Summary of key outcomes:

The bulk of Sydney's container throughput is handled at Port Botany, with 75% of this volume currently moved by road. This amounts to approximately 1,450 truck visits each day (one truck visit is equivalent to two truck movements – inward and outward).

With the growth in container trade and with the addition of the proposed new terminal, Sydney Ports Corporation is targeting a number of initiatives to reduce the growth of truck numbers generated by increased port activities. The main initiatives comprise:

- increasing the transport of containers by rail from the current 25% of container throughput to at least 40% by 2011, and
- encouraging the improved utilisation of trucks serving the port.

With the above improvements the average daily volume of trucks visiting Port Botany is expected to rise to about 2,350 by 2021. Of this, the new terminal, once fully developed, would generate about 940 truck visits per day or 40% of the forecast port traffic.

The forecast increase in traffic generated by Port Botany (including the new terminal) would not result in the deterioration to unacceptable levels of intersection performance in the Port Botany precinct.

Although the port is perceived as a major generator of traffic, it would only generate less than 2% of total (morning) peak hourly traffic flows at the subregional level by 2021. Other development including Green Square and Sydney Airport are projected to account for the greater part of the increase in cumulative traffic volumes.

The proposal by the NSW Government, through RIC, to duplicate the rail line between Cooks River and Botany Yard would complete the full duplication of the dedicated freight rail line between Port Botany and the Enfield Marshalling Yards. Planning by RIC has confirmed that once completed, the duplication would increase the capacity of the dedicated freight rail line to around 1.3 million TEUs, which would be adequate to accommodate the 40% mode share of forecast container trade growth.

21.1 Introduction

The following assessment of the traffic and landside transport impacts of the proposed Port Botany Expansion is primarily based on the report by Maunsell Australia Pty Ltd titled *Traffic and Landside Transport Study for Proposed Port Botany Expansion* (November 2002) and the additional advice dated 15 October 2003. Certain aspects relating to access to the proposed boat ramp on Foreshore Road are addressed in a separate report prepared by Masson/Wilson/Twiney titled *Proposed Replacement Boat Ramp on Foreshore Road at Port Botany* (September 2001). These reports are presented in **Appendix P**. The traffic and landside transport assessment modelled and predicted the increase in road and rail traffic in the Port Botany precinct and immediate subregion based on the forecast growth in container trade at the port. A multimodal approach was taken, wherein road and rail issues were considered in an integrated fashion.

The results of the studies are summarised in this chapter and are used as the basis for assessing the impacts of road and rail traffic that would be generated by the proposed Port Botany Expansion.

21.2 Methodology

The assessment methodology can be summarised as follows:

- the existing transport situation in the study area was assessed, including the existing road and rail network, and road and rail traffic volumes;
- traffic surveys were undertaken in order to establish the present situation and to calibrate traffic forecasting models;
- a model was developed to forecast growth in road and rail traffic from the existing container terminals at Port Botany as well as road and rail traffic from the proposed new terminal;
- present and future traffic flows for roads and intersections of interest, including both background traffic and port traffic, were established;
- road network modelling of current and predicted movement at the local and subregional levels was undertaken;
- an intersection analysis was undertaken using SCATES, a traffic simulation program for modelling signalised intersections within a coordinated system; which is used and accepted by the RTA;
- a rail traffic study was undertaken, including analysis of the capability of the rail and port infrastructure to accommodate the predicted growth in rail traffic; and
- stakeholder comments on road transport were considered and provided contextual input to the assessment.

Road and rail traffic were forecast through a process involving the following steps:

- forecasting future container trade volumes;
- forecasting origin/destination (O/D) of container trade;
- forecasting future peak hour background traffic utilising a traffic model that covers the Sydney Metropolitan area.

- forecasting the number of road and rail movements for various operating assumptions such as the road-rail mode shares; and
- assigning road traffic forecasts to the future road network, including overlaying forecast port related truck movements over future background traffic levels.

Transport Data Centre (TDC) population and employment growth forecasts were used in predicting future background traffic (TDC is an agency under the NSW Department of Transport Services). The predictions do not go past 2016 because the RTA forecasts do not extend beyond that year. The assessment of future port related traffic, however, was based on a forecast throughput in all terminals at Port Botany of 3.2 million TEUs and assumes that this throughput occurs by 2021 (i.e. earlier than the forecast time of this throughput of 2025, as described in **Chapter 4** *Need for the Project*). The upper end of the forecast road traffic volumes in the traffic assessment therefore consists of the predicted port traffic volumes by 2021 overlain on the predicted background traffic by 2016. This provides a conservative assessment of traffic impacts as the volumes of traffic from the port used in the modelling are higher than would actually occur by 2021.

It has been assumed in the traffic assessment study that the volume of container freight moved by rail would be 30% by 2006 and 40% by 2011. A "worst case" road traffic scenario of a rail mode share of only 20% was included as a sensitivity test for road traffic.

Road and rail traffic were forecast for different combinations of throughput share for each of the existing terminals and the new terminal in order to provide a likely "envelope" of future transport demand for each mode. Throughput share would affect traffic forecast by way of variations in the distribution of truck movements through each terminal's entry/exit point to roads immediately adjacent to the port and the resulting effect on intersections.

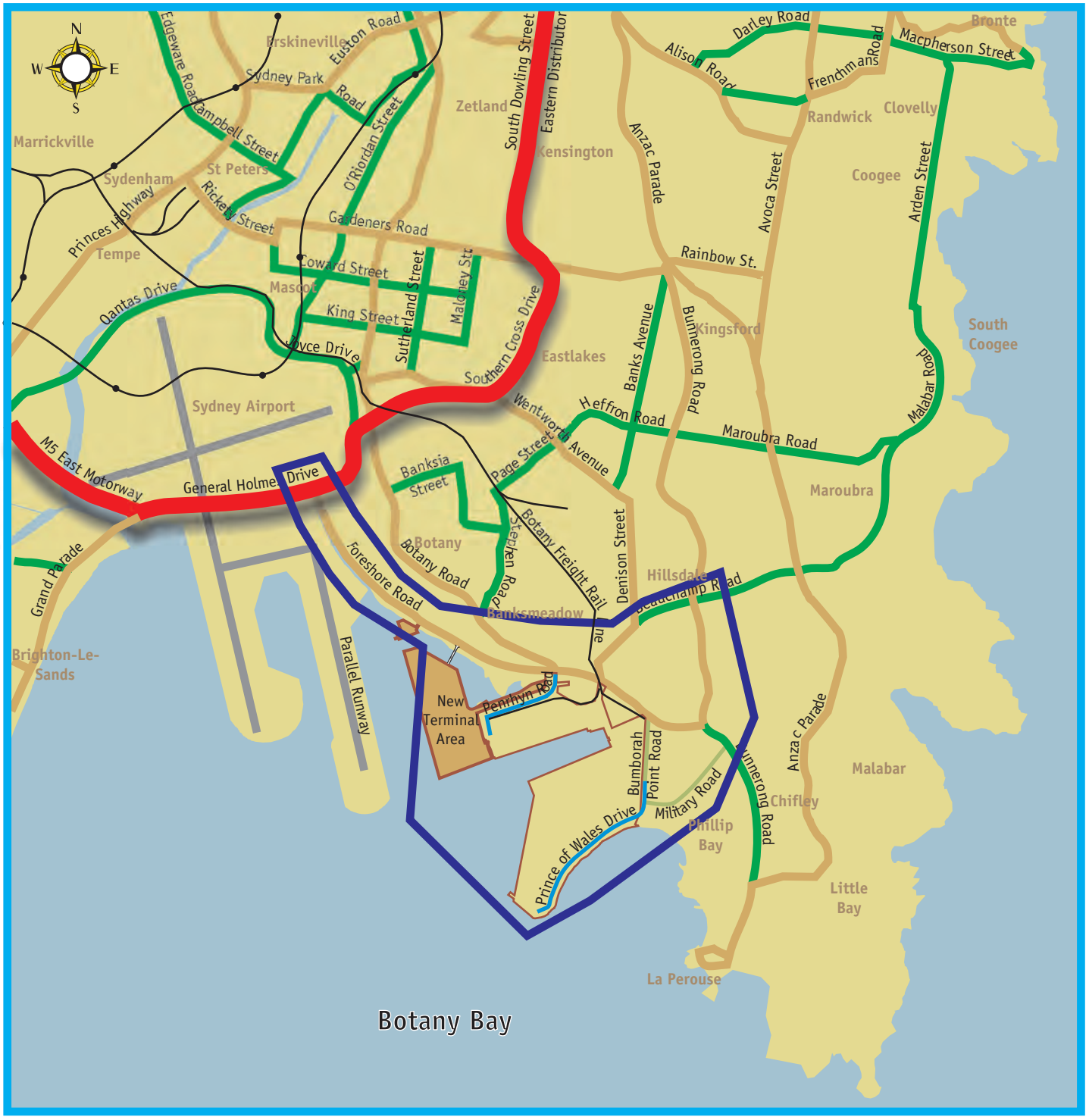
21.3 Study Area

The traffic and landside transport study identified a "core" study area in consultation with the RTA and Sydney Ports Corporation (**Figure 21.1**). The study area was selected to focus on those routes that carry the highest volumes of port trucks. This area is roughly bounded by:

- McPherson Street to the north;
- Bunnerong Road to the east;
- the port precinct and Military Road to the south; and
- General Holmes Drive to the west.

