6 Roads and Traffic

6.1 Introduction

This chapter details the projected impact of the traffic generated by the proposed development, both during its construction and operational phases.

This section describes the existing traffic situation in the area surrounding the site and provides a description of the local road network. Existing traffic levels are quantified and facilities for public transport, cyclists and pedestrians are described.

Details of the proposed development are given and the trip generation and distribution methodologies are explained. The impact of the generated traffic on the local road network is assessed and mitigation measures are investigated where necessary.

6.2 Existing Situation

6.2.1 General

Ringaskiddy is situated on a peninsula to the south east of Cork City. The area is characterised by a number of major industrial plants, some small residential areas, a ferry port, a deepwater berth and the headquarters of the Irish Naval Services. The site of the Waste Management Facility is shown in relation to the local road network in Figure 6.1.

In recent years the Ringaskiddy area has experienced rapid levels of industrial growth, with further growth likely in the future. The increase in industrial growth has led to a significant increase in traffic within the Ringaskiddy area. There are a number of developments proposed for the Ringaskiddy Area and these are listed in Section 6.2.6.

6.2.2 Existing Road Network

The N28 national primary route links Ringaskiddy to Cork City and beyond. It is the major route into and out of Ringaskiddy and has been designed to accommodate high volumes of traffic, serving the ferry port and the various industrial developments in the area. However the roadway does experience congestion during peak periods.

The completion of the Lee Tunnel to the east of Cork City in 1999 has allowed national traffic to access Ringaskiddy via the N28 without travelling through Cork City centre and has reduced journey times between Ringaskiddy and the national road network.

The R613 links Ringaskiddy with Carrigaline and gives access to a number of industrial plants along its route. However, certain sections of the R613, particularly between Coolmore and Carrigaline are narrow with substandard alignment in parts, reducing Heavy Goods Vehicle (HGV) accessibility.

The R610 links the Ringaskiddy area with the residential areas of Passage West and Monkstown, and the cross-river ferry to Cobh and Great Island.

6.2.3 Existing Junctions

Road network congestion and capacity in urban and industrialised areas is generally associated with the junctions on the road network. The following junctions were examined during the morning and evening peak periods to assess their present operational capacity. The location of the junctions can be seen in Figure 6.2.

1. Shannon Park Roundabout
2. Raffeen Bridge Junction
3. Shanbally Junctions
4. Ringaskiddy Junction (N28/R613)
5. Ferry Port Access
6. Coolmore Crossroads.

The above junctions were analysed using the suite of computer applications developed by the UK Department of Transport. PICADY is used to model priority controlled junctions and ARCADY is used to model roundabouts. The assessment was carried out using Year 2001 traffic flow information for a number of time periods including 07:45 – 08:45, the morning peak period and 16:30 – 17:30, the evening peak period, which were identified following an 18 hour traffic count. Refer to section 6.2.4..

The results of the analysis are shown in Appendix A.

Shannon Park Roundabout

This large roundabout junction links the N28, the major route serving Ringaskiddy, with the R611 Carrigaline Road. Historically, the roundabout has been congested in peak periods although recent improvements, providing two lane entries on all approaches, have succeeded in reducing queues.

Raffeen Bridge Junction

This is a priority junction connecting the R610 with the N28. Another priority junction is located roughly 50m to the north of the Raffeen Bridge N28/R610 junction. This junction links the R610 with a minor local road. The local road provides an alternative route for traffic from the Douglas area to Ringaskiddy, avoiding any queues on the N28 and at the Shannon Park Roundabout.

At the Raffeen Bridge Junction the N28 has a dedicated "left turn in " and "right turn in" lanes, allowing vehicles access to Raffeen Bridge without disrupting through traffic. Additionally, a left turn filter lane allows traffic from Raffeen Bridge to merge with eastbound N28 traffic. The junction operates within capacity with small queues developing on the Raffeen Bridge arm of the junction during peak periods.

Shanbally Junctions

These junctions operate as two separate junctions. The first junction is a priority controlled junction linking the N28 to Raffeen and the second junction is a roundabout junction providing a link between the N28 and the R613 at the Coolmore Crossroads.

The roundabout, which is approximately 25 metres to the east of the priority junction experiences congestion in peak conditions, with queues of eastbound traffic extending back for a considerable distance in the morning peak period.

Link Count Locations

1 - N28 (North)

2 - R611 (South)

3 - N28 (East of Shannon Park)

4 - R610 (North)

5 - N28 (East of Raffeen Bridge)

6 - Road form Raffeen Village

7 - Shanbally Village

8 - N28 (East of Shanbally)

9 - R613 (West of Coolmore)

10 - R613 (East of Coolmore)

11 - N28 (Ringaskiddy Village)

12 - N28 (East of FerryPort)

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Figure Title : Local Road Network

Figure No : 6.1

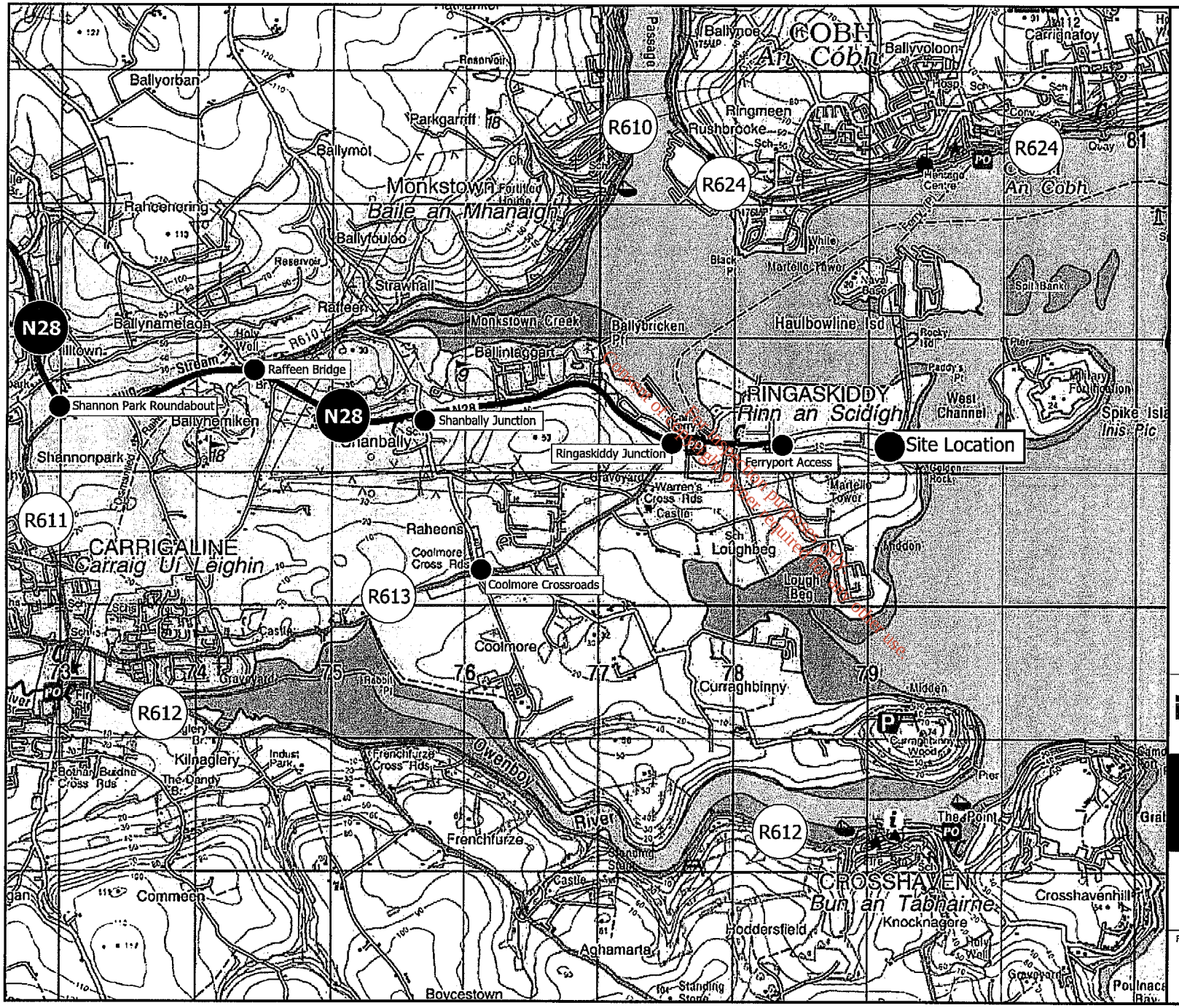

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Figure Title : Existing Junctions Ringaskiddy Area

Figure No : 6.2

The priority junction exacerbates congestion problems with commuters from Monkstown and Passage West using the junction to access the N28, avoiding traffic queues on the N28 between the Raffeen Bridge Junction and the Shanbally Roundabout.

A ghost island arrangement on the N28 at the priority junction in Shanbally allows for the storage of two right turning vehicles without disrupting westbound traffic. Visibility from the minor arm of the priority junction from Raffeen is below standard.

Ringaskiddy Junction (N28/R613)

This priority junction links two heavily trafficked routes in the area and is located to the west of Ringaskiddy Village. The junction experiences problems in peak periods. These problems are caused by high volumes of traffic and the proximity of the nearby Deep Water Berth access road which has a high proportion of HGV traffic and steep approach gradients.

