Current industry practice is for the majority of containers unloaded at external depots to return to an empty container store, before being called up for stuffing by customers for export.

Figure 2-2 shows the annual movement of containers and freight through the MITF.

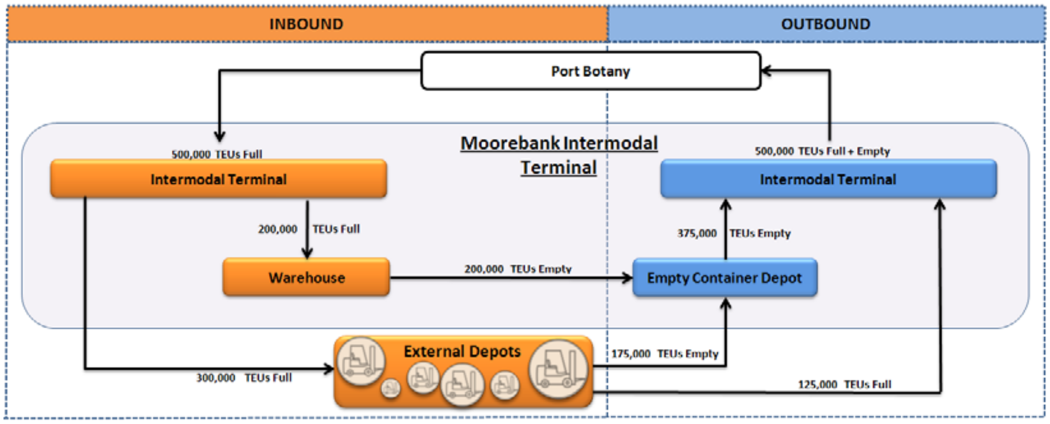

Figure 2-2 Container Movement through MITF

In addition to truck movements generated by the transport of shipping containers offsite, rigid truck trips will be generated by the transport of freight which will be unpacked within SIMTA (200,000 TEUs). This freight will either be distributed directly to customers, or to customers via other distribution warehouses outside of SIMTA.

The calculation of daily articulated truck (i.e. carrying containers) generation from annual TEUs is presented in Section 2.1.2. The calculation of rigid truck (i.e. unpacked freight) generation from annual TEUs is presented in Section 2.1.3.

2.1.2 Calculation of Daily Articulated Truck Generation

A total of 600,000 TEUs (two-way total) was assumed for articulated truck generation.

The calculation of articulated trucks from 600,000 TEUs are:

1 Of the total containers 60% will be 40ft containers and 40% 20ft containers (i.e. one TEU). Therefore on average each shipping container is equivalent to 1.6 TEUs. Therefore to convert the TEUs throughput to individual containers:

$$\boxed{600{,}000\ TEUs\ per\ year \div 1.6\ TEUs\ per\ container = 375{,}000\ containers\ per\ year}$$

2 The facility will operate 52 weeks of the year, therefore the number of containers each week is calculated as:

$$\boxed{375{,}000\ containers\ per\ year \div 52\ weeks = 7{,}212\ containers\ per\ week}$$

3 Containers will arrive every day of the year. In a typical week 85% of containers are processed on weekdays (Monday-Friday), with the remaining 15% processed on Saturday and Sunday. Therefore the number of containers generated each weekday is:

$$\boxed{\begin{gathered}7{,}212\ containers\ per\ week \times 85\%\ in\ weekdays \div 5\ weekdays \\ = 1{,}226\ containers\ per\ weekday\end{gathered}}$$

4 Semi-trailers will carry one 40ft container and B-doubles will carry a 20ft container and a 40ft container. Based on a 2004 survey of Swanston and Webb Docks (Melbourne) each truck (semi-trailers and B-doubles combined) was assumed to carry 1.3 containers on average. This implies a 70/30% split between semi-trailers and B-Doubles. The number of truckloads per day is calculated as:

$$1{,}226\ containers\ per\ weekday \div 1.3\ containers\ per\ truck$$
$$= 943\ truckloads\ per\ weekday$$

5 The majority of articulated trucks will carry a load in one direction only, either to or from the Terminal. Therefore each container movement will result in 2 truck trips. However, 30% of articulated trucks will carry containers in both directions (i.e. back-loading). Therefore, accounting for back-loading, the total number of truck movements per weekday is calculated as:

$$943\ truckloads\ \times 2\ directions - (30\% \times 943\ truckloads)$$
$$= 1{,}603\ truck\ movements\ per\ weekday$$

Therefore, at ultimate development the SIMTA site will generate 1,603 articulated truck movements (both directions) each weekday.

2.1.3 Calculation of Daily Rigid Truck Generation

The analysis assumed that about 200,000 TEUs would be unpacked into warehouses within the Terminal. The unpacked freight will be transported off-site by rigid trucks.

A total of 200,000 TEUs of freight will be generated by this activity.

The calculation of daily rigid trucks is shown below. The calculation is identical to that used for the articulated trucks for steps 1 to 3, albeit with a different TEU volume.

1 Of the total containers 60% will be 40ft containers and 40% 20ft containers (i.e. one TEU). Therefore on average each shipping container is equivalent to 1.6 TEUs. Therefore to convert the TEUs throughput to individual containers:

$$200{,}000\ TEUs\ per\ year \div 1.6\ TEUs\ per\ container = 125{,}000\ containers\ per\ year$$

2 The facility will operate 52 weeks of the year, therefore the number of containers each week is calculated as:

$$125{,}000\ \text{containers per year} \div 52\ \text{weeks} = 2{,}404\ \text{contain}ers\ per\ week$$

3 Containers will arrive every day of the year. In a typical week 85% of containers are processed on weekdays (Monday-Friday), with the remaining 15% processed on Saturday and Sunday. Therefore the number of containers generated each weekday is:

$$2{,}404\ containers\ per\ week \times 85\%\ in\ weekdays \div 5\ weekdays$$
$$= 409\ containers\ per\ weekday$$

4 Each container will carry 12.66 tonnes of unpacked freight on average and rigid trucks transporting unpacked freight will carry 10 tonnes each. Therefore the number of truckloads generated per weekday is calculated as:

$$409\ containers \times 12.66\ tonnes \div 10\ tonnes\ per\ truck$$
$$= 517\ truckloads\ per\ weekday$$

5 All rigid trucks will carry a load in one direction only, either to or from the Terminal. Therefore each container movement will result in 2 truck trips.

$$517\ truckloads\ per\ weekday \times 2\ directions$$
$$= 1035\ truck\ movements\ per\ weekday$$

Therefore, at ultimate development the SIMTA site will generate 1,035 rigid truck movements (both directions) each weekday.

For simplicity the above calculations assume that all trucks that carry un-packed freight from the SIMTA site to off-site customers will be rigid trucks. It is likely that a small proportion, (10-20%), of these trucks will be articulated trucks instead of rigid trucks. While this may change the proportion split between articulated and rigid trucks, the total number of truck movements will not be changed by this assumption.

2.1.4 Daily Truck Generation

According to the "business as usual" assumptions a total of 2,638 truck movements (i.e. both directions) will be generated by the Moorebank Terminal each weekday. This total is composed of 1,603 articulated truck movements carrying containers and 1,035 rigid truck movements carrying unpacked freight. The daily truck generation is split down into hourly demand as described in the following section.