Road traffic volumes beyond the core study area were taken into consideration in developing traffic forecasts at the subregional level. The subregion was taken to extend roughly from Port Botany in the south, Gardeners Road in the north, Bunnerong Road to the east and the Princes Highway to the west (**Figure 21.2**).

The assessment of port related rail traffic focused on the dedicated freight line and the metropolitan intermodal terminals.



Source: Maunsell Australia 2002

0 2.5km

- Freeway
- Arterial
- Sub - Arterial
- Collector
- Local
- Core Study Area

Existing Road Network Near Project Site and Core Study Area

Figure 21.1

Source: Maunsell Australia 2002

0 2.5km

Subregional Road Network with Major Truck Routes Highlighted

Figure 21.2

- North Shore, Northwestern Sydney and City
- Eastern Suburbs
- South Sydney
- Inner West
- Southern and Southwestern Suburbs
- Central West and Western Suburbs

21.4 Existing Transport Conditions

21.4.1 Road

Main Roads

The main roads within the study area consist of the following (**Figure 21.1**):

- Arterial:
  - Foreshore Road;
  - Botany Road;
  - General Holmes Drive;
  - Beauchamp Road (between Botany Road and Denison Street);
  - Bunnerong Road
  - Wentworth Avenue; and
  - Denison Street;
- Sub-Arterial:
  - Stephen Road; and
  - Page Street.

While some roads are well suited to truck traffic (Foreshore Road and General Holmes Drive), others are less suited due to conflict with other road users and local amenity issues.

The subregional road network is shown in **Figure 21.2**, with main truck routes for port related traffic highlighted.

Intersection Performance

The performance of major intersections in the core study area during morning and afternoon peak periods was analysed using SCATES software. The performance criteria for intersections used in the assessment are shown in **Table 21.1**.

The results, shown in summary in **Table 21.2** and presented in detail in **Appendix P**, indicate that these intersections currently provide a good level of service, with only minor vehicle delays. The intersections also have considerable spare capacity. The results were considered consistent with observed traffic flows and the findings of previous studies. An "acceptable" level of service (LOS) is considered to be LOS D or better.

Table 21.1 Performance Criteria for Intersections

LEVEL OF SERVICE	AVERAGE DELAY/VEHICLE (SECS/VEHICLE)	TRAFFIC SIGNALS, ROUNDABOUTS	GIVE WAY AND STOP SIGNS
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity. Incidents at signals will cause excessive delays	At capacity; requires other control mode
F	F >70	Roundabouts required or other control mode	At capacity; requires other control mode

Source: Guide to Traffic Generating Developments, Roads and Traffic Authority, 1993.

Table 21.2 Current Intersection Performance

INTERSECTION	LEVEL OF SERVICE	
	AM Peak	PM Peak
Foreshore Road /General Holmes Drive	A	A
Foreshore Road /Airport Access	A	A
Foreshore Road and Botany Road	B	B
Botany Road and Beauchamp Road	A	A
Botany Road and McCauley Street	A	A
Botany Road and Container Park Access Road	A	A
Botany Road and Bumborah Point Road	A	A

Source: Maunsell Australia, 2002.

Existing Traffic Generation

Container truck volumes are concentrated on Foreshore and Botany Roads, with the following intersections carrying relatively high volumes:

- General Holmes Drive/Foreshore Road;
- Botany Road/Beauchamp Road;
- Botany Road/Bumborah Point Road;
- Botany Road/Foreshore Road/Penrhyn Road; and
- to a lesser extent, Botany Road/Stephen Road.

Data from traffic counts (**Table 21.3)** show that Foreshore Road, Botany Road south of Exell Street, Botany Road between Beauchamp Road and Bumborah Point Road, and Beauchamp Road between Botany Road and Denison Street all carry more than 15,000 vehicles on average per weekday. Port trucks have been estimated to account for between less than 1% and 8% of traffic over these roads.

Table 21.3 Existing Average Weekday Traffic at the Port Botany Area and Contribution of Port Traffic

LOCATION	LIGHT VEHICLES	HEAVY VEHICLES (1)	TOTAL VEHICLES	% HEAVY VEHICLES	PORT TRUCKS (2)	% PORT TRUCKS
Botany Road north of Exell Street	9,060	2,309	11,369	20%	398	4%
Botany Road south of Exell Street	11,499	4,034	15,533	26%	576	4%
Botany Road between Beauchamp Road and Bumborah Point Road	11,300	4,937	16,237	30%	1,037	6%
Foreshore Road	16,369	5,484	21,853	25%	1,823	8%
Bumborah Point Road	2,060	2,680	4,740	57%	1,343	28%
Beauchamp Road between Botany Road and Denison Street	15,868	1,928	17,796	11%	63	<1%

(1) Heavy vehicles are defined as two-axle rigid trucks and above (i.e. Austroads class 3 to 12).
(2) Port trucks are that component of heavy vehicles that carry containers to and/or from the container terminals at Port Botany. The number of port trucks was estimated by Maunsell based on peak hour counts.

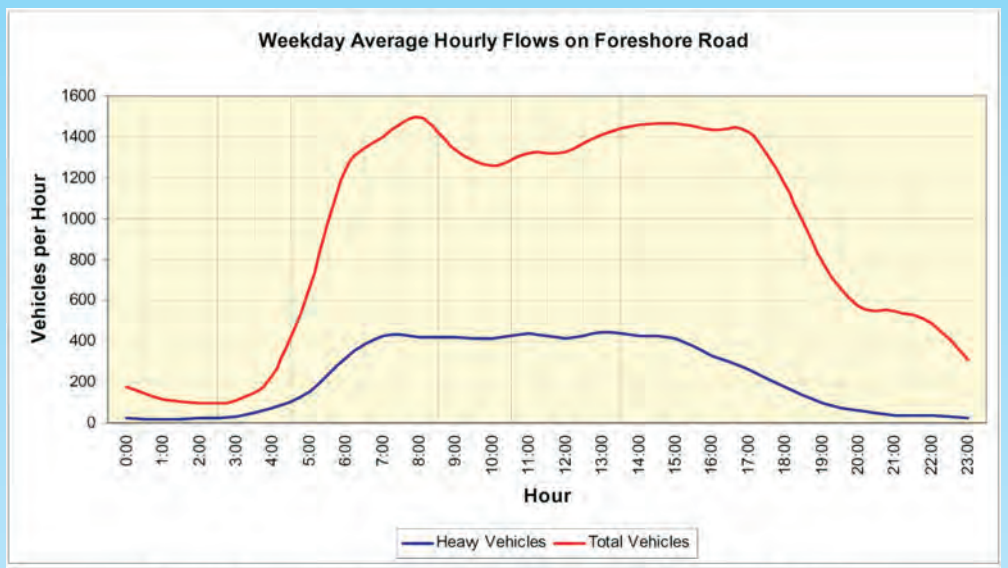
The above traffic survey results for Botany Road are largely consistent with the results of the RTA survey carried out in February 2003. A summary of the RTA survey estimates that the average weekday traffic at a point south of Pemberton Road is 15,539 vehicles per day, of which approximately 17% constitutes heavy vehicles. For a point north of Pemberton Road, the respective results were 10,396 vehicles per day of which 23% were heavy vehicles.