The R613 flares on its approach to the junction to allow two vehicles to queue at the stopline. The width of the N28 allows vehicles waiting to turn right on the R613 to queue without disrupting eastbound traffic. In the AM peak period site observations indicated that some queuing occurs on the R613 arm of the junction.

Ferry Port Access

This is a four arm priority junction of the N28, the Ferry Port access road and the road to the Loughbeg area. Beyond the Ferry Port junction the road continues eastwards, as a local road to the Naval Base and the eastern part of Ringaskiddy. The Ferry Port access arm of the junction flares to allow two vehicles to wait at the stop line. The width of the N28 at this point allows right turning vehicles to queue without disrupting through traffic. The Ferry Port junction does not get congested during peak periods.

Coolmore Crossroads

This priority crossroads junction on the R613 is located to the south of Shanbally at the intersection with the local road from Shanbally village and the N28. A private entrance road to the Coolmore Estate joins this junction from the south.

Both minor arms of the junction (the north and south approaches) flare to allow two vehicles to queue at the stop line. The R613 is approximately 6m wide at the junction and right turning traffic blocks through traffic at this location.

6.2.4 Existing Traffic Levels

An 18 hour (0600-2400) traffic count was undertaken at all of the junctions listed in Section 6.2.3 above on Tuesday 13 February 2001. Five time periods were identified as having the most significant impact by traffic generated by the proposed development. The five time periods included the following.

- Construction AM Peak (06:00 – 07:00)
- Construction PM Peak (18:00 – 19:00)
- Operational AM Peak (07:45 – 08:45)
- Operational Development Peak (13:00 – 14:00)
- Operational PM Peak (16:30 – 17:30)

The peak hour link counts on the surrounding road network can be seen in Table 6.1 below. The location of the link counts can be seen in Figure 6.2.

Table 6.1 Existing Two-Way Link Flows_Year 2001

Roadway	Construction Peak		Operational Peak		
	06:00 - 07:00	18:00–19:00	07:45–08:45	13:00–14:00	16:30–17:30
N28 (North)	288	1639	2470	1180	2032
R611 (South)	153	1339	1594	952	1544
N28 (East of Shannon Park)	209	746	1422	592	978
R610 (North)	26	282	369	199	380
N28 (East of Raffeen Bridge)	178	678	1231	467	984
Raffeen Village	9	67	112	42	140
Shanbally Village	16	148	341	120	265
N28 (East of Shanbally)	175	611	1134	419	862
R613 (West of Coolmore)	37	240	664	286	337
R613 (East of Coolmore)	48	302	805	300	496
N28 (Ringaskiddy Village)	127	319	669	314	421
N28 (East of Ferry Port)	30	97	276	153	190

All traffic flows in vehicles per hour

From the above table it can be seen that traffic flows during the construction AM peak period are quite low and the proposed construction operating times are designed to coincide with these low traffic flows to minimise the potential impact of the development. It can be seen that the operational AM peak is the busiest time period for traffic accessing the Ringaskiddy area.

6.2.5 Existing Provision of Alternative Modes of Transport,

The No. 223 bus route links Ringaskiddy with Cork City, Passage West, and Monkstown. The service runs at irregular intervals throughout the day. Two buses arrive in Ringaskiddy between 07.30 and 09.00 and three buses depart between 17.00 and 19.00. Bus stops are located in Ringaskiddy village within walking distance of the proposed Waste Management facility.

6.2.6 Cycling

There are no footpaths along the roadway adjacent to the proposed developments. However there are footpaths located along both sides of the road through Ringaskiddy village. There are no dedicated cycle facilities in the local area.

6.2.7 Committed Developments

There are a number of developments in the planning stage which will have an impact on the local road network. These developments are expected to be completed before the Waste

Management Facility and will impact on the base year traffic flows. The location of the developments is shown in Figure 6.3.

The committed developments are grouped in two separate locations each with different traffic distribution characteristics. Raffeen Bridge Industrial Units and Portgate Industrial Units are located near Raffeen Bridge, while the Ringaskiddy Logistics Centre, the Vehicle Import Storage Depot and the National Maritime College are all located near Ringaskiddy Village.

Raffeen Bridge Industrial Units

This development of 9 Light Industrial/Warehouse Units totaling roughly 8454m² (91,000ft²) will be located to the north of the N28, close to the Raffeen Bridge junction. The expected level of trip generation for the Industrial Units was established using the TRICS database for the time periods outlined previously.

Table 6.2 Employment/Industrial Units Trip Rates per 100m²

	In	Out
Construction AM Peak (06:00-07:00)	0.16	0.08
Construction PM Peak (18:00-19:00)	0.15	0.40
AM Peak (07:45-08:45)	0.89	0.24
Development Peak (13:00-14:00)	0.48	0.45
PM Peak (16:30-17:30)	0.25	0.73

The estimated number of trips generated by Raffeen Bridge Industrial Units is shown in Table 6.3.

Table 6.3 Raffeen Bridge Industrial Units Estimated Traffic Generation

	In	Out
Construction AM Peak (06:00-07:00)	14 vehs	7 vehs
Construction PM Peak (18:00-19:00)	13 vehs	34 vehs
AM Peak (07:45-08:45)	75 vehs	20 vehs
Development Peak (13:00-14:00)	41 vehs	38 vehs
PM Peak (16:30-17:30)	21 vehs	62 vehs

Portgate Industrial Units

This proposed development is for 8 light industrial units with approximately 200 employees. It is located adjacent to the Raffeen Bridge Industrial Units. The level of trip generation for the industrial units was established using the TRICS database. The estimated number of trips generated for the peak hours is shown in Table 6.5.

Table 6.4 Portgate Industrial Units Trip Rates per 1 employees

	In	Out
Construction AM Peak (06:00-07:00)	0.06	0.04
Construction PM Peak (18:00-19:00)	0.06	0.16
AM Peak (07:45-08:45)	0.35	0.10
Development Peak (13:00-14:00)	0.18	0.17
PM Peak (16:30-17:30)	0.10	0.28

Table 6.5 Portgate Industrial Units Estimated Trip Generation

	In	Out
Construction AM Peak (06:00-07:00)	12 vehs	8 vehs
Construction PM Peak (18:00-19:00)	12 vehs	32 vehs
AM Peak (07:45-08:45)	70 vehs	20 vehs
Development Peak (13:00-14:00)	36 vehs	34 vehs
PM Peak (16:30-17:30)	20 vehs	56 vehs

Ringaskiddy Logistics Centre

This development which is currently approaching completion is located to the east of the Ferry Port Access Road, on the north side of the local road to the site. Information on the files of Cork County Council planning department indicates that only one person will be employed at the Centre while 5 HGV daily movements into and out of the site will take place. It has been assumed that most daily HGV movements will take place in the peak hours and have been distributed as follows:

Table 6.6 Ringaskiddy Logistics Centre – Estimated Trip Generation

	In	Out
Construction AM Peak (06:00-07:00)	1 vehs	0 vehs
Construction PM Peak (18:00-19:00)	0 vehs	1 vehs
AM Peak (07:45-08:45)	2 vehs	1 vehs
Development Peak (13:00-14:00)	1 vehs	1 vehs
PM Peak (16:30-17:30)	1 vehs	2 vehs