2.1.5 Peak Hour Truck Generation

AM and PM peak hour truck generation was calculated based on total daily generation (2,638 per weekday) and a daily truck activity profile. The SIMTA site is anticipated to operate 24 hours a day, 7 days a week. Semi-trailer, B-double and rigid truck movements have individual profiles.

There are no intermodal terminals within NSW that have the same size and function as SIMTA and therefore no identical daily trip profile of truck movements could be used. The daily profile used for the Enfield Traffic Study has instead been adopted. The daily truck activity profile used in the Enfield Traffic Study was originally based on truck movements to/from Port of Melbourne. While it is recognised that Port of Melbourne does not include significant warehousing facilities, and does not operate as an intermodal terminal, the profile has been adopted as the most likely "business as usual" profile of daily truck movements.

The SIMTA site is planned to operate 24 hours per day, 7 days a week. B-Double, semi-trailer and rigid truck movements pick up in the morning from about 05:00 onwards and remain fairly consistent throughout the day. Semi-trailer and B-double movements continue into the evening with reasonable volumes, however the number of rigid truck trips drop off significantly in the evening from about 17:00 onwards.

It is assumed that site maintenance activities will be carried out between 3:00am and 5:00am based on typical intermodal terminal operation. Consequently, traffic generation over these two hours is expected to be low.

The hourly truck generation profile for SIMTA site is shown in Figure 2-3 and provided as a table in Appendix A.

The profile shows that the AM and PM peak hour for truck movements will occur at 07:00-08:00 with 204 trucks per hour and 14:00-15:00 with 245 trucks per hour respectively. AM and PM peak hour truck movements will represent 7.7% and 9.3% of total daily truck movements respectively.

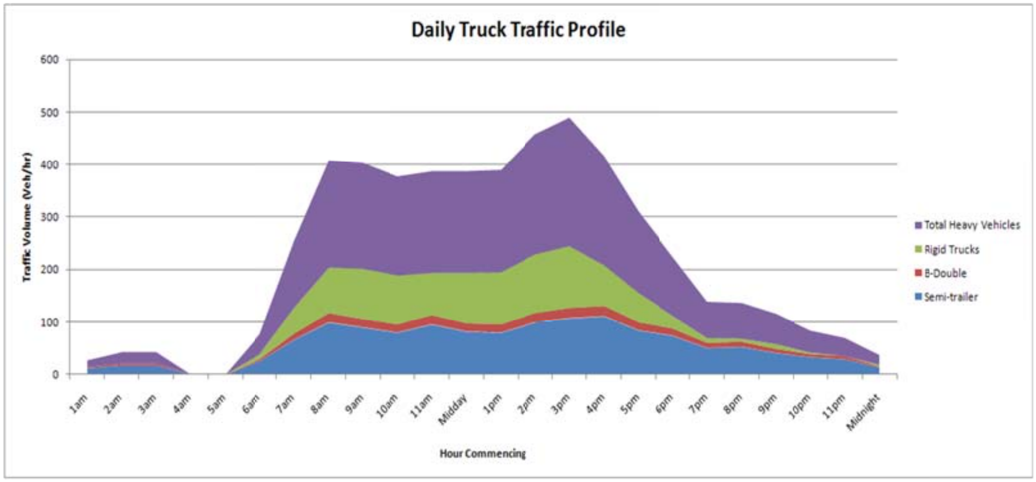

Figure 2-3 SIMTA Daily Truck Generation Profile

Truck generation during the AM peak will coincide with the AM road peak (07:00-08:00), while the PM road peak (16:00-17:00) occurs two hours after the PM truck peak. The total truck generation during the PM road peak period is 155 trucks per hour, representing 5.9% of total daily truck movements.

Peak hour truck generation is summarised in Table 2-1.

Table 2-1 Peak Hour Truck Generation Summary

	Road Peak (07:00-08:00; 16:00-17:00)		Truck Peak (07:00-08:00; 14:00-15:00)	
Truck Type	**AM**	**PM**	**AM**	**PM**
Semi-trailer	99	83	99	107
B-Double	17	16	17	19
Artic. Total	**116**	**99**	**116**	**126**
Rigid	87	56	87	118
Total	**204**	**155**	**204**	**245**

Trucks will be arriving and departing throughout the day, with only short periods stationary within the Terminal. In some cases trucks will enter and exit within the same hour. The in/out split of trucks was therefore assumed to be a 50%/50% split.

2.2 Employee Traffic Generation

Employee traffic generation was calculated based on Gross Floor Areas (GFAs) proposed in the SIMTA proposal Masterplan.

2.2.1 Employment Activities

In addition to the trips generated by freight related activities, employee trips are generated by warehouse and ancillary freight village and train terminal operational staff.

Warehouse and Distribution Centres

The majority of staff will work in the warehouses and distribution centres unpacking containers or preparing the contents for distribution. The warehouse is planned to have a GFA of 292,000 m^2. Using a warehouse employment density rate determined for existing facilities (160m^2 per employee), it is estimated that there would be about 1,825 staff working in the warehouses and distribution centres.

The analysis assumed that SIMTA (terminal warehouses) will operate in two shifts over part of the day. It is expected that the first shift will start prior to 07:00 and finishing around 16:00. The second shift would start at around 16:00 and finish after 12:00 midnight. Actual start and finish times is expected to be staggered to spread out parking and traffic demand.

Office and Ancillary

The majority of office and ancillary staff would work during the normal working hours, with some staff required to support early morning and late evening shifts. Based on an estimated office GFA of 4,400m^2 provided in the Master Plan and an employment density rate of 18m^2 per employee, 244 administration staff will be required on a weekday.

Retail

Retail facilities will mainly be services such as food outlets and convenience stores for other staff. The facilities will be required to provide services during each of the main warehouse shifts. Based on a retail GFA provided in the Master Plan (about 1,700m^2 and an employment density rate of 20m^2 per employee), about 85 retail staff will be required. Within the SIMTA proposal, a small hotel is proposed. About 64 staff is estimated for operation of the 80 room hotel facility. A total of 149 staff has been estimated.

Train Terminal

It is expected that additional 40 staff will be required to operate the SIMTA train terminal.

In summary, a total of 2,258 staff will be required for each weekday spread across the sites normal operating hours. Table 2-2 summarises the on-site employee requirements based on GFA provided in the Master Plan.

Table 2-2 On-site Employee Requirements

Function	Area (m^2)[1]	Employment density rate[2]	Number of employees
Warehouse and office inside warehouse	292,000	160m^2 / employee	1,825
Office and Ancillary	4,400	18m^2 / employee	244
Retail - support staff on site, café (including 64 hotel staff[3])	1,700	20m^2 / employee	149
Operational staff - train terminal[4]			40
		Total	**2,258**

Note: **1.** Area information is based on Master plan Option 5 prepared by Reidcampbell in Sept 2010; **2.** Staffing ratios determined from existing developments; **3.** Most hotel guests will be intermodal business related. The proposed hotel will contain up to 80 rooms. The World Tourist Organization suggests 8 staff per 10 rooms for a 3 star hotel. http://www.city-of-hotels.com/165/hotel-staff-en.html; **4.** Information provided by SIMTA .

The *Needs Assessment for Moorebank Intermodal Facility* (PWC, March 2011) has estimated a maximum ongoing direct operational employment of 2,840. This estimate is about 25% higher than the calculated staff totals calculated from GFA contained in the Master Plan. . A higher staff total has been considered as a sensitivity test in Section 4.3.