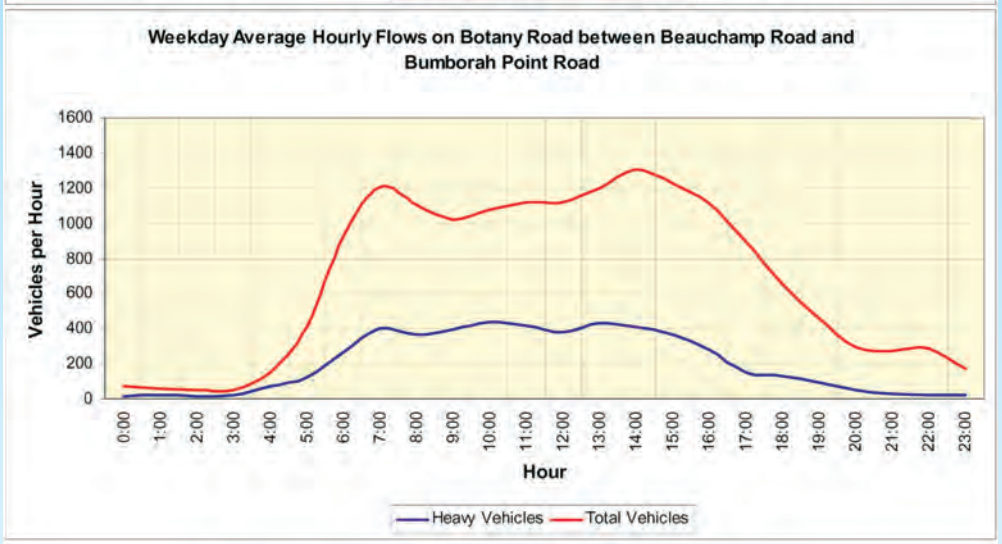
Information provided by terminal operators Patrick Stevedores and P&O Ports indicate that a typical day generates around 800 truck visits to Patrick Stevedores terminal and 600 to P&O Ports terminal, with about 8% of the daily volume representing morning (8:00 – 9:00 am) peak flows and about 4% afternoon (5:00 – 6:00 pm) peak flows.

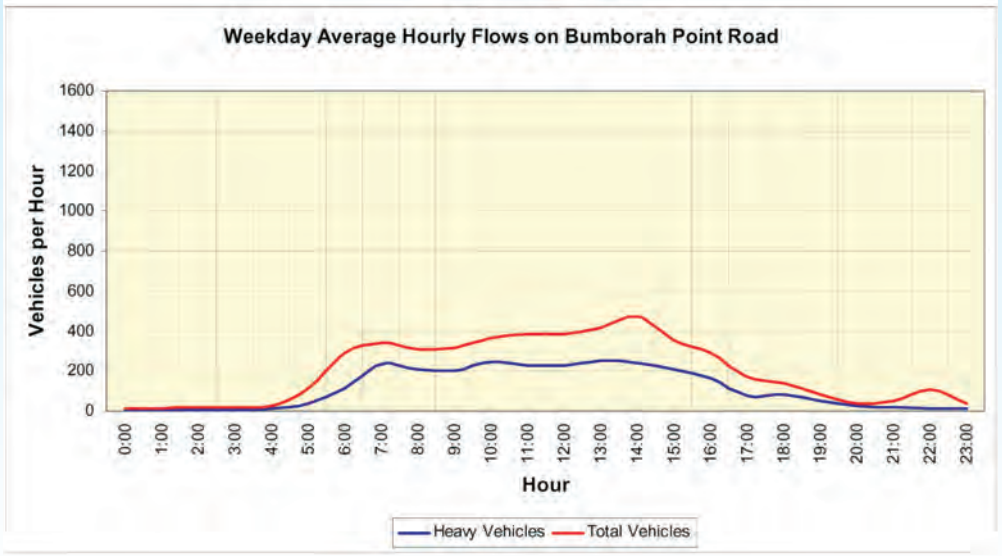
The above figures exclude “block runs,” the movement of containers en masse between the port terminals and container parks generally using internal port roads, usually during pre-arranged off-peak periods like Saturday mornings or weekday evenings. These are encouraged to reduce pressure on timeslotting arrangements. Block runs can account for up to 300 truck visits at Patrick and around 200 at P&O per occurrence.

Operating Hours

Road servicing (receival and delivery) is able to occur seven days a week, 24 hours a day. However, data indicate that weekends and evening hours are currently under-utilised and typically road servicing operations occur 16 hours each day, 5.5 days per week. The movement of heavy vehicles, a proportion of which are port trucks (see **Table 21.3**), during business hours is reflected in the hourly traffic count for Bumborah Point Road, Botany Road and Foreshore Road, presented as traffic volume profiles in **Figure 21.3**.







Source: Maunsell Australia 2002

Note: Heavy Vehicles Include Port Vehicles and Other Heavy Vehicles

Weekday Average Hourly Traffic Flows at Selected Locations

Figure 21.3

Truck turnaround times at either terminal are between 35 and 45 minutes, with both operators planning to implement measures to reduce turnaround times.

The rate of backloading (the practice of utilising a truck to carry a load on both directions of its journey) is currently about 8%. Patrick Stevedores has been implementing measures to encourage backloading such as allowing backloads to be picked up without advance bookings.

21.4.2 Rail

Rail Network

For the proposed Port Botany Expansion, the most operationally significant rail line is the Botany Freight Rail Line, a dedicated freight line that connects Port Botany with the Cooks River intermodal terminal and the Enfield Marshalling Yard. This freight line connects to the shared metropolitan network at Concord West (Main North Line), Flemington Junction (Main West Line) and Sefton (Main South Line). Recently completed line upgrade works by RIC have duplicated the track between Marrickville and Cooks River. Duplication of the single line between Cooks River and Botany Yard is the subject of planned upgrades as discussed in **Chapter 2** *Regional Context*.

At the port end of the freight line is Botany Yard, which facilitates shunting activities and the breaking up of trains prior to entering the port terminals.

The Botany Yard consists of a master siding, a transit siding and other breakdown sidings, with lengths from 872 m to 1,492 m. The Yard is owned and operated by RIC.

Some container rail services arriving at Port Botany have traffic destined for both container terminals. This requires these trains to be split on arrival at the Botany Yard before entering the terminal sidings. The time required to carry out these movements is about 50 to 60 minutes.

The number and lengths of the sidings which receive trains at the port terminals are shown in **Table 21.4**.

Table 21.4 Existing Rail Sidings at Port Botany

OPERATOR	NO. OF SIDINGS	LENGTH (M)
P&O	3	350
Patrick Stevedores	2	600
P&O Trans Australia	2	445

The length of the trains servicing the terminals is dependent on the length of the available siding at either the port or inland rail terminal. Thus, trains serving both port container terminals on the same trip, without shunting, would be restricted by the length of the shortest siding.

The rate of loading and unloading at each terminal determines the train turnaround times.

Rail Traffic

P&O Ports receives an average of seven train visits (14 train movements) a day while the Patrick Stevedores terminal receives an average of six train visits (12 train movements) a day. In addition, P&O Trans Australia receives two train visits per day for transferring empty containers to rural areas for packing and full containers to White Bay for export.

Operating Hours

Train movements and servicing is able to occur seven days a week, 24 hours a day, but at present the terminal sidings are not fully utilised and can accommodate increased volumes.

Metropolitan Intermodal Terminals

Intermodal terminals are inland facilities where the exchange of containers from rail to road and vice versa occurs. They are designed for the rail transport of freight cargo to/from the port terminals and the distribution of this cargo by truck to/from different origins/destinations. The term *intermodal* is used to describe freight which can be transported by more than one mode (e.g. rail, road and sea) and the usual form of intermodal freight is containerised freight, which can be conveniently transferred between modes.

There are five intermodal terminals in the Sydney metropolitan area that service Port Botany:

- Yennora;
- Minto;
- Camellia;
- Leightonfield; and
- Cooks River.

Cooks River serves Port Botany via the dedicated freight rail network. The other terminals serve the port via a combination of the shared metropolitan rail network and dedicated freight rail network. Priority is given to passenger trains on the shared metropolitan network. This represents a significant constraint to rail freight efficiency, particularly during the peak commuter hours and when curfews prevent any activities by freight trains on the metropolitan rail network.

Clyde and Chullora are other intermodal terminals within the metropolitan area, but do not currently service Port Botany.

21.4.3 Geographic Distribution of Trade

Around 80% of existing container movements have origins/destinations in the greater Sydney area, with only 20% destined for or coming from rural and regional NSW. Container freight volumes moved by road and rail by origin/destination are discussed in **Chapter 2** *Regional Context*.

Future origin/destination trends of container freight were estimated based on projected industrial land uses across Sydney. The expected expansion in industrial areas in Western and Southwestern Sydney due to new land releases and the proximity to transport improvements such as the Western Orbital, is forecast to

increase the proportion of container freight traffic to these areas from 55% in 2001 to 65% by 2021, 40% of which would travel by rail to inland intermodal terminals.

