Intersection 3.2 for the future year scenario in 2024. The analysis has assessed potential trips generated by the IIP development and these have then been added to the development traffic scenario (i.e. background traffic plus the NPC Mayfield development traffic). All intersection upgrades and mitigation measures recommended in the earlier Chapters are included in the intersection layouts. Intersection performance assessments for the intersections of Industrial Drive / George Street for both morning and evening peaks in 2024 have been assessed and the results are summarised in **Table 6.2** and **Table 6.3**.

Table 6.2: 2024 AM Peak Intersection Performance, Industrial Drive / George Street – with link road and mitigation measures

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)	1,833	D	1.00	35.3	298
George St (E Leg)	250	F	1.09	191.5	273
Industrial Drive (N Leg)	2,740	F	1.12	269.5	1,876
George St (W Leg)	152	E	0.46	71.7	61
All Vehicles	**4,975**	**F**	**1.12**	**173.3**	**1,763**

Source: AECOM, 2010

Table 6.3: 2024 PM Peak Intersection Performance, Industrial Drive / George Street – with link road and mitigation measures

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)	2,175	F	1.15	329.6	1,454
George St (E Leg)	484	F	1.13	279.1	809
Industrial Drive (N Leg)	2,174	F	1.16	334.9	1,538
George St (W Leg)	92	D	0.14	44.5	30
All Vehicles	**4,925**	**F**	**1.16**	**321.6**	**1,506**

Source: AECOM, 2010

The intersection of Industrial Drive / George Street is shown to operate over and at LOS F in both the AM and PM peak hour periods. During both the AM and PM peak, the largest 95^{th} percentile queue occurs on Industrial Drive (northern leg) and is indicated in the order of 1,876 m and 1,538 m respectively.

Intersection performance for the intersections of Industrial Drive / Ingall Street for both AM and PM peaks have been assessed and the results are summarised in **Table 6.4** and **Table 6.5**.

Table 6.4: 2024 AM Peak Intersection Performance, Industrial Drive / Ingall Street – with link road and mitigation measures

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)	192	C	0.28	32.4	45
Industrial Drive (E Leg)	1,650	D	1.00	45.4	353
Ingall St (N Leg)	344	F	1.08	164.6	274
Industrial Drive (W Leg)	2,440	F	1.06	187.9	1,281
All Vehicles	**4,626**	**F**	**1.08**	**128.9**	**1,281**

Source: AECOM, 2010

Table 6.5: 2024 PM Peak Intersection Performance, Industrial Drive / Ingall Street – with link road and mitigation measures

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)	208	C	0.44	28.3	56
Industrial Drive (E Leg)	2,046	F	1.12	283.8	1,162
Ingall St (N Leg)	694	F	1.13	192.7	599
Industrial Drive (W Leg)	1,763	F	1.03	88.2	521
All Vehicles	**4,711**	**F**	**1.13**	**185.9**	**1,154**

Source: AECOM, 2010

The intersection of Industrial Drive / Ingall Street is shown to operate over capacity during the AM and PM peak and at LOS F in both the AM and PM peaks. During both the AM and PM peak, the largest 95th percentile queue occurs on Industrial Drive (western leg) and is indicated in the order of 1,281 m, while during the PM peak, a 95th percentile queue in the order of 1,162 m is indicated on Industrial Drive (eastern leg).

6.3 Possible Mitigation Measures

The assessment suggests that when the traffic from the proposed IIP development is included the intersections of Industrial Drive / George Street and Industrial Drive / Ingall Street are both unable to operate at an acceptable level of service in the year 2024. Under this scenario, both intersections fail with regards to performance.

To improve the levels of service anticipated for the intersections of Industrial Drive / George Street and Industrial Drive / Ingall Street, the following potential mitigation measures may be suitable:

- Additional lanes on Industrial Drive which may require land acquisition or dedication of land as part of future developments;
- Upgrade of the Industrial Drive/George Street intersection to improve its capacity such as by adding longer or additional turning lanes;
- Partial or full grade separation of one or both of the key intersections; and
- Creation of an additional intersection mid-way between George Street and Ingall Street as part of the IIP development.

These mitigation measures would need to be tested as part of the traffic studies undertaken for the application for the future development of Intertrade Industrial Park. These mitigation measures are not a requirement of this Concept Plan.

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7.0 Summary and Conclusions

7.1 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.

7.2 Road Network Impacts

7.2.1 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 159 truck movements and 60 vehicle (car) movements in the day time peak hour under the proposed initial operations (2024) and 232 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 7.1**.

Table 7.1: 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	110	183	-	-
Bulk Liquid	9	9	-	-
Employees	-	-	60	90
Total	**159**	**232**	**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 aDOS 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.