2.2.2 Travel Mode Split

Journey to Work (JTW) data 2006 compiled by the Bureau of Transport Statistics (BTS) has been used to determine existing mode share of Moorebank area. The JTW data relates to trips to places of employment within travel zones 1108, 1110, 1113 and 1120 in Moorebank. The zones comprise employment areas along Moorebank Avenue and include the Intermodal site. The zones also include some residential land between Moorebank Avenue and Heathcote Road, and south of Cambridge Avenue. The extent of the zones are shown in Figure 2-4.

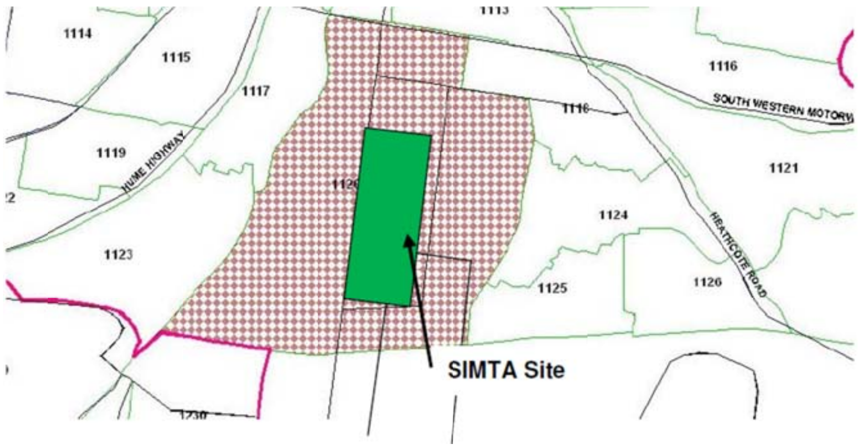

Figure 2-4 Extent of Travel Zone in Study Area

Analysis of the Journey-to-Work data, shown in Table 2-3 indicated that around 85% of people surveyed travelled to work by private vehicle (driver and passenger), while 3% of workers travelled by public transport. The remainder were walk/cycle trips (5%), indicating that a proportion of employees live locally. The remainder worked from home, did not travel, or not stated (8%).

Table 2-3 Daily Work Trip Model Share to and from Moorebank Study Area

Travel Mode	Study Area as Workplace (Inbound trips)	% Study Area as Workplace
Car Driver	5,444	78%
Car Passenger	466	7%
Public Transport	213	3%
Others (walk, cycle, etc)	328	5%
Work at home, did not travel, or not stated	534	8%
Total	6,985	100%

Source: TDC 2006 TZ06: 1108,1110, 1113 and 1120

The low public transport usage (3%) is due to the fact that the site is poorly served by public transport.

One bus service (Route 901) connects Liverpool Station with the development site, before continuing to Wattle Grove and terminating at Holsworthy Rail Station. The route is shown in

Figure 2-5. One morning service before 07:00 and one afternoon service before 16:00 are extended to include the DNSDC site.

The first bus leaves Liverpool Station at approximately 05:30 with the last bus returning to Liverpool Station at 20:50. The service frequency ranges from half hourly in the morning and evening peak periods and hourly between the peaks. The existing service could be of direct benefit to staff of SIMTA.

Figure 2-5 Existing Bus Route (190) on Moorebank Avenue

Longer distance trips to the DNSDC site are served by rail with the site located near to Liverpool, Casula and Holsworthy train stations. Liverpool and Casula are served by the South and Inner West Lines. The Bankstown and Cumberland Lines start and terminate at Liverpool, while Holsworthy station is located on the Airport and East Hills Line.

Liverpool Station is approximately 3 kilometres north west of the Intermodal site with the 901 bus service providing a connection between them.

Casula Station is approximately 1 kilometre west of the SIMTA proposal. There is currently no direct connection. Holsworthy Station is approximately 3.4 kilometres south east of the Intermodal site. The sites are linked by the 901 bus service on Anzac Road.

There is significant scope for improving public transport services to Moorebank as part of the SIMTA proposal. A Transport Management and Accessibility Plan (TMAP) have been prepared for the site (see Section 8 of Hyder's Main Traffic Report) which outlines the measures required to increase the public transport mode share.

For the impact assessment purpose, it was assumed that about 80% of employee trips would be made by private vehicle (car driver, car passenger) when the SIMTA site is fully developed. The employee car mode share is considered to be a conservative estimate in the long term for modelling purpose. There is scope to encourage a more favourable employee public transport mode share where a Travel Demand Management (TDM) approach is adopted on the site and measures put in place to better link the site to the nearby passenger rail network.

2.2.3 Daily Employee Trip Generation

With 2,258 personnel working on site, a total of 4,516 car movements will be generated to or from the site each weekday. Assuming 80% of these movements will be made by private car (driver or passenger), about 3,613 car movements will be generated.

2.2.4 Peak Hour Trip Generation

Based on assumptions around the individual daily shift patterns for warehousing and ancillary freight village (office, retail and train terminal operations), the total daily car trips were distributed throughout the day. Shift assumptions for the warehousing and freight village facilities are summarised in Appendix B. Figure 2-6 shows the assumed distribution of car trips throughout the day.

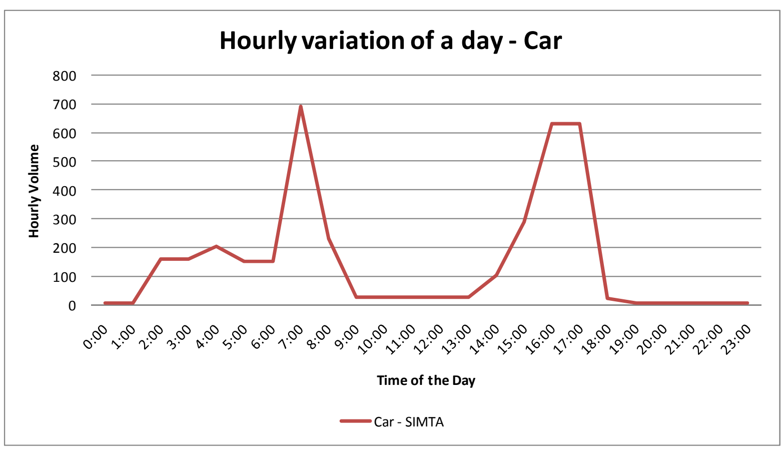

Figure 2-6 Weekday Distribution of Car Trips

The profile shows that the AM and PM peak hour for private car movements will occur at 07:00-08:00 and 16:00-18:00 (flat 2-hrs) respectively. Peak hour car movements will represent 19.1% and 17.4% of total daily car movements respectively. The total car movements during the AM and PM peak hours are 692 and 630 cars per hour respectively.

Private car trip generation during the AM and PM peaks will coincide with the general AM and PM road peaks observed at 07:00-08:00 and 16:00-17:00.

Peak hour car generation is summarised in Table 2-4.

Table 2-4 Peak Hour Private Car Generation Summary

	Road Peak (07:00-08:00; 16:00-17:00)		Truck Peak (07:00-08:00; 14:00-15:00)	
	AM	PM	AM	PM
Private Car	**692**	**630**	**692**	**630**

Note: The directional split of trips into and out of the Terminal was determined through analysis of employee shifts. The assumptions that determine this in/out split are provided in Appendix B.

2.3 Development Staging

For trip generation estimation purpose, it was assumed that up to 500, 000 TEUs (per annum) throughput could be achieved by 2021. The full one million TEU's could be achieved by 2031.