While freight bound for the outer suburbs would increasingly be carried by rail, cargo bound for Port Botany precinct would continue to travel by road.

The growth in freight volume between Port Botany and local area (Botany) would be constrained by the capacity of container parks and container freight stations and the limited amount of land available for new industrial development. While the freight volume, and therefore the total number of truck trips, to Botany would grow in absolute terms, its share would decrease from the current 20% to around 15% in 2021. A similar trend is forecast for the inner suburbs.

21.5 Access

21.5.1 Road Access to New Terminal

The main entrance to the new terminal would consist of a road bridge between Foreshore Road and the new terminal, across the tidal channel. The access road would require a new intersection onto Foreshore Road as shown in **Figure 21.4**. Sydney Ports Corporation would provide the funding for the intersection road works and traffic signals as described below.

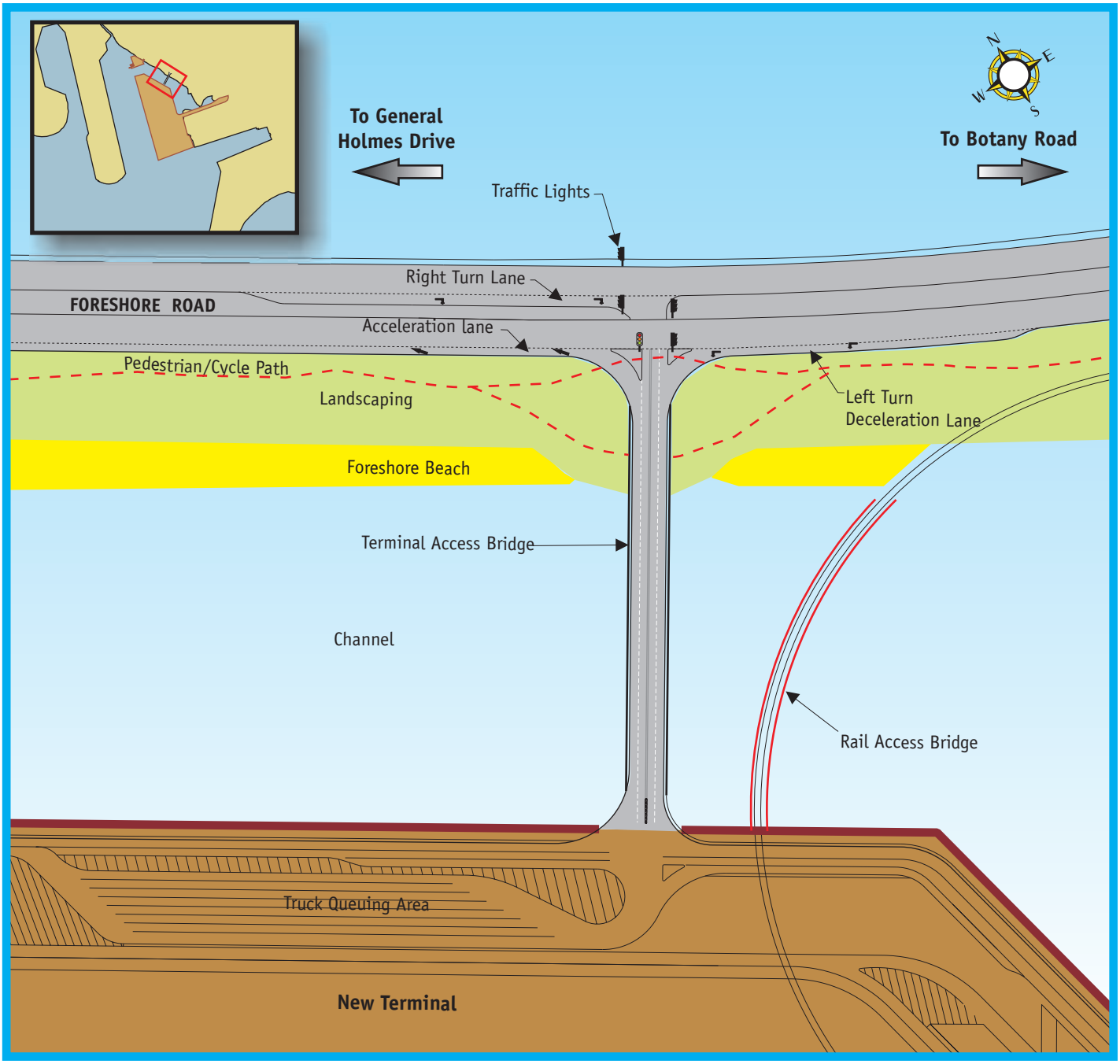
The intersection would consist of the following:

- traffic signal control, to safely accommodate heavy vehicle movements into and out of the site;
- design to cater for a 70 km/h speed, including provision on Foreshore Road for a 125 m left turn lane into the site, a 150 m right turn bay into the site, and a 320 m acceleration lane for traffic turning left out of the site; and
- adequate separation from the adjacent intersections at Botany Road/Penrhyn Road/Foreshore Road and the proposed (unsignalised) intersection for the relocated boat ramp on Foreshore Road.

The access road would provide the following benefits:

- traffic generated by the new terminal would be able to avoid the Penrhyn Road/Botany Road/Foreshore Road intersection, thereby avoiding capacity problems at this intersection;
- provision of an alternative access point to the existing port area (via an inter-terminal access road connecting with the new terminal) in the event of incidents/delays occurring at the Penrhyn Road/Botany Road/Foreshore Road intersection; and
- ability to facilitate a reduction in the number of port trucks using Botany Road north of Foreshore Road, as this would become a less direct route for trucks travelling to/from South Sydney and the Inner West.

At peak times up to 75 trucks per hour may arrive at the new terminal. The truck holding bay and queuing facilities within the new terminal would be able to hold up to 200 trucks at any one time. A preliminary truck queuing analysis shows that the proposed truck queuing area and the loading bays would provide more queuing capacity than would be required, ensuring that no truck queuing occurs on external public roads (**Appendix P**).



Terminal Access Intersection with Foreshore Road

Figure 21.4

In addition to the main access road described above, there would be an inter-terminal access road running parallel to the existing Penrhyn Road and following the eastern boundary of the new terminal. This would link the existing terminals internally, avoiding the use of Foreshore Road for movements between terminals.

A grade-separated crossing for road transport over the new and existing rail tracks would be constructed over Penrhyn Road (refer to **Figure 8.11**). This crossing would cater for road traffic to and from the existing port area and inter-terminal traffic as well as trains into and out of the port.

21.5.2 Access to Public Recreation Area

Access to the proposed public recreation area, including the boat ramp, would also be from Foreshore Road. It would consist of an unsignalised intersection on Foreshore Road which would include a right turn bay and left turn deceleration lane for entering vehicles, and a right turn acceleration/merge lane and left turn acceleration/merge lane for exiting vehicles, as shown in **Figure 21.5**. Sydney Ports Corporation would provide the funding for these intersection road works.