Vehicle Import Storage Depot

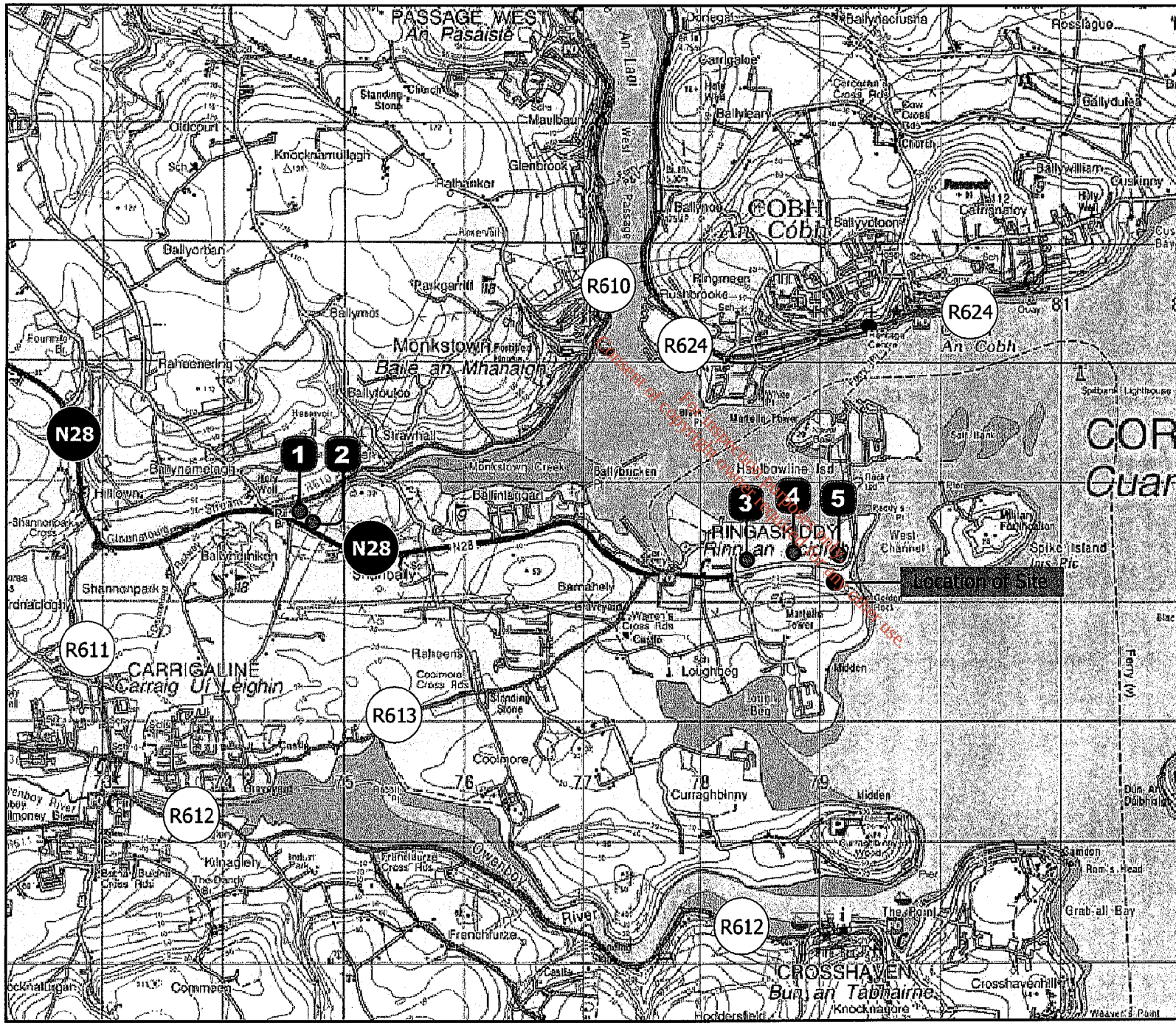
This development is located adjacent to the Deep Water Berth and will access the N28 via the existing Deep Water Berth access road. Up to 4 employees will work in the Depot. It is expected that around 100 HGVs per week will access the site. To establish the trip profile for the depot, a similar profile from the TRICS database was applied. The peak hour trips are shown in Table 6.7.

Table 6.7 Vehicle Import Storage Deport Trip Generation

	In	Out
Construction AM Peak (06:00-07:00)	1 vehs	0 vehs
Construction PM Peak (18:00-19:00)	1 vehs	1 vehs
AM Peak (07:45-08:45)	7 vehs	1 vehs
Development Peak (13:00-14:00)	2 vehs	2 vehs
PM Peak (16:30-17:30)	1 vehs	7 vehs

National Maritime College

The Department of Education and Science proposes to build the National Maritime College on a 10 acre site adjacent to the N28 in Ringaskiddy. Outline planning permission has been granted. The college will have approximately 750 full time students. The courses offered will be vocationally based (i.e. they will be studied by people currently employed in the maritime industry). The ratio of staff to student is 1:10 giving total population of 825.



1 Portgate Industrial Units

2 Raffeen Bridge Industrial Units

3 Logistics Centre

4 Vehicle Import Depot

5 Proposed Naval College

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Figure Title : Other Developments in Locality

Figure No : 6.3

The traffic generated by the proposed maritime college was based on the provision of car parking within the complex. The college received outline planning permission based on the provision of 150 car park spaces. The TRICS database was used to establish the arrival and departure pattern for the college based on the parking provision and from this information, the peak hour traffic flows were determined. The estimated amount of traffic generated by students and staff of the National Maritime College can be seen in Table 6.8.

Table 6.8 National Maritime College Trip Generation.

	In	Out
Construction AM Peak (06:00-07:00)	0 vehs	0 vehs
Construction PM Peak (18:00-19:00)	23 vehs	46 vehs
AM Peak (07:45-08:45)	109 vehs	46 vehs
Development Peak (13:00-14:00)	69 vehs	58 vehs
PM Peak (16:30-17:30)	34 vehs	92 vehs

6.2.8 Summary Of Committed Development Traffic Flows

The total volume of committed development traffic generated in the area is summarised in Table 6.9 below.

Table 6.9 Committed Development Trip Generation (Two-Way)

Roadway	Construction Peak		Operation Peak		
	06:00 - 07:00	18:00–19:00	07:45–08:45	13:00–14:00	16:30–17:30
Raffeen Bridge Industrial Units	21	47	95	79	83
Portgate Industrial Units	20	44	90	70	76
Ringaskiddy Logistics	1	1	3	2	3
Vehicle Import Storage Depot	1	2	8	4	8
National Maritime College	0	69	155	127	126

All traffic flows in vehicles.

As stated previously the various committed developments will have different traffic distributions based on their location within Ringaskiddy. The Raffeen Bridge Industrial Units and the Portgate Industrial Units will have the same distribution and their distribution profile can be seen in Table 6.10. The distribution profiles have been derived based on the present distribution of traffic into and out of the Ringaskiddy area.

Table 6.10 Traffic Distribution – Raffeen/Portgate Industrial Developments

Roadway	Construction Peak		Operation Peak		
	06:00 - 07:00	18:00–19:00	07:45–08:45	13:00–14:00	16:30–17:30
N28 (North)	67%	45%	48%	42%	45%
R611 (South)	27%	35%	34%	42%	31%
R610 (North)	5%	16%	13%	10%	20%
Raffeen Village	0%	0%	0%	0%	0%
R613 (West of Coolmore)	1%	4%	5%	6%	4%

The following distribution profile has been used to calculate the volume of traffic assigned to the different roadways for the other committed developments in Ringaskiddy. The distribution of traffic varies with the time of day as the prevailing traffic conditions have been taken into account.

Table 6.11 Traffic Distribution – Committed Developments (Ringaskiddy Area)

Roadway	Construction Peak		Operation Peak		
	06:00 - 07:00	18:00–19:00	07:45–08:45	13:00–14:00	16:30–17:30
N28 (North)	67%	45%	48%	42%	45%
R611 (South)	14%	19%	11%	19%	15%
R610 (North)	2%	11%	8%	6%	13%
Raffeen Village	3%	5%	5%	4%	7%
R613 (West of Coolmore)	14%	20%	28%	29%	20%

Based on the traffic generation rates identified earlier for the committed developments and the assumed distribution profiles, the following generated traffic flows were assigned to the local road network. The traffic assignment process has been carried out in two stages, first the Raffeen Bridge and Portgate Industrial Units were assigned to the local road network and the results of the analysis can be seen in Table 6.12. The second stage involved the remaining committed developments and the results can be seen in Table 6.13.

Table 6.12 Assigned Traffic Flows – Raffeen Bridge/Portgate Industrial Units

Roadway	Construction Peak		Operation Peak		
	06:00 - 07:00	18:00–19:00	07:45–08:45	13:00–14:00	16:30–17:30
N28 (North)	27	41	89	63	71
R611 (South)	11	32	62	63	49
N28 (East of Shannon Park)	38	73	151	126	120
R610 (North)	39	77	162	134	127
N28 (East of Raffeen Bridge)	1	4	10	9	6
Raffeen Village	0	0	0	0	0
Shanbally Village	1	4	10	9	6
N28 (East of Shanbally)	0	0	0	0	0
R613 (West of Coolmore)	1	4	10	9	6
R613 (East of Coolmore)	0	0	0	0	0
N28 (Ringaskiddy Village)	0	0	0	0	0
N28 (East of Ferry Port)	0	0	0	0	0

All traffic flows in vehicles per hour

Table 6.13 Assigned Traffic Flows – Committed Development – Ringaskiddy Area

Roadway	Construction Peak		Operation Peak		
	06:00 - 07:00	18:00–19:00	07:45–08:45	13:00–14:00	16:30–17:30
N28 (North)	1	32	80	56	61
R611 (South)	1	14	19	25	21
N28 (East of Shannon Park)	2	46	99	81	82
R610 (North)	0	8	13	8	18
N28 (East of Raffeen Bridge)	2	54	112	89	99
Raffeen Village	0	4	8	5	10
Shanbally Village	0	0	0	0	0
N28 (East of Shanbally)	2	57	120	94	109
R613 (West of Coolmore)	0	15	46	39	28
R613 (East of Coolmore)	0	15	46	39	28
N28 (Ringaskiddy Village)	2	72	166	133	137
N28 (East of Ferry Port)	2	72	166	133	137

All traffic flows in vehicles per hour

6.3 Base Traffic

6.3.1 Assessment Years

It is anticipated that the Ringaskiddy Waste Management Facility will be fully operational by Year 2005 with the peak construction period occurring in Year 2004. Background traffic levels have been established by applying a 4% annual growth rate to traffic counts undertaken in 2001 (as detailed in Section 6.2.4). This 4% growth has been used in a variety of similar assessments in the Cork area and has been generally accepted in the past as a reasonably accurate growth rate for the Cork area. Traffic generated by the committed development has been added to establish both the Year 2004 and the Year 2005 base figures. The estimated Year 2004 and Year 2005 traffic flows on the local road network without the proposed development can be seen in Table 6.14.