2.3.1 Traffic Generation Staging

Table 2-5 lists the predicted traffic volumes for 500,000 and one million TEUs.

Table 2-5 Weekday Daily Traffic Generation Forecasts in each stage

Indicative Year	TEU Processed in total	Average Daily (Weekday)		AM Peak 1 hour (7-8am)		PM Peak 1 hour (4-5pm)	
		Car	Truck	Car[1]	Truck	Car[1]	Truck
2021	500,000	2,492	1,313	317	104	435	76
2031	1,000,000	3,614	2,638	692	204	630	155

Note: 1. Car trips for one peak hour is estimated to be 50% of two peak hour trips

The resulting traffic generation is shown in Figure 2-7.

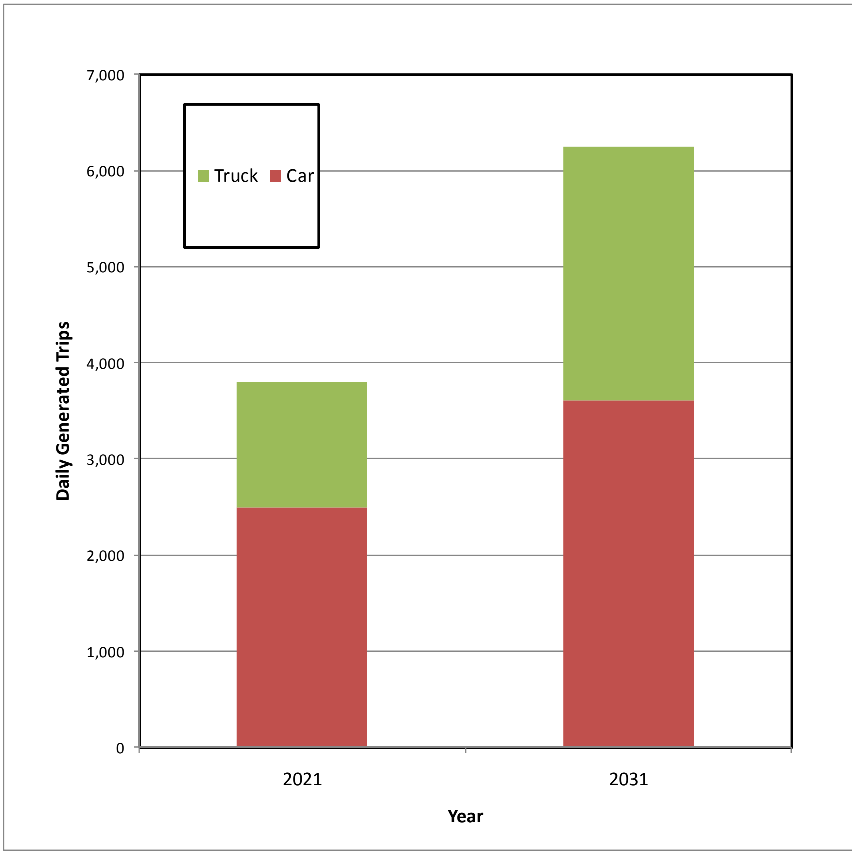

Figure 2-7 Weekday Daily Traffic Generation Forecasts

The estimates of future traffic volumes are based on current vehicle types, container sizes and existing commuter travel. Sensitivity testing of some key assumptions is described in Section 4.

3 VALIDATION OF TRUCK GENERATION

This chapter outlines an exercise to validate the calculated truck generation for the SIMTA proposal against other similar developments, and related work.

3.1 Port Botany EIS Truck Generation

The Port Botany Environmental Impact Statement[4] sets out the growth in container movements and traffic expected at the Port through to 2021.

The report indicated in 2021 forecast year the EIS forecasted 3.2 million TEUs would come through the Sydney Port. Under the assumption (worst-case) that only 20% of these containers would be transported by rail, the report forecasts a traffic generation of 6,273vpd, with 376vph and 234vph in the AM and PM peak hours respectively. Peak hour traffic represented 6.0% and 3.7% of total daily truck generation.

This corresponds to a daily traffic generation rate (per million TEUs) of:

$$\frac{6{,}273 \ vehicles\ per\ day}{(3.2\ million\ TEUs - 20\%\ by\ rail)} = 2{,}450\ vpd\ per\ million\ TEUs$$

If we assume that the SIMTA proposal generates truck traffic at a similar rate to the Port Botany, it would be possible to compare this figure against the SIMTA traffic generation.

The intermodal nature of the SIMTA proposal will therefore result in the generation of smaller rigid trucks, collecting unpacked freight (40% of TEUs) from on-site warehousing facilities. Consequently, for the same volume of freight as transported through the Port Botany, the SIMTA proposal is likely to generate a larger total number of trucks (i.e. more smaller rigid trucks).

3.2 Analysis of Enfield Truck Generation

On behalf of the Sydney Ports Corporation, SKM prepared an analysis of the traffic impacts of the proposed Enfield Intermodal Logistics Centre. The EIS traffic report[5] calculated the total traffic generation from first principles. The Enfield ILC and SIMTA will serve the same intermodal function, albeit with different capacities. The Enfield ILC is planned to have a maximum capacity of 300,000 TEUs per annum, in contrast to the 1,000,000 TEU capacity of SIMTA. Otherwise, both terminals are expected to operate in a very similar way, receiving freight containers from Port Botany via rail, transferring directly off-site via articulated trucks, unpacking freight on site for distribution by rigid trucks, and receiving full and empty containers for return to Port Botany.

Truck generation from the 300,000 TEU per annum Enfield ILC was calculated to be 826 truck movements per day, with 60 and 45 trucks per hour in the AM and PM peak hours respectively. This “generation rate” equates to 2,753 daily trucks movement per million TEUs. The peak hours represented 7.3% and 5.4% of daily traffic in the AM and PM peaks respectively.

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[4] Port Botany Environmental Impact Statement, Sydney Ports Corporation, 2004.

[5] Enfield Intermodal Logistics Centre – Final Transport Working Paper, Appendix B – Traffic and Transport (July 2005)

3.3 Summary

A summary of daily and peak hour truck generation rates is provided in Table 3-6. It shows that daily truck generation estimates (per million TEUs) from independent sources are very close to the daily truck generation calculated using the SIMTA proposal “business as usual” assumptions. When fully developed, SIMTA is expected to generate about 2,638 trucks movements per day. The estimated truck movements for SIMTA site is in line with the Port Botany EIS estimate and the Enfield Traffic Report estimate.

The peak hour factors, as percentage of daily traffic, are also within the range of other independent data sources/estimates.

Table 3-6 Summary of Daily Truck Generation Comparisons

Source	Daily Truck Generation (per 1 million TEUs)	AM Peak Hour (% of daily traffic)	PM Peak Hour (% of daily traffic)
Port Botany EIS	2,450	6.0%	3.7%
Enfield ILC Traffic Report	2,753	7.3%	5.4%
SIMTA Proposal	**2,638**	**7.7%**	**9.3%**

This conclusion provides confidence in the assumptions used and the resulting outcome for daily truck generation to and from SIMTA.

4 SENSITIVITY TESTING

The RTA have indicated that sensitivity testing should be carried out around key assumption values. This section summarises results from sensitivity testing exercise to assess the impact of changing container size, vehicle utilisation and employee totals.