In addition to this, further mitigation measures are required at the Ingall Street intersection to accommodate the proposed development traffic in 2024 and 2034. The recommended mitigation measures are as follows:

- 2024 with development – addition of short left turn slip lane from the Ingall Street southern approach; and
- 2034 with development – addition of short right turn lane from the Ingall Street northern approach.

These upgrades may be able to be undertaken within the existing road reserve. but if not, acquisition of property may be required and/or land could be dedicated for road widening as part of future development of properties fronting Industrial Drive (e.g. the IIP site).

Table 7.2 and 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 7.2: 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	3,039	B	0.830	21.7	273
	Future conditions without development (2024)	3,565	B	0.861	21.6	368
	Future conditions without development (2034)	3,934	B	0.879	20.7	444
	Future conditions with development and link road (2024)	4,070	B	0.870	20.8	424
	Future conditions with development and link road (2034)	4,560	C	0.933	29.7	642
PM Peak	Existing conditions	3,129	C	0.857	29.0	254
	Future conditions without development (2024)	3,669	B	0.839	23.8	305
	Future conditions without development (2034)	4,051	B	0.873	25.8	380
	Future conditions with development and link road (2024)	4,179	B	0.861	25.5	361
	Future conditions with development and link road (2034)	4,676	C	0.905	32.1	525

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, namely LOS B in 2024 and LOS C in 2034.

Table 7.3: 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)	3,602	B	0.765	21.1	207
	Future conditions without development (2034)	3,979	B	0.858	26.2	292
	Future conditions with development and link road and mitigation measure (2024)	3,914	B	0.803	20.6	234
	Future conditions with development and link road and mitigation measures (2034)	4,334	B	0.861	27.7	320
PM Peak	Existing conditions	3,141	B	0.818	26.9	223
	Future conditions without development (2024)	3,684	D	0.954	48.8	472
	Future conditions without development (2034)	4,068	F	1.048	110.4	993
	Future conditions with development and link road and mitigation measure (2024)	4,001	C	0.936	40.5	459
	Future conditions with development and link road and mitigation measures (2034)	4,429	E	1.000	59.2	736

Source: AECOM, 2010

With an internal link road and Traffic Management Plan (TMP), and recommended intersection upgrade works, the level of service remains at LOS B in the future 2024 AM peak hour and LOS C in the future 2024 PM peak hour in the 2034 AM peak hour the level of service remains at LOS B however the level of service reduces to LOS E in the 2034 PM peak hour and the intersection will operate at capacity. Employee traffic diversion.

If employee traffic was also diverted to the Industrial Drive/George Street intersection then this would further improve the intersection performance at Industrial Drive/Ingall Street in the PM peak hour.

It should be remembered that the assessment is being undertaken of traffic conditions in the year 2034, nearly 25 years from now and there are a range of variables/assumptions which underpin the assessment. The results of the assessment therefore provide only a generic guide to the potential traffic impacts over this extended timeframe. Further detailed assessments will be required in association with future Project Applications.

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 mitigation measures and TMP, as long as they can demonstrate that the intersections operate satisfactorily under a different management option.

The results indicate that the intersection operates at capacity (DOS 1.048) and at LOS F in the future 2034 PM peak without development, suggesting the intersection requires upgrading regardless of the proposed development traffic. The RTA has advised that Industrial Drive is fully developed and no further upgrades are planned at this time. The existing road reserve for Industrial Drive has no provision for future widening, except for a small parcel opposite the Tourle Street junction. If widening was to occur it would in all likelihood require property acquisitions or dedication of land as part of the future development proposals.

It should be noted that the 2034 assessment is based on likely future development rates over a 20+ year design horizon and background traffic growth of 1% per annum. Future regional road upgrades, such as the Hunter Expressway (F3 – Branxton) and the F3 – Raymond Terrace may also reduce some of the traffic on Industrial Drive. It is therefore recommended that the long term scenario be reassessed in the future as part of the detailed Project Applications and when more current traffic data becomes available. This is not a requirement of this application.

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 the port development.

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. However, grade separation of at least one of the rail crossings is likely to be required in the longer term so that the efficiency of port operations are not unduly compromised. Monitoring of traffic conditions at regular intervals (e.g. every 3-4 years) during the period of the concept plan will help determine when and where such improvements are required.

Changes to the modal split to favour rail in the medium/longer term will significantly reduce the generation of truck traffic associated with the Concept Plan with consequential improvements in the performance of the two key intersections and the arterial road network surrounding the site. However, this change in modal split would depend on the implementation of the NSFC project and upgrades to local rail infrastructure within the Mayfield site.

7.2.2 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.

7.3 Rail Network Impacts

At initial operations scenario in 2024 (up to 600,000 TEU of containers per annum) and 3 trains per day a minimum of two 520m sidings would need to be 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 the site.