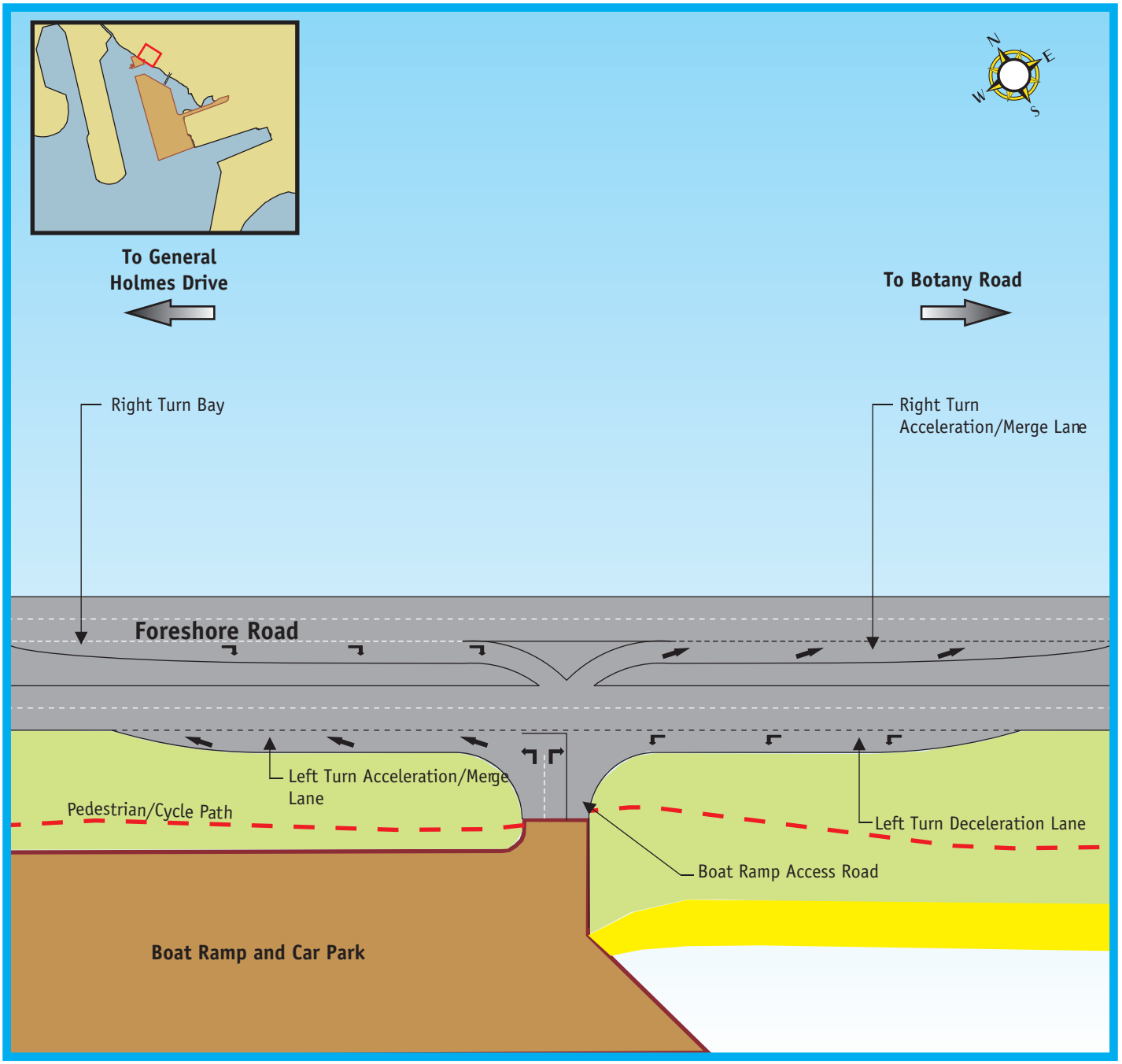
Right turn exit movements from the boat ramp between 6:00 am and 9:00 am on weekdays would be prohibited as the southbound flows on Foreshore Road at this time would restrict the number of right turn movements. The intersection would comply with relevant RTA standards.

A separation of approximately 450 m between the new terminal access road and the access road to the public recreation area and boat ramp would be required.

21.5.3 Proposed Infrastructure and Traffic Management Enhancements

There are several road development and traffic management proposals that would impact on road access to Port Botany. Among the proposals which were considered in the traffic and transport study are the following:

- proposal by the City of Botany Bay Council to construct a port feeder road linking McPherson Street with Swinbourne Street, to service port related developments. The proposal aims to reduce the number of truck movements on Stephen Road, which has a residential frontage and is not approved for B-doubles;
- possible restrictions on truck access off Botany Road north of McPherson Street may be imposed by the City of Botany Bay Council and/or the RTA, which would affect regional truck trips, but leave local truck trips largely unaffected;
- City of Botany Bay Council proposal to extend Hale Street through to Foreshore Road, which would facilitate development of port related uses without a corresponding increase in truck traffic on Botany Road as trucks would be able to access Foreshore Road directly; and
- proposed traffic management scheme for the Mascot/Green Square area (Maunsell 2002) which is intended to improve traffic safety and efficiency.



Source: Masson, Wilson, Twiney 2001

0 20 80m

Boat Ramp Access Intersection with Foreshore Road

Figure 21.5

Other proposed developments, such as the Southern Arterial, Marrickville Truck Tunnel and signalisation of certain intersections were reviewed, but were not considered further in the modelling as these would probably not be implemented in the medium term or would have a relatively minor impact on the traffic to be generated by the proposed Port Botany Expansion.

21.5.4 Rail Access to the New Terminal

The new terminal would be serviced by three additional rail sidings through the extension of the existing Botany Freight Rail Line around the northern edge of Penrhyn Estuary and into the new terminal. Two of these would be used for unloading/loading of containers while the third siding would be designed as a runaround track which allows an engine to move to the other end of a train. An additional two sidings would be provided along the northern side of the existing Patrick Stevedores terminal, parallel to Penrhyn Estuary, to allow trains to wait and avoid congestion of the Botany Freight Rail Line. A 600 m passing loop would be provided adjacent to Foreshore Road prior to the track entering the new terminal, to allow trains to pass each other.

The geometry of the rail approaches and the length of the sidings for loading/unloading operations would allow the use of longer trains that could take a greater number of containers. The length of the rail sidings would be between 400 m and 600 m. A minimum rail curvature radius of 180 m would be required for the extended rail line and this dictates the alignment for the extension of the rail line to the new terminal.

The proposed rail line extension would be constructed parallel to Foreshore Road. A strip of land would be retained between the rail tracks and the roadside to allow for a pedestrian pathway and a cycleway, and to avoid putting in any foundation or permanent structure next to the road verge where there are existing underground services. Access points would also be provided to allow for maintenance of the rail line.

The construction of the rail line would involve the following:

- a rail bridge crossing the tidal channel to the new terminal;
- two minor rail bridges or culverts crossing over Springvale and Floodvale Drains;
- rail maintenance access points;
- security fencing; and
- signalling, signage and lighting.

The rail track would generally be constructed at the existing ground level. This would require some excavation of surface material and replacing it with suitable foundation material on which high quality, free draining rock ballast would then be placed. Placing and levelling of the sleepers and rails is a specialised operation and would probably be undertaken utilising rail mounted equipment.

21.5.5 Proposed Rail Infrastructure Enhancements

The NSW Government has committed to the future upgrade and duplication of the Botany-Enfield dedicated freight rail line between Cooks River and Botany Yard. Funding of $70 million was confirmed in November 2001 for the project. RIC has already undertaken substantial upgrades along the Enfield-Botany freight line corridor in support of the Government's commitment to increase transport of containers by rail. Planning

undertaken by RIC has confirmed that the upgrade and duplication of the Cooks River to Botany Yard section would provide sufficient capacity to meet the forecast rail freight traffic along the Botany-Enfield line.

The current theoretical capacity of the single line between Cooks River and Botany Yard is 96 train movements per day (two train movements equal one train visit). However, activities at Cooks River, which require shunting activities to utilise the main line, and constraints at Botany Yard reduce this capacity to about 52 movements per day. It is anticipated that the capacity of the single line between Cooks River and the Botany Yard could be further improved by reducing headways and improved operational efficiencies to provide between 72 and 84 train movements per day. With these operational improvements in place, the line would need to be duplicated between 2011 and 2016 to accommodate future freight rail growth. The proposal to duplicate this line is discussed further in **Chapter 2** *Regional Context*.

Once duplication is completed, the capacity of the dedicated freight rail line would be expected to be around 1.3 million TEUs based on 90 to 110 train movements a day, which is adequate to accommodate the 40% mode share of forecast container trade.

Another option being proposed is the South Sydney Freight Line (SSFL), which would extend the current dedicated freight network from where it finishes at Chullora through to Macarthur. This option would allow rural trains from the south and trains from Minto and Leightonfield to utilise it, thus reducing loading on the passenger network between these locations and Port Botany and improving the network's operational flexibility.

The increased rail mode share of container movements would require development of additional intermodal facilities, preferably along dedicated freight rail lines. The development of new intermodal terminals along the dedicated freight line would be a benefit as it would reduce freight traffic on the shared metropolitan network.

21.5.6 Achieving 40% Rail Mode Share

The share of port container throughput moved by rail has increased from 13% in 1995 to 25% in 2002 – a threefold increase in seven years. This increase in rail freight volumes may be attributed in large part to the following factors:

- infrastructure improvements and funding commitments – typified by duplication works by RIC on the Botany- Enfield dedicated rail freight line for which $34 million has been spent to date;
- Government policy support – through the *Action for Transport* and *Action for Air* policies (refer **Chapter 10** *Strategic Policy Considerations*) which call for increased rail mode share of container freight and reduced vehicle emissions, respectively; and
- Commercial considerations – which include rail capability to handle larger volumes and heavier containers compared to trucks, competitive pricing, and guaranteed service windows at the ports leading to increased certainty and reliability of rail freight movement.