The “business as usual” daily traffic generation from SIMTA can be summarised as:

- 1,603 articulated trucks per week day
- 1,035 rigid trucks per week day
- (2,638 total trucks per week day)
- 3,613 cars per week day

4.1 Change in Container Size

There is a trend towards the use of larger containers, increasing the proportion of 40ft containers. The “business as usual” analysis assumes that 60% of containers are 40ft containers. The Sydney Ports Corporation (SPC) Port Freight Logistics Plan (2008), which outlines the key forecast efficiency indicators, predicts a change in the ratio of 40ft and 20ft containers from 60%/40% (2006) to 65%/35% by 2016.

Sensitivity testing showed that if the proportion of 40ft containers increased to 70% the total articulated truck generation would reduce by 4%. There is no change in the number rigid trucks required since the total freight volume remains constant. Increasing the proportion of 40ft containers will therefore reduce the number of articulated trucks required. Our current “business as usual” assumption is therefore considered conservative.

4.2 Vehicle Utilisation

B-doubles are assumed to carry a 20ft container and a 40ft container. Semi-trailers are assumed to carry one 40ft container only. The “business as usual” truck utilisation of 1.3 containers per truck (equivalent to 2.08 TEUs per truck) represents a split between B-doubles and semi-trailers of about 30% and 70% respectively.

The SPC Freight Logistics Plan forecasts an increase in truck utilisation from 2.1 (2006) to 2.3 by 2016. Sensitivity testing was carried out on a range of vehicle utilisation parameters. Table 4-7 shows the impact of changing truck utilisation, increasing the proportion of B-doubles to 40%, 50%, 60% and 70%.

Table 4-7 Sensitivity to Vehicle Utilisation

Vehicle Utilisation (containers per truck)	Vehicle Utilisation (TEUs per truck)	Total Truck Generation (per week day)	% Change in Truck Generation compared to BAU
1.3 (Business as usual)	2.1	2,638	-
1.4	2.2	2,523	4% reduction
1.5	2.4	2,424	8% reduction
1.6	2.6	2,337	11% reduction
1.7	2.7	2,261	17% reduction

Sensitivity testing showed that increasing the truck utilisation has the potential to reduce the total truck generation. Again, there was no reduction in the total number of rigid trucks.

4.3 SIMTA Site Employee Totals

The "business as usual" assessment assumed a total of 2,258 employees, generating a total of 3,613 car movements per week day. However the Needs Assessment for Moorebank Intermodal Terminal Facility (PWC, March 2011) estimates a maximum of 2,840 employees; about 26% increase. Assuming the same proportion of employment between the warehouse and ancillary freight village staff, this number of employees would result in about 4,544 movements per week day.

The sensitivity of car movements is directly related to total employment on site. Therefore an increase in employment will result in a pro-rata increase in week day car movements.

APPENDIX A

DAILY PROFILE OF TRUCK ACTIVITY

	Total Movements									
	Semi-trailer		B-Double		Total Container Trucks		Rigid Trucks		Total Heavy Vehicles	
Hour Commencing	Count	%	Count	%	Count	%	Count	%	Count	%
Midnight - 1am	12	0.9%	2	0.8%	14	0.5%	0	0.0%	14	0.5%
1am - 2am	17	1.3%	4	1.6%	21	0.8%	0	0.0%	21	0.8%
2am - 3am	17	1.3%	4	1.6%	21	0.8%	0	0.0%	21	0.8%
3am - 4am	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
4am - 5am	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
5am - 6am	25	1.9%	4	1.6%	29	1.1%	9	0.9%	38	1.5%
6am - 7am	66	4.9%	12	4.7%	78	2.9%	50	4.8%	128	4.8%
7am - 8am	99	7.3%	17	7.0%	116	4.4%	87	8.4%	204	7.7%
8am - 9am	89	6.6%	16	6.3%	105	4.0%	97	9.3%	201	7.6%
9am - 10am	80	5.9%	16	6.3%	95	3.6%	93	9.0%	189	7.1%
10am - 11am	95	7.0%	17	7.0%	113	4.3%	81	7.8%	194	7.3%
11am - Midday	82	6.0%	16	6.3%	97	3.7%	97	9.3%	194	7.3%
Midday - 1pm	80	5.9%	16	6.3%	95	3.6%	100	9.6%	195	7.4%
1pm - 2pm	99	7.3%	17	7.0%	116	4.4%	112	10.8%	229	8.7%
2pm - 3pm	107	7.9%	19	7.8%	126	4.8%	118	11.4%	245	9.3%
3pm - 4pm	111	8.2%	19	7.8%	130	4.9%	78	7.5%	208	7.9%
4pm - 5pm	83	6.2%	16	6.3%	99	3.8%	56	5.4%	155	5.9%
5pm - 6pm	74	5.4%	14	5.5%	87	3.3%	25	2.4%	112	4.3%
6pm - 7pm	50	3.7%	10	3.9%	60	2.3%	9	0.9%	70	2.6%
7pm - 8pm	52	3.9%	10	3.9%	62	2.4%	6	0.6%	68	2.6%
8pm - 9pm	41	3.0%	8	3.1%	49	1.8%	9	0.9%	58	2.2%
9pm - 10pm	33	2.4%	6	2.3%	39	1.5%	3	0.3%	42	1.6%
10pm - 11pm	29	2.1%	6	2.3%	35	1.3%	0	0.0%	35	1.3%
11pm - Midnight	14	1.0%	2	0.8%	16	0.6%	3	0.3%	19	0.7%
Total	1355	100.0%	248	100.0%	1603	60.8%	1035	100.0%	2638	100.0%
% of type of trucks	51%		9%				39%			100.0%

Source: Based on Enfield Intermodal Centre EIS traffic distribution in a weekday

APPENDIX B

EMPLOYEE SHIFT WORK ASSUMPTIONS

				To the site (Inbound)					From the site (Outbound)				
Function	**Working Periods**	**Function %**	**Projected Number of staff**	**Before 7am**	**AM Peak (7-9am)**	**Before 4pm**	**PM Peak (4-6pm)**	**After 6pm**	**Before 7am**	**AM Peak (7-9am)**	**Before 4pm**	**PM Peak (4-6pm)**	**After 6pm**
Warehouse (See Note 5)	Normal working hour (8am-5pm)	38%	694	10%	90%					2%	10%	88%	
	Day-shift (5am-4pm)	39%	712	70%	30%					2%	30%	68%	
	Night-shift (4pm-3am)	23%	420			70%	30%						100%
	Subtotal	100%	1,825										
Office (See Note 6)	Normal working hour (8am-5pm)	80%	196		100%							100%	
	Day-shift (5am-4pm)	10%	24	70%	30%					2%	10%	88%	
	Night-shift (4pm-3am)	10%	24			70%	30%						100%
	Subtotal	100%	244										
Retail (Support staff on site) (See Note 5)	Normal working hour (8am-5pm)	38%	57		100%							100%	
	Day-shift (5am-4pm)	39%	58	70%	30%						30%	70%	
	Night-shift (4pm-3am)	23%	34			70%	30%						100%
	Subtotal	100%	149										
Operational staff - train terminal (See Note 7)	Normal working hour (8am-5pm)	20%	8		100%							100%	
	Day-shift (5am-4pm)	40%	16	90%	10%						10%	90%	
	Night-shift (4pm-3am)	40%	16			90%	10%						100%
	Subtotal	100%	40										
	Grand Total	N/A	2,258										

Note (5) Warehouse and retail shift info is based on Intermodal Logistics Centre at Enfield EIS (prepared in October 2005)
Note (6) The majority of office staff would work during the day but some staff would be requried to support monring and night shifts. Their shift split is from Hyder's assumption.
Note (7) The terminal would be staffed 24 hours per day. The major shift would be a morning and night shift. Their shift split is from Hyder's asseumption.
Note (8) Hyder estimates their percentage of arrival and leaving rate.