Table 6.14 Base Year Traffic Flows

Roadway	Construction - Year 2004		Operation - Year 2005		
	06:00 - 07:00	18:00–19:00	07:45–08:45	13:00–14:00	16:30–17:30
N28 (North)	353	1917	3059	1499	2510
R611 (South)	183	1552	1946	1201	1876
N28 (East of Shannon Park)	275	958	1914	899	1346
R610 (North)	68	402	607	375	589
N28 (East of Raffeen Bridge)	203	820	1563	644	1257
Raffeen Village	10	79	139	54	174
Shanbally Village	19	170	409	149	316
N28 (East of Shanbally)	199	745	1446	584	1118
R613 (West of Coolmore)	43	288	833	382	428
R613 (East of Coolmore)	54	354	988	390	608
N28 (Ringaskiddy Village)	145	431	949	500	630
N28 (East of Ferry Port)	36	181	489	312	359

All traffic flows in vehicles per hour

6.4 Proposed Development

As indicated in Section 6.1 the proposed development is located on a site to the east of Ringaskiddy Village. In terms of traffic generation the three key elements of the development are:

- Waste to Energy Facility.
- Waste Transfer Station
- Community Recycling Plant

The traffic impact assessment has been undertaken examining both the construction traffic (traffic generated by the workforce and processes involved in the construction period) and the operational traffic (traffic generated by the processes involved in the operation of the plant once complete). The expected level of traffic generated by both the construction and the operational aspects of the development are detailed below.

6.4.1 Construction Traffic

Traffic will firstly be generated during the construction phase of the development. Throughout the construction phase, three types of construction traffic will access the site.

- HGV Traffic
- Workforce Traffic
- General Site Traffic

HGV Traffic

The construction stage of the development will involve a significant number of HGV movements. Estimates of the anticipated HGV construction traffic volumes indicate that a maximum of 7 HGV vehicles per hour would access the site during the day time shift.

Workforce Traffic

The construction period will also generate demand in terms of construction workforce access. Throughout the construction there will be some variation in the number of workforce on site. A maximum of around 320 construction workers will be employed on site, with around 250 workers working a daytime shift (07:00-19:00) and the remainder working a night shift (19:00-07:00).

To determine the trips generated during construction it is assumed, that 95% of the workforce travel by car and there will be a car occupancy of 1.15. These assumptions are applied to the 250 workers arriving for the day shift and also to the 70 workers leaving after the night shift. The assumptions are based on information obtained from a survey of workers including construction workers at the various industrial plants in Ringaskiddy. The information is contained in the Ringaskiddy Traffic Study carried out by Arup Consulting Engineers for Pfizer Pharmaceuticals Production Corporation.

Due to the nature of the construction stage of the development not all workers will arrive before 07:00 to start their shift or finish at 19:00 in the evening as there will be some natural fall-off in construction activity before 19:00. For the purpose of this estimate the following profile was added to take account of the construction workers arrival and departure profile:

- 80% of the daytime construction workers arrive before 07:00
- 20% of the daytime construction workers arrive after 07:00
- 100% of the nighttime construction workers leave after 07:00
- 50% of the daytime construction workers leave between 12:00-14:00 with 75% leaving before 13:00 and 25% arriving back before 13:00.
- 20% of the daytime construction workers leave before 18:00
- 20% of the daytime construction workers leave between 18:00-19:00
- 60% of the daytime construction workers leave after 19:00
- 100% of the night shift construction workers arrive before 19:00.

General Site Traffic

The construction stage will also generate general site traffic in addition to HGV movements and workforce traffic. This general site traffic accounts for visitors and general service vehicles to the site. The general site traffic is estimated at up to 20 vehicles per hour between 06:00 - 19:00 with a fall-off to 6 vehicles per hour during the night shift.

Total Construction Traffic

The projected volume of traffic generated during the construction phase of the development can be seen in Table 6.15 below.

Table 6.15 Projected Volumes of Construction Traffic

	HGV Movements		Workforce Traffic		General Site Traffic		Total Traffic Generation		
	In	Out	In	Out	In	Out	In	Out	Total
0600-0700	**7**	**7**	**165**	**0**	**10**	**10**	**182**	**17**	**199**
0700-0800	7	7	42	58	10	10	59	75	134
0800-0900	7	7	0	0	10	10	17	17	34
0900-1000	7	7	0	0	10	10	17	17	34
1000-1100	7	7	0	0	10	10	17	17	34
1100-1200	7	7	0	0	10	10	17	17	34
1200-1300	7	7	26	78	10	10	43	95	138
1300-1400	7	7	78	26	10	10	95	43	138
1400-1500	7	7	0	0	10	10	17	17	34
1500-1600	7	7	0	0	10	10	17	17	34
1600-1700	7	7	0	0	10	10	17	17	34
1700-1800	7	7	0	41	10	10	17	58	75
1800-1900	**7**	**7**	**58**	**42**	**10**	**10**	**75**	**59**	**134**
1900-2000	2	2	0	124	3	3	5	129	134
2000-2100	2	2	0	0	3	3	5	5	10

6.4.2 Operational Traffic Generation

The proposed development will generate two types of operational traffic. Heavy Goods Vehicle (HGV) traffic will be generated by the operation of the waste to energy facility and the waste transfer station. Car traffic will be generated by workers commuting to the site, by visitors to the site and by the users of the Community Recycling Park.

HGV Generation

The estimated volume of HGV traffic generated by the proposed development was based on anticipated volumes of waste coming into the facility. The facility will accept waste for 50 weeks per year, for 5.5 days per week and 10 hours per day. It is planned to restrict HGV movements to outside of the Ringaskiddy morning commuter peak hour by restricting the hours that waste will be accepted at the facility.

Information obtained from the Indaver Waste To Energy plant, treating municipal solid waste in Beveren, Flanders, established that peak hour traffic at the site was around 12% of total daily traffic.

Indaver's experience has been that the waste processing procedure does not operate at a continuous rate and peaks and troughs tend to occur throughout the year. Based on monthly variations at the Dublin Port Waste Transfer Station, it was established that the peak usage of the facility was 13% greater than the average usage. The traffic generated through HGV movements

and the Community Recycling Park have been increased by 13% to account for the peaks in the arrival of vehicles. HGV traffic generated by the facility in Phase 1 is shown in Table 6.16, with HGV traffic generated in Phase 2 shown in Table 6.17.

Table 6.16 Estimated HGV Generation (Phase 1)

Waste	Tonnes per Annum	Tonnes per Truck	Annual Trips	Average Traffic Generation	Maximum Traffic Generation
Solid	60,000	12	5,000	36 vehs per day	41 vehs per day
Liquids	40,000	20	2,000	15 vehs per day	17 vehs per day
Transfer Station	15,000	12	1,250	9 vehs per day	10 vehs per day
Raw Material	10,000	12	833	6 vehs per day	7 vehs per day
Total	**125,000**	**56**	**9,083**	**66 vehs per day**	**75 vehs per day**

Table 6.17 Estimated HGV Generation (Phase 2)

Waste	Tonnes per Annum	Tonnes per Truck	Annual Trips	Average Traffic Generation	Maximum Traffic Generation
Solids	100,000	12	8,333	61 vehs per day	69 vehs per day
Raw Materials	5,000	12	417	3 vehs per day	3 vehs per day
Total	**105,000**	**24**	**8,750**	**64 vehs per day**	**72 vehs per day**

Commuters/Site Visitors

It is estimated that a total of 57 staff will be employed on site with both phases in operation, with 32 staff working normal office hours (0900 –1800). Most of these will be employed in phase 1. There will be very few additional office workers in phase 2. Twentyfive staff will work on a shift pattern, with 5 staff working on an 8 hour, 3 shift rota (day time shifts will start at 0700). The fourth shift provides cover during the day-time and the fifth provides weekend/holiday cover. Again, most of the shift workers will be employed in phase 1 with very few additional shift workers in phase 2. For the analyses, it is conservatively assumed that there will be 57 staff in phase 1. It is anticipated that virtually all staff will travel to the site by car. It is also envisaged that half of all staff will leave the site and return during lunch hour.

Community Recycling Park

Estimating the level of traffic generated by the Community Recycling Park is more problematical as it is dependent upon a variety of factors including the likelihood of local residents recycling waste and the number of "competing" Community Recycling Park facilities in the local area.

The use of the TRICS database was investigated to calculate trip generation rates based on analysis of historic traffic. However, the information contained in the database does not adequately compare with the proposed development.

Therefore, studies undertaken by Indaver at similar sites in Ireland have been used to estimate trip generation rates for the Community Recycling Park. The Study of the Navan Town Bring Bank facility in 2000 showed that approximately 5,000 visits per month on average were made for a catchment area of 15,000 households (5000/15000= 0.33 monthly visits per household). The catchment area for the Community Recycling Park in Ringaskiddy is estimated at being a maximum of 2500 households, therefore generating approximately 833 visits per month or 10,000 visits a year.

Experience of other community recycling parks indicates that many of these trips occur on Saturday mornings when most people are off work. It has been assumed that a quarter of these monthly trips occur at weekends. Based on a 5 day working week (50 weeks a year), 150 trips would be made per week on average, with approximately 30 trips per day.