Rail is being continually developed as the lower cost higher volume alternative to truck transport. It is anticipated that by 2011 the rail mode share would increase to at least 40% of the forecast Port Botany container trade due to the following:

- further rail infrastructure improvements including:

  - new sidings in the proposed Port Botany Expansion which would provide increased rail capacity and flexibility;
  - planned upgrade of the Patrick Stevedores and P&O container terminals to increase rail handling capacity;
  - proposed dedicated freight rail line from Macarthur to Chullora which would provide the main link from Port Botany to southern NSW and Melbourne;
  - proposed duplication of the Cooks River to Port Botany section of the Enfield-Botany dedicated rail freight line which is expected to provide sufficient capacity to meet the forecast increase in container rail freight to and from Port Botany;
- continued State and Federal government policy support expressed in:
  - a recently released five-point plan to manage Port Botany truck traffic, which sets a new target of 50% rail mode share for container freight by 2010;
  - the Milton Morris Report (*Independent Review of the Proposed Enfield Intermodal Terminal*, Feb 2003) recommending the investigation of future intermodal terminal capacity needs of western Sydney;
  - a national interstate rail track access policy overseen by the Australian Rail Track Corporation;
- environmental considerations such as the need to reduce road congestion and vehicle emissions; and
- commercial drivers such as:
  - joint ventures by container terminal and rail freight operators which are expected to promote rail freight over long hauls backed by local truck distribution;
  - expected doubling of freight over the next 20 years (BTRE Report *Greenhouse Emissions from Australian Transport: Trends to 2020*, 2002); and
  - opening of new industrial areas around the Western orbital in western and southwestern Sydney, which increases opportunities for rail freight volumes to existing and planned intermodal terminals.

21.6 Traffic Forecast

21.6.1 Construction

Road

The main road transport task during construction of the new terminal would be the delivery of rock, piling equipment and concrete to the site. Based on projected material volumes, sequence and rate of construction, the average number of truck deliveries related to major construction traffic has been projected as shown in **Table 21.5**.

Table 21.5 Major Construction Traffic

	AVERAGE NUMBER OF TRUCK DELIVERIES PER WORKING DAY															
	YEAR 1				YEAR 2				YEAR 3				YEAR 4			
Rock Embankment		60	60	60	45											
Piling			5	6	6	6	6	6								
Rock Armouring					42	44	44	44	44	42						
Concrete Works						20	20	20	20	20	20	20	10			
Miscellaneous	5	8	8	10	10	10	10	10	10	10	10	10	8	5	4	3
TOTAL	**5**	**68**	**73**	**76**	**103**	**80**	**80**	**80**	**74**	**72**	**30**	**30**	**18**	**5**	**4**	**3**

The exact sources of supply for the various types of construction materials are not known at this stage, but it is expected that the majority of construction traffic would access the site from the south. The probable route would therefore be via General Holmes Drive and Foreshore Road. Construction traffic would arrive at the site via the major arterial roads (i.e. using the same routes as those already used by port trucks). It is expected that there would be little, if any, use of local residential streets by construction generated traffic.

Rail

It is not anticipated that there would be rail borne construction traffic. However, there may be opportunities to deliver specific materials by rail.

21.6.2 Operation

Road

To forecast road traffic, the assumed growth in Port Botany container trade to be transported by road was converted into truck numbers using the following assumptions:

- 1.35 TEUs per container, increasing to 1.6 TEUs per container by 2021, reflecting the increasing use of forty-foot containers;
- 1.19 containers per truck, based on data from container terminals and consistent with traffic counts conducted as part of the traffic and transport study. This has been scaled up to 1.33 containers per truck by 2021, in recognition of the increased use of more efficient B-double trucks (3 TEU capacity); and
- 8% rate of backloading increasing to 27% in 2021.

On the assumption that the rail mode share would increase in accordance with the strategy of Sydney Ports Corporation, the stevedores and Government to a minimum of 30% by 2006 and a minimum of 40% by 2011, and assuming that the new terminal would handle a minimum of 40% of the total trade, the forecast truck movements during morning and afternoon peak hours would be as shown in **Table 21.6.** Forecasts for an average day are also shown and compared to the daily forecast for the "worst case" scenario of 20% rail mode share (noting that the current rail mode share is already 25%).

Table 21.6 Forecast Truck Movements to and from Port Botany (all terminals)

	CURRENT SITUATION	2011			2016			2021		
		New Terminal	Existing Facilities	TOTAL	New Terminal	Existing Facilities	TOTAL	New Terminal	Existing Facilities	TOTAL
Rail Mode Share	25%	40%			40%			40%		
AM Peak	240	78	178	256	126	190	316	150	226	376
PM Peak	110	36	82	118	58	86	144	94	140	234
Total for average day	2,913	941	2,174	3,115	1,546	2,316	3,862	1,882	2,818	4,700
Total for average day - if rail mode share is 20%		1,124	2,622	3,746	2,062	3,092	5,154	2,509	3,764	6,273

Note: Two truck movements – inbound and outbound – are generated by each truck visit.
Source: Maunsell Australia, 2002.

The estimate of truck movements within the Botany area has also considered the effects of the following new developments:

- Australian Customs Service X-ray facility at Bumborah Point Road, estimated to generate six truck visits per hour for 16 hours a day, or about 100 truck visits; and
- the trade and transport terminal at Molineux Point, which is expected to generate up to 700 truck visits per day.

Rail

Rail traffic was forecast using a rail analysis model which included the following key assumptions:

- imports would represent up to 32% of rail freight by 2021;
- export cargo of metropolitan area origin would increase from 25% to 53% of rail freight by 2021;
- export cargo of rural origin would represent up to 15% of rail freight by 2021;
- additional intermodal terminal capacity would handle 192 TEUs per day in 2006, 770 TEUs per day in 2011, 1,106 TEUs per day in 2016 and 1,410 TEUs per day in 2021, and throughput volumes would be evenly split between imports and exports;
- siding lengths for the existing Port Botany terminals and the existing metropolitan intermodal terminals would not change over the analysis period;
- two siding configurations were considered, the first with 600 m sidings and the second with 400 m sidings. Each configuration included two operational sidings and a third runaround track;
- simplifying assumptions on train and wagon lengths were made due to the complicated nature of existing trains and wagon lengths at metropolitan intermodal terminals;
- simplifying assumptions on train movements were made due to the complex nature of existing movements, particularly trains to/from rural areas; and

- wagon space utilisation, which could be limited by heavy container freight and rolling stock capabilities, would increase from the current 75% to 80% in 2006 and 85% in 2011 onwards.

The forecast number of train movements for each container terminal, assuming that rail has a modal share of 40% by 2011, is shown in **Table 21.7**.

Table 21.7 Forecast Daily Train Movements to Port Botany

	EXISTING*		2006*		2011		2016		2021	
TERMINAL	All	New	All	New	All	New	All	New	All	New
600m#1 Long Sidings at New Terminal	30	0	46	0	62	16	80	26	94	30
400m#2 Long Sidings at New Terminal	30	0	46	0	66	18	92	32	108	38

Note: Two train movements (inbound and outbound) are equivalent to one train visit. Also translates to movements through Botany Yard..
** New Terminal not yet operational*
#1 (2x22m locos + 38 + 14.6 wagons = 598.8m)
#2 (2x22m locos + 25 + 14.6m wagons = 409m)
Source: Maunsell Australia, 2002 and 2003.

21.7 Assessment of Impacts

21.7.1 Construction

Road

Construction generated truck traffic volumes would be significantly lower than the existing volume generated by the port. The estimated 103 truck deliveries per day in the second year, which is the maximum during the construction period, represents about 7% of the existing 1,450 port trucks on an average day). Construction traffic would also represent a very small proportion of peak traffic volumes. As a result, the impact of construction vehicles on the performance of the road system would likely be very minor.

The materials to be delivered to the site (rocks, piling equipment and concrete) would generally be transported by standard articulated and rigid trucks, although depending on the sources, some rock materials may also be delivered by barge. The use of restricted access oversize/overmass vehicles would be unlikely, except possibly for transport of some plant and equipment to and from the construction site (e.g. loaders, dozers, rollers, cranes and graders).

Normal construction working hours would generally apply for landside activities (7 am to 6 pm Monday to Friday; 7 am to 1 pm Saturday). These are generally considered as “daytime” working hours and are in line with EPA guidelines and working hours of other construction projects around Sydney. Some works may be undertaken outside of these hours (e.g. maintenance or road and rail works) to minimise impact on other users. Where the project requires construction work outside these hours, the regulatory authorities and affected stakeholders would be notified.