Appendix E

Paramics (Traffic) Model Audit Report by Halcrow

SIMTA

SYDNEY INTERMODAL TERMINAL ALLIANCE

Part 3A Concept Plan Application

Traffic and Transport

August 2013

SIMTA Moorebank Intermodal Terminal Proposal

Paramics (Traffic) Model Audit

29 July 2011

Prepared for

Sydney Intermodal Terminal Alliance (SMITA)

SIMTA Moorebank Intermodal Terminal Proposal
Paramics (Traffic) Model Audit

Prepared for

Sydney Intermodal Terminal Alliance (SMITA)

This report has been issued and amended as follows:

Rev	Description	Date	Prepared by	Approved by
V01	Draft for internal review	28/7/2011	AH	SK
V02	Draft for Client Review	29/7/2011	AH	JR

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Contents

1 Introduction

1.1 Overview of SIMTA Proposal

The Sydney Intermodal Terminal Alliance (SIMTA) is a joint venture between Stockland, Qube Logistics and QR National.

The SIMTA Moorebank Intermodal Terminal Facility (SIMTA proposal) is proposed to be located on the land parcel currently occupied by the Defence National Storage and Distribution Centre (DNSDC) on Moorebank Avenue, Moorebank, south west of Sydney.

SIMTA proposes to develop the DNSDC occupied site into an intermodal terminal facility and warehouse/distribution facility, which will offer container storage and warehousing solutions with direct rail access.

The SIMTA site is located in the Liverpool Local Government Area. It is 27 kilometres west of the Sydney CBD, 16 kilometres south of the Parramatta CBD, 5 kilometres east of the M5/M7 Interchange, 2 kilometres from the main north-south rail line and future Southern Sydney Freight Line, and 0.6 kilometres from the M5 motorway.

1.2 Purpose of Paramics Model Audit

As part of the traffic and transport planning process of the SIMTA proposal, a Paramics model has been developed by Hyder Consulting.

In order to understand and quantify the current road network performance around the SIMTA site, Hyder consulting have undertaken road network capacity assessment for the core area.

The assessment undertaken by Hyder involved the development and interrogation of a purpose-built micro-simulation model (Paramics) of the core Moorebank road network.

The purpose of the Paramics Model audit (as presented in this report) is to:

- audit the Paramics base case models undertaken by Hyder Consulting for the SIMTA Proposal;
- Review the traffic generation assumptions and associated methodology used in the development of the Paramics model inputs; and
- Provide recommendations for model improvements and modifications (if required).

It is understood that the Paramics base models will be used for assessment of future development scenarios. Therefore this audit has been undertaken to provide commentary as to the appropriateness of the base model for its intended use prior to further model development and future scenario testing.

We note that no information has been provided to Halcrow regarding "traffic distribution of future freight traffic flows". As such no comment has been provided in this report regarding future traffic scenarios (ie. with SIMTA proposal operating).

1.3 Information Reviewed

The audit presented in this report has been based in the following information:

- AA003210 Technical Note 3_Rev B – Traffic Generation xisting Road Network Capacity Issues (with Rev D also subsequently provided)
- AA003210 Technical Note 4_Rev B & D – Existing Road Network Capacity Issues
- AM peak Paramics Base Model
- PM Peak Paramics Base Model

1.4 Audit Approach

It is an ideal practice to have core Paramics network/control files consistent between models and also conform to the RTA standard. However, Paramics files controlling signal timing, traffic demand, lane changing behaviour and other calibration parameters are expected to be adjusted throughout the course of model development. This is to mimic and cater for different traffic conditions exhibited between modelled periods.

In some instances, slight differences between models (although not ideal) do not pose any significant impact on the validity of models from a practical point of view. For example, a difference of 0.5 metres in locating a kerb point between AM and PM peak period models would have insignificant impacts to the overall network operation. Indeed, the stochastic nature of microsimulation models will introduce variability which is encountered in real life daily traffic.

This audit will focus on aspects which are important to the operation and validity of the models. Halcrow believes this will be more beneficial to SIMTA than merely conforming to the RTA audit guidelines (which require a substantial amount of effort on documenting minor aspects of the model that will have no real bearing on model operation).

2 Paramics Model Setup

2.1 *Configuration file*

The configuration file is generally in accordance with the RTA standard file:

- Route Selection: Perturbation has been disabled in the models with an all-or-nothing route assignment. This is in general contrary to the RTA standards. However, the current models provide almost no alternative routings for traffic. Therefore, this is deemed acceptable. (However, note that this may not be appropriate in the expanded models where route selection is available).

- Split Random Seed and Streams: This option has been selected in both models. According to the RTA Paramics Manual, this option could provide some level of consistency for comparison purposes and is deemed to be acceptable.

- Closest Destination Carpark: This option has been selected in both models. However, there is no carpark specified in the models. Therefore it has no effect on simulation results.

- TWOPAS: Gradients have been incorporated in the models together with TWOPAS option selected. No information has been provided to Halcrow for verification of node heights. However, visual inspection together with Paramics auditing tool show no obvious abnormalities. (Relatively high values of 46m – 140m are on nodes outside of the core network).

2.2 *Vehicles File*

The vehicles file is generally in accordance with the RTA standard file. However, periodic vehicles files have been installed in both models. This is not necessary given that heavy vehicles are specified in separate matrices within each demand period. This setup also contributes to the following discrepancies:

- Periodic Vehicles File: In the AM peak model only "vehicles.1" and "vehicles.2" files are present. Whereas in the PM peak model "vehicles.1", "vehicles.2" and "vehicles.3" files for all three defined periods are present.
- Sum of vehicles proportion: The sum of vehicles proportion for matrix 1 in "vehicles.1" file adds up to 99.99%. "vehicles.2" adds up to 100.02%

For correctness and to avoid confusion, the vehicles proportion should add up to 100%. However, it is believed that the difference is small enough to have no significant impact on the modelling results.

2.3 Arrival Profile

With regard to the arrival profile:

- No information has been provided in regard to the development of vehicle arrival profiles in the technical note.
- A single profile has been installed each for the AM and PM peak models for all zones generating traffic.

It is generally good practice to have multiple arrival profiles for zones which are different in nature, provided data is available to substantiate this profiling. This will provide a more realistic profile of traffic arriving at intersections and queue behaviour. Therefore, it is recommended to install multiple profiles and more crucially in the expanded models.

2.4 Intersection Lane Configuration

Visual comparison on lane configuration at major intersections has been made with reference to the latest information from Google map and Nearmap on the internet. The comparison shows that the lane configuration is correct.

2.5 Signal Timing

There is no documentation in Technical Note 4 in regard to the development of signal timing in the models. Signal timing could generally be adopted based on real-life SCATS data such as IDM records or based on information sampled from site investigation. Nonetheless, queue length and congestion level validation could provide some assurance to the correctness of signal timing installed.