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.

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 the train 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.

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 sidings created within the port site. The efficiency of train operations would be improved by creating additional and/or longer sidings and possibly by incorporating gantries rather than reach stackers for loadings/unloading. This allows longer trains to access the port.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 shunting and loading and unloading operations within the site 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 in 2034 is such that the NSFC 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. 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 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 NSFC project is completed. The first Stage of this project is to be completed in 2015 with subsequent Stages 2 & 3 completed by 2024;
- In the short/medium term (until 2015) there is the potential for the port to rely more heavily on road transport while the first stage of the NSFC project is completed. Road traffic will need to be carefully monitored during this period to ensure that the threshold limits identified in the EA are not exceeded; 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.

7.4 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 appears to operate satisfactorily in the future AM peak hour under initial and final operation development scenarios (2024 and 2034) if an internal link road between the precincts and a Traffic Management Plan (TMP) are implemented to channel more traffic to the Industrial / George Street intersection which has available capacity; and
- Intersection upgrades, in addition to an internal link road, are required at the Industrial Drive / Ingall Street intersection in 2024 and 2034 to accommodate proposed development traffic in the PM peak. A diversion of all employee traffic in the PM peak at the Industrial Drive/George Street intersection would also help improve the intersection performance;
- Assessment results for 2034 based on an assumed underlying traffic growth rate of 1% per annum, suggest that the strategic road network (Industrial Drive) may also require upgrading to accommodate background traffic growth.

These conclusions are based on the assumptions on trip generation, distribution and assignment available at the Concept Plan phase and on the basis of an assessment undertaken over an extended 25 year period (through to 2034). 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 the 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 industrial road network. The truck queuing associated with operation of the railway crossings has also been demonstrated to be within the capacity of the local industrial road network, although impacts on the road network and access to adjoining properties in the Mayfield precinct will need to be regularly monitored to determine if impacts can be managed or if further improvements are warranted.

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. Designated truck routes requiring truck traffic to utilise the arterial road network should be included in the TMPs. Truck traffic should be prohibited from using the local residential road network.

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. It is also recommended that construction of any future road infrastructure should consider pedestrians and cyclists by incorporating appropriate facilities for these users, where appropriate. This would need to be balanced against the proposed operation of the road within the port facility.

It is recommended that Local Area Traffic Management (LATM) plans be prepared for the adjoining residential areas, once more details around the Project are known, during the Detailed Project Application stage. This will ensure that local area traffic management works and road improvements are identified and implemented in the future.

The cumulative traffic impacts associated with potential development of the adjoining Intertrade Industrial Park (IIP) have been assessed. Despite there being no approval or application lodged for development of the IIP site the assessment has been based on a potential development scenario using the draft Master Plan for the IIP dated 2008. This provides an estimate of the general level of traffic impacts only and further assessment will be required at a later date when details of the development are available.

Development of this site is likely to generate significant additional traffic movements (up to 1,775 trips in peak hour) which will place considerable strain on the 2 key intersections and they will be operating beyond capacity. A range of options have been identified to improve performance of the intersections. These options would require further detailed assessment to be undertaken as part of the Project Application(s) for development of the IIP.

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 (2024 initial operations);
- A new crossover to be installed between number 6 and 7 roads in the Morandoo Sidings (required for 2024 initial operations);
- The existing OneSteel siding may need to be re-signalled to allow multiple train movements (required for 2024 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 2024 initial operations);
- The new western road crossing of the railway line may also require a suitable treatment to separate road and rail movements (required for 2024 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;
- To support final operations in 2034 it is likely that the road crossing of the railway line at Selwyn Street will need to be grade separated so as to avoid unnecessary delays that may detrimentally impact on the efficiency of port operations.

The NSFC project will provide additional freight train paths on the Main North Line between Sydney and Newcastle. The estimated timing for development of this project generally is consistent with the timeframes for development of the Concept Plan with all 3 Stages of NSFC project to be completed by 2024.

However, in the short/medium term (prior to 2015) it may be necessary to accommodate a larger proportion of the freight task by road until such time as Stage 1 of NSFC project has been completed. There should be adequate capacity at key intersections on the local industrial road network and on Industrial Drive to accommodate this additional traffic in the short/medium term although traffic levels will need to be monitored so that they are generally consistent with the threshold limits identified in the EA.

There is capacity in the medium/longer term to support a higher modal split to rail by development of new infrastructure within the port land, including a new exit road to the Bullock Island loop, additional and/or longer rail sidings and gantries rather than reach stackers. This allows larger trains to service the port. A higher modal split to rail is desirable as it would reduce traffic on the road network and improve the performance of the 2 key intersections.

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.

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