The daily profile of arrivals and departures at Community Recycling Parks does not replicate that of other land uses. Peak levels of traffic generation tend to take place outside of the traditional commuter peak periods. The TRICS database was used to establish an average daily trip profile for similar sites in the UK although it should be noted that Indaver proposes that the Community Recycling Park will not open before 10:00 on a weekday. The TRICS profile indicated that on a weekday the peak generation period for the Community Recycling Park would be the 10:00 – 11:00 period while the 13:00 – 14:00 period would also experience a peak in traffic generation.

Total Operational Traffic

The projected volume of traffic generated during the operational phase of the development can be seen in Table 6.18 below for phase 1.

Table 6.18 Projected Volumes of Operational Traffic (Phase 1)

	HGV Movements		Workforce Traffic		Visitor Traffic		CRP Traffic		Total Traffic Generation		
	In	Out	In	Out	In	Out	In	Out	In	Out	Total
0600-0700	0	0	5	0	0	0	0	0	5	0	5
0700-0800	0	0	0	5	0	0	0	0	0	5	5
0800-0900	0	0	32	0	1	1	0	0	33	1	34
0900-1000	1	1	0	0	1	1	0	0	2	2	4
1000-1100	2	2	0	0	1	1	6	6	9	9	18
1100-1200	5	4	0	0	1	1	5	5	11	10	21
1200-1300	4	5	0	0	1	1	3	3	8	9	17
1300-1400	**5**	**5**	**16**	**16**	**1**	**1**	**4**	**4**	**26**	**26**	**52**
1400-1500	5	5	5	0	1	1	3	3	14	9	23
1500-1600	4	5	0	5	1	1	3	3	8	14	22
1600-1700	5	4	0	0	1	1	3	3	9	8	17
1700-1800	3	3	0	0	1	1	3	3	7	7	14
1800-1900	3	3	0	32	0	0	3	3	6	38	44
1900-2000	0	0	0	0	0	0	0	0	0	0	0
2000-2100	0	0	0	0	0	0	0	0	0	0	0

The projected volume of traffic generated during the operational phases of the development can be seen in Table 6.19 below for phase 1 and phase 2. Most of the staff traffic will arise in phase 1 and there will be very little additional staff traffic generated by phase 2. However phase 2 will result in an increase in the number of HGV movements.

Table 6.19 Projected Volumes of Operational Traffic (Phase 1 and 2)

	HGV Movements		Workforce Traffic		Visitor Traffic		CRP Traffic		Total Traffic Generation		
	In	Out	In	Out	In	Out	In	Out	In	Out	Total
0600-0700	0	0	5	0	0	0	0	0	5	0	5
0700-0800	0	0	0	5	0	0	0	0	0	5	5
0800-0900	0	0	32	0	1	1	0	0	33	1	34
0900-1000	2	2	0	0	1	1	0	0	3	3	6
1000-1100	5	5	0	0	1	1	6	6	12	12	24
1100-1200	9	9	0	0	1	1	5	5	15	15	30
1200-1300	9	9	0	0	1	1	3	3	13	13	26
1300-1400	**9**	**9**	**16**	**16**	**1**	**1**	**5**	**5**	**31**	**31**	**62**
1400-1500	9	9	5	0	1	1	3	3	18	13	31
1500-1600	9	9	0	5	1	1	3	3	13	18	31
1600-1700	8	8	0	0	1	1	3	3	12	12	24
1700-1800	7	7	0	0	1	1	3	3	11	11	22
1800-1900	7	7	0	32	0	0	3	3	10	42	52
1900-2000	0	0	0	0	0	0	0	0	0	0	0
2000-2100	0	0	0	0	0	0	0	0	0	0	0

From both tables above it can be seen that the peak level of development traffic is generated in the 13:00 – 14:00 period. This peak development traffic differs from the general Ringaskiddy area peak periods.

6.5 Traffic Distribution

6.5.1 General

The generated traffic from the proposed development has been distributed through the road network based on existing traffic patterns. The construction traffic and the operational traffic have different profiles as the distribution is subject to prevailing traffic conditions. Table 6.20 shows the estimated trip distribution profile for the proposed development.

Table 6.20 Traffic Distribution

Roadway	Construction - Year 2004		Operation - Year 2005		
	06:00 - 07:00	18:00–19:00	07:45–08:45	13:00–14:00	16:30–17:30
N28 (North)	67%	45%	48%	42%	45%
R611 (South)	14%	19%	11%	19%	15%
R610 (North)	2%	11%	8%	6%	13%
Raffeen Village	3%	5%	5%	4%	7%
R613 (East of Coolmore)	14%	20%	28%	29%	20%

6.6 Traffic Assignment

6.6.1 General

The projected levels of construction and operational traffic generated by the proposed development were assigned to the local road network in accordance with the trip distribution proportions detailed above. Tables 6.21 below shows the total traffic (two-way) assigned to the local road network.

Table 6.21 Projected Distribution of Traffic

Roadway	Construction - Year 2004		Operation - Year 2005		
	06:00 - 07:00	18:00–19:00	07:45–08:45	13:00–14:00	16:30–17:30
N28 (North)	133	60	16	26	23
R611 (South)	28	26	4	12	8
N28 (East of Shannon Park)	161	86	20	38	31
R610 (North)	3	14	3	4	7
N28 (East of Raffeen Bridge)	164	100	23	42	38
Raffeen Village	6	7	2	2	4
Shanbally Village	0	0	0	0	0
N28 (East of Shanbally)	170	107	25	44	42
R613 (West of Coolmore)	29	27	9	18	10
R613 (East of Coolmore)	29	27	9	18	10
N28 (Ringaskiddy Village)	199	134	34	62	52
N28 (East of Ferry Port)	199	134	34	62	52

All traffic flows in vehicles per hour

The projected levels of traffic on the local road network can be seen in the following tables for the construction and operational phase of the proposed development.

Table 6.22 Projected Traffic Flows – Construction – Year 2004

Road	Construction – Year 2004	
	06:00-07:00	18:00-19:00
N28 (North)	485	1977
R611 (South)	212	1578
N28 (East of Shannon Park)	436	1044
R610 (North)	71	416
N28 (East of Raffeen Bridge)	367	920
Raffeen Village	16	86
Shanbally Village	19	170
N28 (East of Shanbally)	369	851
R613 (West of Coolmore)	72	316
R613 (East of Coolmore)	83	382
N28 (Ringaskiddy Village)	344	565
N28 (East of Ferry Port)	235	315

All traffic flows in vehicles per hour

Table 6.23 Projected Traffic Flows – Operational – Year 2005

Road	Operation – Year 2005		
	07:45-08:45	13:00-14:00	16:30-17:30
N28 (North)	3075	1525	2533
R611 (South)	1950	1213	1884
N28 (East of Shannon Park)	1934	937	1377
R610 (North)	609	379	596
N28 (East of Raffeen Bridge)	1586	686	1295
Raffeen Village	140	57	178
Shanbally Village	409	149	316
N28 (East of Shanbally)	1471	628	1159
R613 (West of Coolmore)	843	400	439
R613 (East of Coolmore)	997	408	618
N28 (Ringaskiddy Village)	983	562	682
N28 (East of Ferry Port)	523	374	411

All traffic flows in vehicles per hour

6.7 Impact on the Local Road Network

6.7.1 General

The impact of traffic generated on the local road network has been assessed by comparing the projected future traffic volumes with and without the construction of the proposed development. In addition, the effect of the generated traffic on the junctions in the immediate vicinity of the proposed development was examined.

6.7.2 Construction Traffic

The projected increase in traffic during the construction stage can be seen in Table 6.24. The table includes Year 2004 projected flows both with and without the proposed construction traffic.

Table 6.24 Projected Traffic Flows – Construction Traffic

Roadway	Year 2004 _ 06:00-07:00			Year 2004 _ 18:00-19:00		
	Without	With	% Change	Without	With	% Change
N28 (North)	353	485	+37%	1917	1977	+3%
R611 (South)	183	212	+16%	1552	1578	+2%
N28 (East of Shannon Park)	275	436	+59%	958	1044	+9%
R610 (North)	68	71	+4%	402	416	+4%
N28 (East of Raffeen Bridge)	203	367	+81%	820	920	+12%
Raffeen Village	10	16	+60%	79	86	+9%
Shanbally Village	19	19	0%	170	170	0%
N28 (East of Shanbally)	199	369	+85%	745	851	+14%
R613 (West of Coolmore)	43	72	+67%	288	316	+10%
R613 (East of Coolmore)	54	83	+54%	354	382	+8%
N28 (Ringaskiddy Village)	145	344	+137%	431	565	+31%
N28 (East of Ferry Port)	36	235	+553%	181	315	+74%

All traffic flows in vehicles per hour

From the above assessment it can be seen that during the construction AM peak period that the relative increase in traffic is quite significant, however it should be noted that the construction start time has been designed to coincide with the lower traffic flows between 06:00 - 07:00 and to avoid the higher traffic flows which occur later. It should also be noted that all roadways are expected to be within capacity during the morning construction peak period. It can be seen that the percentage change during the evening peak period is far less significant with percentage increases generally less than 15%.