As pedestrian and cyclist activity on Foreshore Road is currently very low, the construction traffic is expected to have a negligible impact on these road users.

Road and water access would be maintained to a public boat ramp at all times during construction until the new boat ramp becomes available for public use. A new road is to be constructed to the existing boat ramp as part of the current expansion of the Patrick Stevedores terminal and this road would remain available to the public until an alternative boat launching facility has been provided.

An early requirement would be construction of the unsignalised intersection from Foreshore Road to the tug berth/new boat ramp area. This would be required for trucks transporting material for construction of the tug berths and traffic bringing rock embankment material for loading onto barges moored at the berth. Construction of the intersection would cause some minor and temporary disruption to traffic using Foreshore Road. A Traffic Management Plan would be implemented with RTA's concurrence for the duration of the works.

Installation of traffic signals, construction of the right hand turn lane and construction of the acceleration/merge lanes at the main terminal access point would also involve some minor disruption to traffic as would construction of the right hand turn lane. Speed restrictions would need to be applied on Foreshore Road while construction is being undertaken.

The inter-terminal access road would pass through the back of the parking area of the existing boat ramp and therefore construction would not be undertaken until the new boat ramp was opened to the public or additional parking provided at the western side of the existing boat ramp. Construction work would involve some excavation and placing of rock for road foundations. An asphaltic concrete surface would then be placed and compacted. These operations would not add significantly to construction traffic on the southern side of Penrhyn Estuary.

Construction of the grade separation (road over rail) at the Penrhyn Road entry point to Port Botany is expected to result in a number of trucks and construction plant entering and leaving the site. Public roads would be kept open at all times, however, short duration delays to port traffic would be expected throughout this period.

The installation/connection of services would not add significantly to construction traffic.

Rail

The construction of rail infrastructure for the new terminal would have minimal impact at the interface with the existing line.

An additional spur line would be constructed to join the existing rail line prior to it entering the Patrick Stevedores terminal. The extension of the rail line would also include two sidings to the north of the existing Penrhyn Road which would provide an additional train holding/waiting area.

A disruption to the existing service is anticipated during the installation of new turnouts from the existing tracks. The turnouts would connect the rail line extension to the new terminal. The installation could be undertaken at night to minimise operational impact and it is estimated that the work could be completed over a 12-hour period.

21.7.2 Operation

Road

Traffic Generation

The traffic that would be generated by Port Botany has been modelled to produce future road network flows with and without the new terminal at 5-yearly intervals (2006, 2011, 2016 and 2021). The approach assumes that trade growth by 2010 would approach the capacity of the two existing terminals (approximately 1.8 million TEUs), i.e. there would be little growth in port truck traffic after 2010 without the new terminal. With the new terminal, port traffic would continue to grow beyond 2010. The predicted port traffic based on the assumed throughput of Port Botany of 3.2 million TEUs was then overlain on the predicted background traffic by 2016 (TDC forecasts used in the modelling do not extend beyond this year) to provide an upper end to the traffic assessment. This approach shows the incremental differences resulting from the new terminal on road traffic volumes.

The road traffic modelling shows that:

- port truck volumes would be concentrated on Foreshore Road and Botany Road (between Penrhyn Road and Bumborah Point Road);
- total volumes, including light vehicles, would be heaviest on Foreshore Road, Beauchamp Road and Botany Road (between Beauchamp and Penrhyn Roads); and
- port trucks would make up a relatively small proportion of the total future traffic (less than 2%) on routes further from the port area, including Airport Drive, Canal Road and O'Riordan Street; the latter roads would be affected more by growth in airport traffic than Port Botany traffic.

Intersection Performance

The performance of the road system in urban areas would normally be dictated by intersection capacity. Estimated delays at intersections during peak periods provide a good indication of future network performance.

Given that port traffic generally makes up a relatively minor proportion of total traffic on routes beyond the vicinity of the core study area, it would be unlikely that the forecast increase in port traffic would significantly influence the performance of intersections in these areas. Intersections such as Joyce Drive/O'Riordan Street, Botany Road/Gardeners Road, General Holmes Drive/Joyce Drive and Gardeners Road/O'Riordan Street may already be problematic in terms of level of service. Their future performance, however, would mainly be influenced by growth in non-port traffic, particularly airport traffic.

The traffic and transport study, therefore, focused on the following intersections (**Figure 21.1**):

- Foreshore Road/General Holmes Drive;
- Foreshore Road/General Holmes Drive/Airport access;
- Foreshore Road/New Terminal access;
- Foreshore Road/Botany Road/Penrhyn Road;
- Botany Road/Beauchamp Road;

- Botany Road/McCauley Street;
- Botany Road/Container Park Access Road; and
- Botany Road/Bumborah Point Road;

Future turning movements at the above intersections were forecast with and without the new terminal. The former assumes a new intersection at Foreshore Road as the access to the new terminal.

The intersection analysis adopted a "worst case" scenario of 20% rail mode share to define the "upper limit" impact of the new terminal on the road system. The analysis also assumed a 50% throughput share (of assumed container trade volume) in 2011 and 40% in 2016 for the Patrick Stevedores terminal, which would maximise truck numbers accessing the Foreshore Road/Botany Road/Penrhyn Road intersection. It is important to note that the existing rail mode share of 25% is already greater than the scenario used in the intersection analysis and that this level would be further increased to at least 40% by about 2011. Therefore, the "worst case" scenario provides a very conservative analysis of the potential impacts of the additional traffic volumes generated by the proposed Port Botany Expansion on the road network.

The results of intersection analysis, presented in detail in **Appendix P**, show that the forecast increase in traffic generated by Port Botany (including the new terminal) would not result in the deterioration to unacceptable levels of intersection performance in the Port Botany precinct, except for the Patrick Stevedores terminal entry/exit at the Foreshore Road/Botany Road/Penrhyn Road intersection, where the level of service would deteriorate to LOS E in the afternoon peak by 2016 for the 20% rail mode share scenario.

The critical turning move at this intersection would be the right turn from Botany Road (south) into Botany Road (north). Duplicating this right turn lane would achieve LOS C. Such a measure would also require widening Botany Road (north) to accommodate two lanes of northbound traffic to a distance of about 70m from the intersection.

However, for a rail mode share target of at least 40%, there would not be deterioration in the level of service of this intersection to less than LOS D. Therefore, the works described above would not be required to be undertaken.

Rail

Botany Freight Rail Line

As discussed above, duplication of the remaining unduplicated section of the Botany Freight Rail Line, between Botany Yard and Cooks River, would be required between 2011 and 2016 in order to accommodate the forecast freight rail demand from the port at this time.

The number of train movements to/from Port Botany could be reduced by increasing the length of P&O sidings and improving rail operations to avoid splitting of trains and reducing shunting in the port precinct. However, these would not negate the need for the duplication of the freight rail line.

The Botany Yard would have sufficient capacity to process future train volumes. Potential constraints to throughput would be the time required for inspection of wagons and the separation/rejoining of longer trains destined for more than one stevedore. The former constraint could be addressed by changed work practices

and the use of technology, and the latter would be addressed by separating/joining trains at intermodal terminals.

Metropolitan Network

The major rail related issue with regard to future growth in container rail freight would be the impact on the shared metropolitan network of increased freight traffic. Based on the projected number of train paths that would be required to meet future container volumes, there may be capacity concerns on some sections of the metropolitan network. One such area of concern is the Main Western Line, in particular the section between Clyde and Lidcombe. Capacity constraints would be alleviated by increased train lengths from intermodal terminals, reduced headways and the construction of additional dedicated freight lines.

Regional Rail Services

Regional terminals in rural areas would generally be able to cope with the forecast increased number of train movements. However, the anticipated use of longer trains and wagons may lead to lower container wagon space utilisation mainly due to rolling stock capabilities and/or axle load limits.

Rural rail services may also be constrained in the future by existing passing loops which are not capable of handling trains longer than 900 m. These passing loops would need to be extended in order to allow for the passing of 900 m trains.

21.8 Cumulative Impacts

Other major developments in the wider area (roughly bounded by Gardeners Road, Bunnerong Road, Princes Highway and Bay Street) that would be generating road traffic have been considered in a cumulative impact assessment. These include the following:

- expansion of operations at Sydney Airport;
- development of Green Square in Alexandria;
- development of Cooks Cove, Arncliffe;
- a recreation, recycling/waste management and light industrial facility at the Tempe tip site;
- a potential aviation business park at a 20 ha site at Sydney Airport's southeast sector;
- a potential 20 ha warehousing/business park facility on the former Pacific Power site adjacent to Alexandra Canal in Tempe; and
- a potential multimodal cargo facility on Sydney Airport's "Northern Lands" site which is adjacent to the former Tempe tip site.