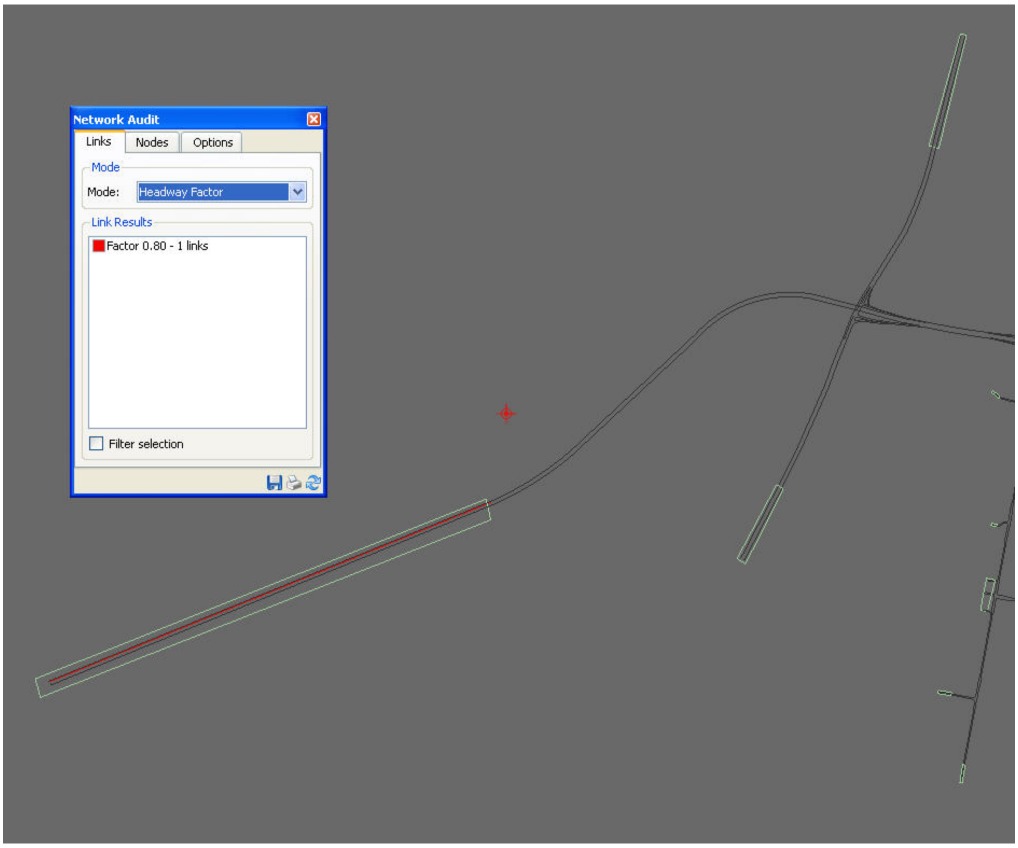
The eastbound off-ramp from M5 into Moorebank Avenue northbound is signal controlled according to our information. However, in the models this movement appears to be operating under free flow condition.

2.6 Bus Routes

Bus routes such as 855 and 870 operating along Hume Highway appear to be missing in the models.

2.7 Headway Factor

The lowest link headway factor adopted in the model is 0.8. This is installed on link 103:180 on M5 eastbound for both models and is considered to be acceptable.



2.8 Reaction Factor

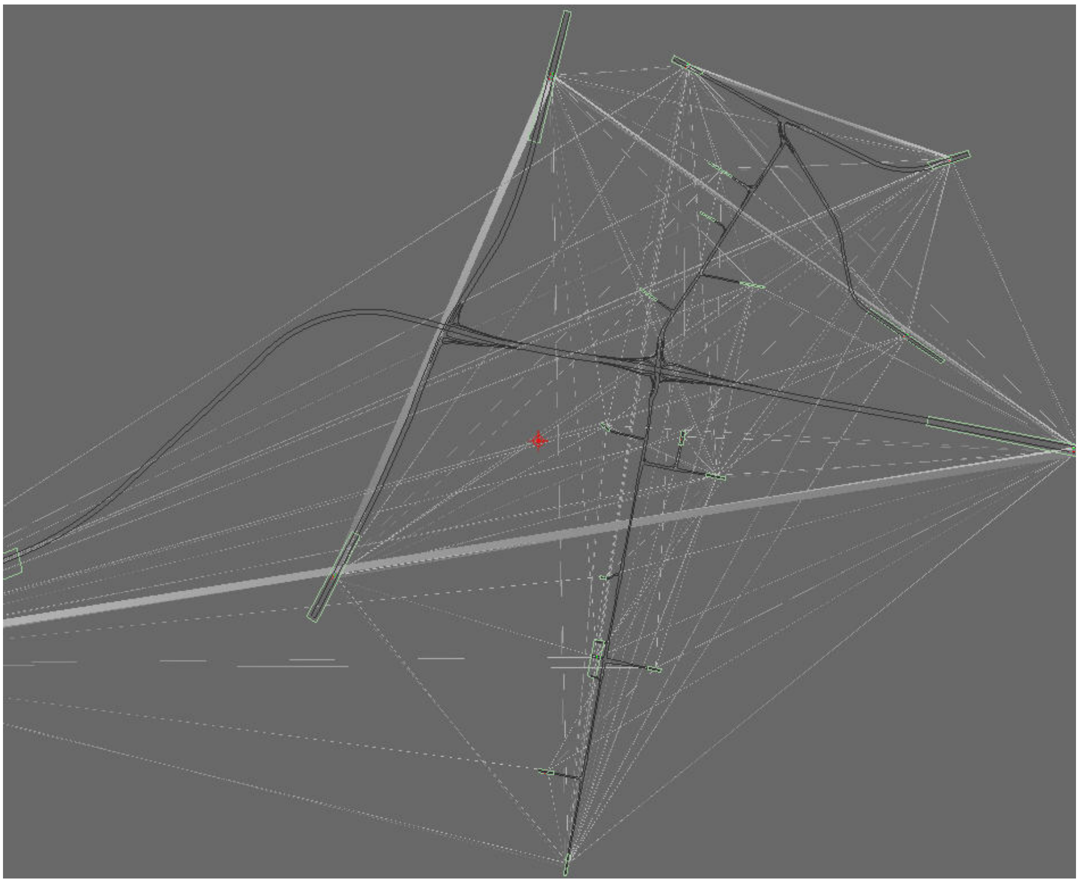
Reaction factors have been adjusted to 0.80 in the PM base model only on links at the east approach of Moorebank/Newbridge intersection. This is perceived as acceptable given the expected increase of driver aggressiveness under congested traffic conditions.

2.9 Travel Demand Data

It is documented in the technical note that the prior trip matrix and subsequent matrix estimation is undertaken using TransCAD transport planning software.

Based on anecdotal understanding of the travel pattern in the region, the demands appear to be reasonably distributed in the models. Visual inspections have also been conducted to ensure internal to internal short trips are in reasonable numbers.

The sample snapshot below shows the trip distribution for the PM base model:



2.10 Network File Consistency between AM and PM Peak Models

The core network files are in general consistent between the AM and PM peak periods.

The main difference is highlighted below:

- The position of node 118 is different by approximately 18 metres between models. This translates to the calculated gradient on links associated with this node being different between models. However, given that there is no acute change in heights of adjoining nodes, the impacts to the modelling is believed to be insignificant.