6.7.3 Operational Traffic

The peak period of generated traffic from the Waste Management Facility does not correspond with the Ringaskiddy road network peaks. The proposed development traffic peak occurs in the 13:00-14:00 hour, while the Ringaskiddy road network peaks occur in the 07:45 – 08:45 hour and 16:30 – 17:30 hour period. The traffic assessment has considered the traffic impact during the following periods:

- AM Network Peak (07:45 – 08:45)
- Development Peak (13:00 – 14:00)
- PM Network Peak (16:30 – 17:30)

It should be noted that, as stated in section 6.4.2, shift start times, working hours and waste acceptance hours have been carefully chosen to ensure that the traffic generated by the facility avoids the Ringaskiddy morning peak period. However, to ensure that the assessment is robust and conservative, for the purposes of the assessment it has been assumed that traffic generated by the facilities' office staff in the morning will travel in the peak period. This is conservative as a significant portion of the day-time workers should arrive between 8.45 and 09.00, after the peak, for a 9.00 start. A similar conservative assumption was made for the evening peak period.

The projected increase in traffic during the operational stage can be seen in Table 6.25 to Table 6.27. The tables include Year 2005 projected flows both with and without the construction of both Phase 1 and Phase 2.

Table 6.25 Projected Traffic Flows – Operational AM Peak – Year 2005

Road	Operation _ 07:45-08:45		
	Without	With	% Change
N28 (North)	3059	3075	+1%
R611 (South)	1946	1950	0%
N28 (East of Shannon Park)	1914	1934	+1%
R610 (North)	607	609	+1%
N28 (East of Raffeen Bridge)	1563	1586	+2%
Raffeen Village	139	140	+2%
Shanbally Village	409	409	0%
N28 (East of Shanbally)	1446	1471	+2%
R613 (West of Coolmore)	833	843	+1%
R613 (East of Coolmore)	988	997	+1%
N28 (Ringaskiddy Village)	949	983	+4%
N28 (East of Ferry Port)	489	523	+7%

All traffic flows in vehicles per hour

From the above analysis it can be seen that the proposed development when operational will have little or no impact on the local road network during the morning peak period. It is expected that only the N28 (East of Ferry Port) will see an increase greater than 5%. A 5% increase is generally regarded as the threshold above which a development is considered to have an impact.

Table 6.26 Projected Traffic Flows – Operational Development Peak – Year 2005

Road	Operational _ 13:00-14:00		
	Without	With	% Change
N28 (North)	1499	1525	+2%
R611 (South)	1201	1213	+1%
N28 (East of Shannon Park)	899	937	+4%
R610 (North)	375	379	+1%
N28 (East of Raffeen Bridge)	644	686	+7%
Raffeen Village	54	57	5%
Shanbally Village	149	149	0%
N28 (East of Shanbally)	584	628	+8%
R613 (West of Coolmore)	382	400	+5%
R613 (East of Coolmore)	390	408	+5%
N28 (Ringaskiddy Village)	500	562	+12%
N28 (East of Ferry Port)	312	374	+20%

All traffic flows in vehicles per hour

From the above analysis it can be seen that during the developments peak traffic generation period, its relative impact on the local road network is greater than that during the morning peak. However, it should be noted that traffic conditions during this time period on the local road network are not considered congested. Traffic generated by the proposed development is not expected to impact roadways located near Shannon Park Roundabout, however, traffic through Ringaskiddy Village may increase by up to 12%.

Table 6.27 Projected Traffic Flows – Operational PM Peak – Year 2005

Road	Operation _ 16:30-17:30		
	Without	With	% Change
N28 (North)	2510	2533	+1%
R611 (South)	1876	1884	+0%
N28 (East of Shannon Park)	1346	1377	+2%
R610 (North)	589	596	+1%
N28 (East of Raffeen Bridge)	1257	1295	+3%
Raffeen Village	174	178	+2%
Shanbally Village	316	316	+0%
N28 (East of Shanbally)	1118	1159	+4%
R613 (West of Coolmore)	428	439	+3%
R613 (East of Coolmore)	608	618	+2%
N28 (Ringaskiddy Village)	630	682	+8%
N28 (East of Ferry Port)	359	411	+15%

All traffic flows in vehicles per hour

The above analysis shows that the proposed development will have little or no impact on most of the local road network. Traffic is expected to increase by between 1% - 4% on the N28 west of

Ringaskiddy. A greater increase in traffic is expected within the village and east of it. However, this section of Ringaskiddy does not experience congestion during the evening peak period.

Link Capacity Assessments

The capacity of the road links has been assessed by referring to tables contained in the DMRB UK TA 79/99 "Traffic Capacity of Urban Roads" circular. This assigns a capacity value for a link dependent upon the size and characteristic of the roadway. Two-way traffic flows can be compared to these capacity values to determine how close a road link is to capacity. Table 6.28 below shows the comparison between road capacity and Year 2005 projected AM traffic flows, as this time period was judged to have the most traffic compared to all other time periods. The assessment has been carried out based on the volume of traffic generated by both Phase 1 and Phase 2.

Table 6.28 Projected Traffic Flows – Operational Development Peak

Road	Projected Capacity	Year 2005 07:45-08:45	Projected Capacity Ratio
N28 (North)	2583	3075	119%
R611 (South)	2167	1950	90%
N28 (East of Shannon Park)	2583	1934	75%
R610 (North)	1500	609	41%
N28 (East of Raffeen Bridge)	2583	1586	61%
Raffeen Village	1250	140	11%
Shanbally Village	1250	409	33%
N28 (East of Shanbally)	2583	1471	57%
R613 (West of Coolmore)	1500	843	56%
R613 (East of Coolmore)	1500	997	66%
N28 (Ringaskiddy Village)	2167	983	45%
N28 (East of Ferry Port)	2583	523	20%

All traffic flows in vehicles per hour

From the above road capacity assessment it can be seen that all roadways in the vicinity of the proposed development have sufficient capacity to cope with the projected future volume of traffic except for the N28 heading north from the Shannon Park Roundabout. It should be noted that the traffic will exceed the available road capacity on the N28 (North) in Year 2005 even without the additional traffic generated by the Ringaskiddy Waste Management Facility, which only increases the traffic by 1%.

6.7.4 Projected Junction Operation

In urbanised and industrialised areas it is recognised that it is the capacity of the junctions on the road links rather than the road links themselves which determine the capacity of the road network. The following junctions were assessed both with and without traffic from the proposed development. These assessments were carried out to measure the impact of the generated traffic on the local road network.

Junction 1	Shannon Park Roundabout
Junction 2	Raffeen Bridge Junction
Junction 3	Shanbally Roundabout
Junction 4	Ringaskiddy Junction (N18/R613)

Junction 5	Ferry Port Access
Junction 6	Coolmore Crossroads

The impact of the generated traffic on the local junctions has been assessed using the UK Department of Transport computer applications, ARCADY and PICADY. These computer applications determine the projected operation of the junctions based on a number of geometric parameters and traffic flow conditions.

Each junction has been assessed based on the following five time periods and the results can be seen in Appendix B for the without Scenario and Appendix C for the with Scenario:

- Construction AM Peak (06:00-07:00)
- Construction PM Peak (18:00-19:00)
- AM Peak (07:45-08:45)
- Development Peak (13:00-14:00)
- PM Peak (16:30-17:30)

The junction analysis has been assessed over the whole hour for all time periods except for the Construction AM Peak (06:00-07:00). It is accepted that most of the construction staff will arrive to the site within fifteen minutes of the start of the shift. To take account of this the analysis for the Construction AM Peak has been carried out for the time period (06:45-07:00) with 75% of the construction workers who arrive before 07:00 assumed to arrive during 06:45-07:00 time period.

6.7.5 Shannon Park Roundabout

The impact on the above junction was assessed during both the construction and operational phases of the development. The analysis indicated that during the construction peak periods the roundabout has sufficient capacity to accommodate the projected increase in construction traffic.

The increase in generated traffic during the operation phase of the proposed development has little or no impact on the projected operation of roundabout. However, it should be noted that during the morning peak period it is expected that the northern arm of the roundabout will be at capacity both with and without the construction of the proposed development.

6.7.6 Raffeen Bridge Junction

As with the previous junction, the Raffeen Bridge junction was assessed during both the construction and operational phase of the development. During the construction AM and PM peak periods it is expected that the Raffeen Bridge Junction will have sufficient capacity to accommodate the projected temporary increase in traffic associated with the construction generated traffic.

It is envisaged that following the opening of the proposed development that the Raffeen Bridge junction will have sufficient capacity to accommodate the projected increase in traffic. The additional operational traffic will result in little change in the operation of junction compared with the base conditions.

6.7.7 Shanbally Roundabout

It is expected that the AM peak construction traffic will impact on the operation of the Shanbally Roundabout in the time period 06:45-07:00. It is expected that the increase in traffic during this

time period will lead to increased queues and delays along the western arm of the roundabout. It is noted that the expected queue will be short in duration as the construction shift starting time is 07:00. It is envisaged that some queuing will also occur at this junction during the PM construction peak period. As with the AM peak period the queues generated during the PM construction peak period will be short in duration.

It is expected that the traffic generated during the operational phase of the development will have little or no impact on the operation of Shanbally Roundabout during the morning and evening peak periods. While during the development peak of 13:00-14:00 the impact is quite small. The Shanbally Roundabout is expected to be over capacity both with and without the proposed development during the morning and evening peak periods. However during 13:00-14:00 it is expected that the roundabout will have sufficient capacity.