The locations of these proposed developments are shown in **Figure 21.6**.

A master plan being developed for Sydney Airport is anticipated to provide for an expansion of airport infrastructure, including an expanded terminal, apron, gate and hangar facilities, and baggage and check-in facilities, for the projected passenger volume of up to 63.5 million by 2020 (compared to 25.3 million in 2000). The Green Square project is a 14 ha redevelopment incorporating a mix of commercial and residential land uses. By 2020, the redevelopment is expected to provide for an estimated 20,000 new residents and 20,000 new workers.

Source: Maunsell Australia 2002

0 2.5km

Location of Major Future Developments Within the Subregion of the Project Site

Figure 21.6

A preliminary assessment of cumulative traffic volumes that would be generated by major developments in the subregional study area have been estimated to increase from about 11,700 to about 21,000 vehicles in the (morning) peak hour in 2011, and about 27,000 in the (morning) peak hour in 2021. These traffic forecasts include the predicted increase in traffic generated from an expanded Port Botany. The bulk of the increase in traffic would be generated by Green Square and Sydney Airport, accounting for approximately 50% and 30% respectively of the additional traffic generated by the major developments considered in the cumulative impact assessment. By 2021, the contribution of the expanded Port Botany facilities to total forecast peak hourly traffic flow in the subregional study area would be less than 2%.

The broader transport implications of the cumulative traffic assessment include the following:

- based on existing trends, peak demand for the road network in the Mascot area would exceed capacity by 2011, and a deterioration in the level of service is probable;
- the State Government is addressing this through a road development program and through demand management (*Action for Transport* and *Draft SEPP No 66*);
- notwithstanding this, some adjustment of peak travel demands through peak spreading is likely to take place;
- the Airport Rail Link is likely to play an increased role in serving the passenger transport needs of the area;
- Port Botany traffic represents only a small proportion (less than 2%) of forecast peak traffic volumes; and
- the achievement of Sydney Ports' objective of a rail mode share of 40% (for freight transport) would attenuate the impact of port related traffic on the road system.

The forecast deterioration in the road system's level of service would not be caused by the new terminal, as port traffic would represent a very minor proportion of peak hour total traffic. Most of the projected increase in traffic would be associated with private vehicle travel to Sydney Airport and Green Square.

21.9 Mitigation Measures

21.9.1 Construction

A detailed Construction Traffic Management Plan would be developed and incorporated into the Construction EMP for the project. The plan would include detailed consideration of:

- identification of preferred haulage routes;
- access routes and signage, and access arrangements at the site;
- measures to ensure that Foreshore Road would not be affected by:
  - loading/unloading from the carriageway;
  - queuing; and
  - reversing manoeuvres during construction;

- the need for restrictions on delivery hours and/or routes; and
- the need for measures to protect pedestrians, cyclists and other motorists in the vicinity of the site.

Disruption during the installation of the connection of the rail line extension to the new terminal with the existing rail line to Patrick Stevedores terminal would be addressed by scheduling around peak operations and rescheduling trains as necessary.

21.9.2 Operation

Road

The main strategy that Sydney Ports Corporation would adopt to mitigate the impact of increased port related road traffic would be to encourage an increased rail mode share to at least 40%. The components of the proposed development and other environmental, commercial and policy factors that would help achieve this target were discussed in Section 21.5.6.

Aside from this, the following measures would be implemented by the terminal operator(s):

- increasing truck utilisation by:
  - improving port turnaround time;
  - promoting backloading; and
  - encouraging the use of high productivity vehicles such as B-Doubles, which require less vehicle kilometres and road space per unit TEU load;
- spreading container traffic more evenly throughout the proposed 24 hour operating period; and
- operating road servicing more evenly over 7 days per week.

Measures that promote freight efficiency and increase the use of rail freight would be consistent with key government strategic policies such as *Action for Transport 2010*, *Shaping our Cities* and *SEPP No. 66 Integrating Land Use and Transport* (refer **Chapter 9** *Statutory Planning* and **Chapter 10** *Strategic Policy Considerations*).

Sydney Ports Corporation is not in a position to control the route selection for trucks travelling to/from Port Botany. However, as a State Owned Corporation, it would work with both State and Local Governments to bring a “whole-of-government” approach to addressing potential impact of truck traffic on local amenity. The latter could include working with the terminal operators and trucking companies to encourage the use of alternate routes to minimise impacts on local residents.

A report documenting the proportion of cargo transported to/from Port Botany by road and rail, and the average daily truck trips to Port Botany, would be provided to the RTA and City of Botany Bay Council in 2011, 2016 and 2021.

Rail

The forecast increase in port related rail traffic would need to be addressed by operational enhancements initially and then infrastructure augmentation. Within the new terminal, Sydney Ports Corporation would provide the following rail facilities to facilitate loading/unloading and improve train turnaround times:

- three rail sidings from the extension of the existing Botany Freight Rail Line into the new terminal, two of which would be used for loading and unloading containers;
- additional two sidings along the northern side of Patrick Stevedores terminal to provide a waiting area for trains and avoid congestion of the Botany Freight Rail Line.

Rail infrastructure and operational issues would not be the responsibility of Sydney Ports Corporation directly. However, Sydney Ports Corporation would work with the Office of Coordinator General of Rail, Transport Coordination Authority, RIC, the terminal operators, logistics companies and intermodal terminal operators to help achieve the necessary enhancements that would cater for the growth in rail freight to and from Port Botany, including:

- duplication of the dedicated freight line between Cooks River and Botany Yard between 201and 2016;
- trip scheduling to reduce the use of mixed carriages that need to be split to go to separate port terminals;
- use of longer trains;
- improvements to existing intermodal terminals, such as increasing siding lengths and terminal capacity, and improving local handling efficiency;
- new shunting neck at Cooks River by 2021, if detailed train operational planning cannot mitigate the effect of shunting on the main line;
- improvements to the shared metropolitan network by reducing headways through signalling changes;
- construction of additional dedicated freight lines;
- construction of new intermodal terminal(s) on dedicated freight lines to reduce the need for trains to travel on the shared metropolitan network; and
- upgrade of passing loops in rural areas to allow for 900 m trains.

21.10 Conclusion

The bulk of Sydney's container throughput comes through Port Botany, with 75% of this volume currently moved by road. This amounts to approximately 1,450 truck visits each day (one truck visit is equivalent to two truck movements – inbound and outbound). With the growth in container trade and with the addition of the proposed new terminal, the average daily volume of trucks visiting Port Botany is expected to rise to about 2,350 by 2021. Once fully developed, the proposed new terminal would provide about 40% of the total container port capacity and would generate about 940 truck visits per day.

The traffic impact assessment study assumed that trade throughput at Port Botany would increase to 3.2 million TEUs by 2021. This assumed volume is higher than the projected container growth in Port Botany.

The findings of the traffic assessment would therefore be considered conservative in respect of the forecast traffic volumes and potential impacts on landside transportation arising from the growth in container trade at Port Botany.

It has been assumed that the volume moved by rail would be 30% of container throughput by 2006 and 40% by 2011.

The forecast increase in traffic generated by Port Botany (including the new terminal) would not result in the deterioration to unacceptable levels of intersection performance in the Port Botany precinct. This is based on analysis using a "worst case" scenario rail mode share of freight traffic at a low 20%, where traffic modelling showed a deterioration in the level of service to LOS E would occur in one of eight major intersections analysed. It should be noted, however, that current rail mode share is already at 25% and is being encouraged to increase to at least 40% by 2011. Therefore, intersection performance analysis using the "worst case" scenario presents a very conservative assessment and it would be anticipated that an upgrade of the Foreshore Road/Botany Road/Penrhyn Road intersection would not be required.

Although the port is perceived as a major generator of traffic, it would only generate less than 2% of total (morning) peak hourly traffic flows at the subregional level by 2021. Other development including Green Square and Sydney Airport are projected to account for the greater part of the increase in cumulative traffic volumes.

The proposal by the NSW Government, through RIC, to duplicate the rail line between Cooks River and Botany Yard would complete the full duplication of the dedicated freight rail line between Port Botany and the Enfield Marshalling Yards. Once completed, the duplication would increase the capacity of the dedicated freight rail line to around 1.3 million TEUs, based on 90 to 110 train movements a day, which would be adequate to accommodate the 40% mode share of forecast container trade growth.