3 Overview of Technical Note 4 – Existing Road Network Capacity

3.1 Calibration

Based on the calibration summary in Table A4 – A5 of Appendix A, the models meet the calibration criteria at a satisfactory level. However, comparison of modelled traffic volume against observed count data is not shown. Therefore, our assessment can only be based on the statistical summary.

3.2 Validation

The validation of the models is conducted based on queue length survey and in addition, a weaving analysis on M5 eastbound carriageway between Hume Highway and Moorebank Avenue.

- Overall the modelled queue length in Paramics appears to be in good correlation with the surveyed data. Although on a few approaches the modelled queue length on all traffic lanes are slightly shorter than observed.
- The weaving analysis provides comparable outputs such as weaving speed, density and LoS based on HCM 2000 against the models.

3.3 Reporting

Under section 3.3.2 of the technical note, network operational issues have been identified based on the modelling. Issues 8 and 9 refer to the operation of M5/Moorebank intersection where the southbound right turn and northbound left turn movements along Moorebank Avenue are identified.

Both issues are shown as described in the actual simulation runs of the PM peak model. However, the LoS Summary for this intersection in Table 4 shows contrary information. The south approach through movement (instead of the movements described in issues 8 and 9) is recorded with the highest delay of 101s for this intersection. Further clarification is required for the reported delays.

(Note that during the process of finalising the Audit report, an update to the Technical Note – Revision D has been provided to us by Hyder Consulting.

Table 3 and 4 of the technical note have been updated with revised delays for the south approach through movement. Although the update partial resolve our query, it remains counter intuitive that the problematic movements reported in issues 8 and 9 are recorded with the lowest delays of all movements with 9s and 12s respectively.)

4 Overview of Technical Note 3 – Traffic Generation

Overall the traffic generation assumptions and calculations appear to be appropriate for the proposal.

However, there are a number of uncertainties regarding the reporting of particular issues which would benefit from further explanation and clarification. These are discussed below.

4.1 *Truck Generation*

4.1.1 *Articulated Truck*

- The ultimate design capacity of the proposed SIMTA proposal is anticipated to be 1 million twenty foot equivalent units (TEUs) per annum. In actual trip calculation, this translates to 500,000 TEUs arriving at the intermodal facility from Port Botany.

    - *It is assumed that 1 million TEUs accounts for containers arriving and departing the facility, thus only 500,000 are considered in the actual calculation. This is unclear and would benefit from further explanation and clarification.*

- 200,000 TEUs is assumed to be transported to warehouses on site and once off-loaded will be returned to Port Botany. Thus, no articulated truck trips will be generated from these containers, but rigid trucks only.

- The remaining 300,000 TEUs is assumed to be transported offsite that articulated truck trips will be generated.

    - ➢ *It is unclear how the split of 200,000 & 300,000 TEUs are derived from Hyder's report. However, section 3.3 of the report appears to validate the final truck generation – both articulated and rigid, satisfactorily with other similar facilities..*

- 30% articulated trucks will carry containers in both directions, i.e. back-loading which reduces the total generation from 1886 to 1603 truck movements per weekday.

    - ➢ *It is not clear where the 30% back-loading derives from and not examined in the sensitivity test either.*

4.1.2 Rigid Truck

- Similar calculation employed as for the articulated trucks above, except:
    - o No back-loading
    - o Container and rigid truck loadings (12.66 and 10 tonnes respectively) have been adopted to derive the total trip number.

4.1.3 Peak Hour Profile

- The daily/peak hour profile is based on the Enfield Traffic Study for truck movements to/from Port of Melbourne.

    - ➢ *Section 2.1.5 stated that there is no similar facility suitable in NSW for profile. Thus, while Port Melbourne does not include significant warehouse facilities and not operating as intermodal terminal, its profile is still adopted.*

- The in/out split of all trucks is assumed to be 50/50.

    - ➢ *Section 2.1.5 "trucks will be arriving and departing throughout the day, with only short periods stationary within the Terminal….."*

4.2 Employee Traffic Generation

4.2.1 General Assumption

- The employee traffic generation is calculated base on Gross Floor Areas (GFAs) from the SIMTA proposal Master Plan.

- Table 2-2, page 10 of the report shows the employment density rate adopted to derive the total number of employees.

  - *Note that the "Needs Assessment for Moorebank Intermodal Terminal Facility" by PricewaterhouseCoopers in March 2011 estimates a maximum of 2,840 employees instead if calculated 2,258. This is accounted in section 4 of the report under sensitivity testing.*

- 80% split on private car is subsequently adopted based on Journey to Work data 2006 by Bureau of Transport Statistics (BTS) and the assumption of increase mode share from 3% to 6% on public transport.

  - *It is unclear exactly how the figure of 80% is calculated.*

4.2.2 Peak Hour Profile

- Based on shift pattern for warehousing and ancillary village, such as office, retail and train terminal operations.

- The in/out split for employee is not tabulated in the report. Although it can be worked out based on the information from Appendix B.

4.3 Traffic Generation Staging

- Section 2.3.1 outlines the traffic generation in stages of 500,000 TEUs by 2021 and 1 million TEUs by 2031.

- *This assumption is taken as given at face value. However, some commentary would be beneficial around the assumptions used to come up with these figures and the implications of reaching the staged volumes prior to or after the anticipated years.*

- There is no mentioning of background traffic growth.

  - *It is unclear whether this is due to existing capacity constraints under current road conditions?*

We note that we believe there is a typo in Table 2-4 and 2-5 as shown below.

Truck Peak should be 14:00-15:00?

Table 2-4 Peak Hour Private Car Generation Summary

	Road Peak (07:00-08:00; 16:00-17:00)		Truck Peak (07:00-08:00; 16:00-17:00)	
	AM	PM	AM	PM
Private Car	**692**	**630**	**692**	**630**

692?

Table 2-5 Weekday Daily Traffic Generation Forecasts in each stage

Indicative Year	TEU Processed in total	Average Daily (Weekday)		AM Peak 1 hour (7-8am)		PM Peak 1 hour (4-5pm)	
		Car	Truck	Car[1]	Truck	Car[1]	Truck
2021	500,000	2,492	1,313	317	104	435	76
2031	1,000,000	3,614	2,638	461	204	630	155

5 Conclusion and Recommendations

Halcrow concludes that the audited base models provide a reasonable representation of the existing road network conditions.

However, it is suggested that the following summary of recommendations be considered and in particular for the development of an expanded model.

- Review the suitability of adopting All-or-Nothing route assignment
- Review the sum of vehicle proportion and justify the need of periodic vehicles files
- Consider the adoption of multiple arrival profiles for origin zones
- Review the coding of priority control for eastbound off-ramp at M5/Moorebank intersection
- Verify the correctness of bus operation along Hume Highway
- Review the physical location of node 118 in the models
- Provide explanation on reported operational issues 8 and 9, and their corresponding delays

Technical Note 4 states that the extent of the existing model network will be expanded to provide a wider coverage in an attempt to capture other potential network capacity issues. Although the exiting base models will be used to form the basis, Halcrow envisages that significant modifications will be introduced in terms of zoning system, traffic demands and route selection.

Therefore, Halcrow's comments on the existing base models do not necessarily correlate to any future expanded models and Halcrow accepts no responsibility for any subsequent modification of these base models undertaken by others.

Hyder

Appendix F

Sketch Plan of the Proposed Upgrade

SIMTA SYDNEY INTERMODAL TERMINAL ALLIANCE

Part 3A Concept Plan Application

Traffic and Transport

June 2013