6.7.8 Ringaskiddy Junction (N18-R613)

Based on the junction analysis contained in Appendix B and Appendix C it is expected that the above junction will have sufficient capacity to accommodate the projected levels of construction traffic in both the AM and PM construction peaks.

The projected levels of operational traffic reduce the amount of available capacity at the above junction, but the junction is expected to have sufficient capacity to accommodate this traffic. During the 07:45-08:45 time period the junction will experience some queuing on both the R613 and the N28 (west).

6.7.9 Ferry Port Junction

The projected increase in traffic generated by the proposed development at the above junction will not result in the development of any significant delays at the junction either during the projects construction or operational phases. Although all traffic generated by the proposed development will pass through the above junction it has sufficient spare capacity to accommodate the growth in traffic.

6.7.10 Coolmore Crossroads

It is expected that during the construction phase the projected increase in traffic generated by the development will have little or no impact on the operation of the junction, and it will have sufficient capacity to accommodate the future traffic flows.

During the operational phase of the development, the increase in traffic will have little or no impact on the operation of the junction.

6.8 Mitigation Measures

As part of the design process for the proposed development of the Waste Management Facility a number of mitigation measures were included to control the impact of the generated traffic on the local road network.

The proposed mitigation measures include:

- The construction start time will be 07:00 to avoid the Ringaskiddy morning peak traffic period between 07:45-08:45.
- The operational shift will also start at 07:00 to avoid the Ringaskiddy morning peak period traffic.
- Waste will not be accepted by the development before 09:00, thereby reducing the volume of HGV movements during the Ringaskiddy morning peak period.
- Non shift staff will commence work at 09:00 to avoid the busiest periods of the Ringaskiddy morning peak period.
- The Community Recycling Park will not open till 10:00 again to avoid its generated traffic coinciding with the morning peak period.
- All trucking movements will occur within the sites and it is expected that no vehicles will have to queue on the external road network.
- All parking will be contained within the confines of the proposed sites for both the construction and operational phases of the development.
- If sufficient parking for construction workers can not be accommodated within the site, the contractor will be obliged to provided alternative means of transport to the site.
- The proposed scheme includes the construction of a footpath on the road at the site.

6.9 Residual Impacts

It is expected that during both the construction and operational phases of the proposed development traffic queues will continue to occur at Shanbally Roundabout particularly during the morning peak period.

6.9.1 Bypass of Shanbally and Ringaskiddy

Shanbally Roundabout has previously been identified as a problem junction in the Ringaskiddy area. The National Roads Authority (NRA) have recently placed advertisements seeking engineering consultants for the upgrading of the N28 Cork to Ringaskiddy route. It is expected that if this upgrading proceeds, it would provide a solution which would improve the operation of a number of junctions in Ringaskiddy including the Shanbally Roundabout. This may include a bypass of Shanbally and Ringaskiddy villages.

Appendix 6.1

Existing Junction Operation

Construction AM Peak (Time Period 06:45-07:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
R613 (East)	2%	0	0.11
Coolmore Estate Road	0%	0	0
R613 (West)	0%	0	0
Shanbally Village	3%	0	0.1

Construction PM Peak (Time Period 18:00-19:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
R613 (East)	15%	0	0.14
Coolmore Estate Road	1%	0	0.13
R613 (West)	1%	0	0.11
Shanbally Village	11%	0	0.13

Operational AM Peak (Time Period 07:45-08:45)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
R613 (East)	18%	0	0.17
Coolmore Estate Road	3%	0	0.17
R613 (West)	0%	0	0
Shanbally Village	46%	1	0.2

Operational Development Peak (Time Period 13:00-14:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
R613 (East)	6%	0	0.13
Coolmore Estate Road	1%	0	0.13
R613 (West)	0%	0	0.1
Shanbally Village	12%	0	0.13

Operational PM Peak (Time Period 16:30-17:30)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
R613 (East)	43%	1	0.18
Coolmore Estate Road	1%	0	0.13
R613 (West)	1%	0	0.13
Shanbally Village	10%	0	0.14

Construction AM Peak (Time Period 06:45-07:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0
Loughbeg Road	1%	0	0.09
N28 (West)	37%	1	0.15
Ferry Port Access	0%	0	0

Construction PM Peak (Time Period 18:00-19:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0.1
Loughbeg Road	20%	0	0.11
N28 (West)	15%	0	0.12
Ferry Port Access	4%	0	0.12

Operational AM Peak (Time Period 07:45-08:45)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0
Loughbeg Road	7%	0	0.09
N28 (West)	63%	4	0.22
Ferry Port Access	2%	0	0.15

Operational Development Peak (Time Period 13:00-14:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	1%	0	0.11
Loughbeg Road	7%	0	0.17
N28 (West)	14%	0	0.12
Ferry Port Access	7%	0	0.17

Operational PM Peak (Time Period 16:30-17:30)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0.09
Loughbeg Road	29%	0	0.12
N28 (West)	7%	0	0.11
Ferry Port Access	4%	0	0.13

Construction AM Peak (Time Period 06:45-07:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (West)	0%	0	0
R611 (North)	10%	0	0.14
N28 (East)	0%	0	0.1

Construction PM Peak (Time Period 18:00-19:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (West)	0%	0	0
R611 (North)	21%	0	0.17
N28 (East)	17%	0	0.11

Operational AM Peak (Time Period 07:45-08:45)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (West)	0%	0	0
R611 (North)	34%	1	0.29
N28 (East)	18%	1	0.15

Operational Development Peak (Time Period 13:00-14:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (West)	0%	0	0
R611 (North)	18%	0	0.16
N28 (East)	4%	0	0.1

Operational PM Peak (Time Period 16:30-17:30)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (West)	0%	0	0
R611 (North)	26%	0	0.21
N28 (East)	31%	0	0.13

Construction AM Peak (Time Period 06:45-07:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0
R613(South)	9%	0	0.13
N28 (West)	3%	0	0.11

Construction PM Peak (Time Period 18:00-19:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0
R613(South)	13%	0	0.14
N28 (West)	6%	0	0.14

Operational AM Peak (Time Period 07:45-08:45)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0
R613(South)	48%	1	0.26
N28 (West)	53%	2	0.2

Operational Development Peak (Time Period 13:00-14:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0
R613(South)	13%	0	0.15
N28 (West)	9%	0	0.14

Operational PM Peak (Time Period 16:30-17:30)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0
R613(South)	26%	0	0.15
N28 (West)	13%	0	0.14

Construction AM Peak (Time Period 06:45-07:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	4%	0	0.07
Shanbally Village	1%	0	0.06
N28 (West)	42%	1	0.1

Construction PM Peak (Time Period 18:00-19:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	56%	1	0.13
Shanbally Village	14%	0	0.09
N28 (West)	23%	0	0.08

Operational AM Peak (Time Period 07:45-08:45)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	25%	0	0.09
Shanbally Village	20%	0	0.09
N28 (West)	124%	74	4.21

Operational Development Peak (Time Period 13:00-14:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	22%	0	0.08
Shanbally Village	8%	0	0.08
N28 (West)	31%	1	0.08

Operational PM Peak (Time Period 16:30-17:30)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	89%	6	0.3
Shanbally Village	46%	1	0.17
N28 (West)	17%	0	0.07

Construction AM Peak (Time Period 06:45-07:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (North)	22%	0	0.04
N28 (East)	5%	0	0.03
R613 (South)	13%	0	0.03

Construction PM Peak (Time Period 18:00-19:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (North)	47%	1	0.05
N28 (East)	35%	1	0.05
R613 (South)	35%	1	0.05

Operational AM Peak (Time Period 07:45-08:45)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (North)	76%	3	0.1
N28 (East)	18%	0	0.04
R613 (South)	69%	2	0.08

Operational Development Peak (Time Period 13:00-14:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (North)	34%	1	0.04
N28 (East)	18%	0	0.04
R613 (South)	28%	0	0.04

Operational PM Peak (Time Period 16:30-17:30)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (North)	50%	1	0.05
N28 (East)	59%	1	0.08
R613 (South)	43%	1	0.06

Appendix 6.2

Projected Junction Operation Without Development

Construction AM Peak (Time Period 06:45-07:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
R613 (East)	2%	0	0.11
Coolmore Estate Road	0%	0	0
R613 (West)	0%	0	0
Shanbally Village	4%	0	0.1

Construction PM Peak (Time Period 18:00-19:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
R613 (East)	18%	0	0.14
Coolmore Estate Road	1%	0	0.11
R613 (West)	1%	0	0.11
Shanbally Village	13%	0	0.13

Operational AM Peak (Time Period 07:45-08:45)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
R613 (East)	24%	0	0.19
Coolmore Estate Road	3%	0	0.18
R613 (West)	0%	0	0
Shanbally Village	60%	2	0.27

Operational Development Peak (Time Period 13:00-14:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
R613 (East)	8%	0	0.14
Coolmore Estate Road	1%	0	0.14
R613 (West)	0%	0	0.09
Shanbally Village	16%	0	0.14

Operational PM Peak (Time Period 16:30-17:30)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
R613 (East)	54%	2	0.2
Coolmore Estate Road	2%	0	0.13
R613 (West)	1%	0	0.13
Shanbally Village	14%	0	0.16

Construction AM Peak (Time Period 06:45-07:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0
Loughbeg Road	2%	0	0.09
N28 (West)	42%	1	0.16
Ferry Port Access	0%	0	0

Construction PM Peak (Time Period 18:00-19:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0.1
Loughbeg Road	23%	0	0.11
N28 (West)	16%	0	0.12
Ferry Port Access	4%	0	0.13

Operational AM Peak (Time Period 07:45-08:45)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0
Loughbeg Road	8%	0	0.1
N28 (West)	75%	3	0.29
Ferry Port Access	3%	0	0.17

Operational Development Peak (Time Period 13:00-14:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	1%	0	0.11
Loughbeg Road	8%	0	0.18
N28 (West)	17%	0	0.12
Ferry Port Access	9%	0	0.18

Operational PM Peak (Time Period 16:30-17:30)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0.08
Loughbeg Road	35%	1	0.14
N28 (West)	9%	0	0.13
Ferry Port Access	5%	0	0.14

Construction AM Peak (Time Period 06:45-07:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (West)	0%	0	0
R611 (North)	19%	0	0.16
N28 (East)	1%	0	0.1

Construction PM Peak (Time Period 18:00-19:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (West)	0%	0	0
R611 (North)	41%	1	0.22
N28 (East)	20%	0	0.12

Operational AM Peak (Time Period 07:45-08:45)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (West)	0%	0	0
R611 (North)	76%	3	0.66
N28 (East)	29%	1	0.19

Operational Development Peak (Time Period 13:00-14:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (West)	0%	0	0
R611 (North)	39%	1	0.21
N28 (East)	7%	0	0.11

Operational PM Peak (Time Period 16:30-17:30)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (West)	0%	0	0
R611 (North)	65%	2	0.37
N28 (East)	41%	1	0.15

Construction AM Peak (Time Period 06:45-07:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0
R613(South)	11%	0	0.14
N28 (West)	4%	0	0.11

Construction PM Peak (Time Period 18:00-19:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0
R613(South)	19%	0	0.15
N28 (West)	9%	0	0.15

Operational AM Peak (Time Period 07:45-08:45)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0
R613(South)	78%	3	0.48
N28 (West)	77%	6	0.32

Operational Development Peak (Time Period 13:00-14:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0
R613(South)	21%	0	0.17
N28 (West)	11%	0	0.15

Operational PM Peak (Time Period 16:30-17:30)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0
R613(South)	33%	0	0.18
N28 (West)	16%	0	0.16

Construction AM Peak (Time Period 06:45-07:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	4%	0	0.07
Shanbally Village	1%	0	0.06
N28 (West)	48%	1	0.11

Construction PM Peak (Time Period 18:00-19:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	68%	2	0.16
Shanbally Village	17%	0	0.1
N28 (West)	28%	0	0.08

Operational AM Peak (Time Period 07:45-08:45)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	34%	0	0.1
Shanbally Village	26%	0	0.09
N28 (West)	156%	>200	>5.00

Operational Development Peak (Time Period 13:00-14:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	32%	1	0.09
Shanbally Village	10%	0	0.08
N28 (West)	43%	1	0.1

Operational PM Peak (Time Period 16:30-17:30)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	114%	74	2.27
Shanbally Village	61%	2	0.25
N28 (West)	24%	0	0.08

Construction AM Peak (Time Period 06:45-07:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (North)	27%	0	0.04
N28 (East)	7%	0	0.03
R613 (South)	15%	0	0.03

Construction PM Peak (Time Period 18:00-19:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (North)	54%	1	0.06
N28 (East)	47%	1	0.07
R613 (South)	42%	1	0.05

Operational AM Peak (Time Period 07:45-08:45)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (North)	101%	32	0.4
N28 (East)	26%	0	0.04
R613 (South)	88%	7	0.14

Operational Development Peak (Time Period 13:00-14:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (North)	45%	1	0.05
N28 (East)	28%	0	0.05
R613 (South)	37%	1	0.05

Operational PM Peak (Time Period 16:30-17:30)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (North)	62%	2	0.07
N28 (East)	87%	6	0.18
R613 (South)	58%	1	0.08

Appendix 6.3

Projected Junction Operation With Development

Construction AM Peak (Time Period 06:45-07:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (North)	48%	1	0.06
N28 (East)	9%	0	0.03
R613 (South)	19%	0	0.04

Construction PM Peak (Time Period 18:00-19:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (North)	56%	1	0.06
N28 (East)	50%	1	0.07
R613 (South)	43%	1	0.05

Operational AM Peak (Time Period 07:45-08:45)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (North)	102%	25	0.46
N28 (East)	26%	0	0.04
R613 (South)	88%	6	0.15

Operational Development Peak (Time Period 13:00-14:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (North)	46%	1	0.05
N28 (East)	29%	0	0.05
R613 (South)	37%	1	0.05

Operational PM Peak (Time Period 16:30-17:30)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (North)	62%	2	0.07
N28 (East)	89%	7	0.19
R613 (South)	59%	2	0.08

Construction AM Peak (Time Period 06:45-07:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	8%	0	0.07
Shanbally Village	1%	0	0.07
N28 (West)	96%	11	0.48

Construction PM Peak (Time Period 18:00-19:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	73%	3	0.18
Shanbally Village	18%	0	0.11
N28 (West)	35%	1	0.09

Operational AM Peak (Time Period 07:45-08:45)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	34%	0	0.1
Shanbally Village	25%	0	0.09
N28 (West)	158%	>200	>5.00

Operational Development Peak (Time Period 13:00-14:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	34%	1	0.09
Shanbally Village	10%	0	0.08
N28 (West)	45%	1	0.1

Operational PM Peak (Time Period 16:30-17:30)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	118%	94	3.06
Shanbally Village	61%	2	0.25
N28 (West)	25%	0	0.08

Construction AM Peak (Time Period 06:45-07:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0
R613(South)	34%	0	0.18
N28 (West)	6%	0	0.12

Construction PM Peak (Time Period 18:00-19:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0
R613(South)	19%	0	0.16
N28 (West)	10%	0	0.16

Operational AM Peak (Time Period 07:45-08:45)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0
R613(South)	82%	4	0.54
N28 (West)	79%	6	0.34

Operational Development Peak (Time Period 13:00-14:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0
R613(South)	25%	0	0.18
N28 (West)	11%	0	0.15

Operational PM Peak (Time Period 16:30-17:30)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0
R613(South)	33%	0	0.18
N28 (West)	17%	0	0.16

Construction AM Peak (Time Period 06:45-07:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (West)	0%	0	0
R611 (North)	27%	0	0.23
N28 (East)	1%	0	0.13

Construction PM Peak (Time Period 18:00-19:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (West)	0%	0	0
R611 (North)	44%	1	0.24
N28 (East)	22%	0	0.12

Operational AM Peak (Time Period 07:45-08:45)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (West)	0%	0	0
R611 (North)	92%	5	0.9
N28 (East)	32%	1	0.21

Operational Development Peak (Time Period 13:00-14:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (West)	0%	0	0
R611 (North)	41%	1	0.22
N28 (East)	7%	0	0.11

Operational PM Peak (Time Period 16:30-17:30)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (West)	0%	0	0
R611 (North)	73%	2	0.46
N28 (East)	41%	1	0.15

Construction AM Peak (Time Period 06:45-07:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0
Loughbeg Road	2%	0	0.09
N28 (West)	42%	1	0.16
Ferry Port Access	0%	0	0

Construction PM Peak (Time Period 18:00-19:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0.09
Loughbeg Road	23%	0	0.12
N28 (West)	17%	0	0.12
Ferry Port Access	5%	0	0.14

Operational AM Peak (Time Period 07:45-08:45)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0
Loughbeg Road	8%	0	0.1
N28 (West)	75%	3	0.29
Ferry Port Access	3%	0	0.18

Operational Development Peak (Time Period 13:00-14:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	1%	0	0.11
Loughbeg Road	8%	0	0.19
N28 (West)	17%	0	0.12
Ferry Port Access	9%	0	0.19

Operational PM Peak (Time Period 16:30-17:30)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
N28 (East)	0%	0	0.08
Loughbeg Road	38%	1	0.3
N28 (West)	9%	0	0.12
Ferry Port Access	6%	0	0.14

Construction AM Peak (Time Period 06:45-07:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
R613 (East)	2%	0	0.12
Coolmore Estate Road	0%	0	0
R613 (West)	0%	0	0
Shanbally Village	4%	0	0.1

Construction PM Peak (Time Period 18:00-19:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
R613 (East)	18%	0	0.14
Coolmore Estate Road	1%	0	0.13
R613 (West)	1%	0	0.11
Shanbally Village	13%	0	0.13

Operational AM Peak (Time Period 07:45-08:45)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
R613 (East)	24%	0	0.19
Coolmore Estate Road	3%	0	0.18
R613 (West)	0%	0	0
Shanbally Village	61%	2	0.27

Operational Development Peak (Time Period 13:00-14:00)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
R613 (East)	8%	0	0.14
Coolmore Estate Road	1%	0	0.14
R613 (West)	0%	0	0.09
Shanbally Village	16%	0	0.14

Operational PM Peak (Time Period 16:30-17:30)

	Demand/Capacity	Maximum Queue (vehs)	Average Delay (mins)
R613 (East)	55%	2	0.2
Coolmore Estate Road	2%	0	0.13
R613 (West)	1%	0	0.13
Shanbally Village	14%	0	0.16