

Annex G

Annex G – Sensitivity Analysis

INTRODUCTION

This Annex presents a number of sensitivity assessments which have been undertaken at the request of both PCC and the HA. These assessments build upon the information presented within both the TA and the associated Annexes, including the Trip Generation Technical Note (presented at **ANNEX D**).

The sensitivity assessments have focused on four aspects:

- A. 'Maximum Scenario'
- B. Variation and Impact on the Strategic Road Network
- C. Waste Miles Assessment
- D. Potential Development

Taking each of the above in turn, the remainder of this Annex presents the respective sensitivity assessments:

SECTION A 'MAXIMUM SCENARIO'

The analysis presented within the Transport Assessment has been based around the estimation of the 'typical' average daily situation which is expected to occur at the EfW CHP facility, following its proposed opening in 2014. The typical average scenario has been generated from real traffic data at existing waste delivery points and from the best available assumptions of the SWDWP and from MVV, as set out within the TA and Trip Generation Technical Note.

From the perspective of the TA, the approach that has been taken accords with the relevant best practice guidance, such that the real-world implications of the proposed development can be assessed. This approach has been accepted by PCC and the HA, but a possible 'maximum scenario' has also been requested, for testing purposes.

Establishment of the Maximum Scenario

The same Municipal Waste data that has been presented within Chapter 2 of the TA has been interrogated to consider the maximum number of waste vehicles that could be associated with the EfW CHP facility. As a worst-case scenario, the maximum number of deliveries has been considered by vehicle type, by hour and day of the week.

To expand on this, as before data has been considered for the four busiest weekdays only (Monday – Thursday) but in this case, the busiest hours have been considered, irrespective of which month they were observed. It is considered that this represents an unrealistic situation, but nonetheless has allowed a worst-case scenario in which the maximum observed number of waste vehicle deliveries to be estimated.

The analysis presented in **TABLE G.1** indicates that the busiest observed hour, when taking into consideration the combined data, occurred between 14:00-15:00 when 36 combined deliveries took place. These deliveries were for municipal waste only, and do not include C&I waste or IBA and APCR.

TABLE G.1 Maximum MSW Vehicle Deliveries, by Hour

Time	Devon District Bulker	Torbay RTS Bulker	Devon Hookloader CA	South Hams RCV	PCC Hookloader	PCC RCV	Total MSW per hour
08:00-09:00	6	7	1	1	6	2	23
09:00-10:00	3	9	1	2	8	4	27
10:00-11:00	4	6	1	2	5	13	31
11:00-12:00	3	4	1	3	6	13	30
12:00-13:00	6	6	1	4	7	6	30
13:00-14:00	4	5	1	3	4	11	28
14:00-15:00	3	4	1	6	8	14	36
15:00-16:00	5	2	1	2	5	11	26
16:00-17:00	3	0	1	2	3	1	10
17:00-18:00	1	6	0	0	0	0	7
Total	40	49	9	25	52	75	250

MVV have confirmed that it would be extremely unlikely that the EfW CHP facility would ever process more than 36 waste vehicle movements within a single hour period, even when MSW, C&I and IBA & APCR deliveries would be combined. It was therefore considered that this quantum of waste deliveries would form a robust basis on which the maximum scenario sensitivity assessment could be undertaken.

Sensitivity Assessment

As discussed above, advice from MVV has indicated that for the purpose of undertaking a 'maximum' sensitivity assessment, that 36 waste deliveries (plus staff movements) should be considered for both the AM and PM peak hours.

When combined with the staff movements (see **TABLE G.2** below which is re-produced from the Transport Assessment), the 'maximum' scenario is expected to generate 11 staff movements in the AM Peak and 9 staff movements in the PM Peak.

TABLE G.2 Estimated Staff Arrival and Departure Movements

Time	Arrivals	Departures
05:00-06:00	5	
06:00-07:00		5
07:00-08:00	9	
08:00-09:00	11	
09:00-10:00		
10:00-11:00		
11:00-12:00		
12:00-13:00		
13:00-14:00	5	
14:00-15:00		5
15:00-16:00		4
16:00-17:00		9
17:00-18:00		7
18:00-19:00		
19:00-20:00		
20:00-21:00		
21:00-22:00	5	
22:00-23:00		5
Total	35	35

Table G.2 presented above is re-produced from the Transport Assessment (see Table 6.12 of that document)

Combining the staff movements presented above with the maximum estimated number of waste deliveries subsequently allows the traffic movements associated with the 'maximum scenario' to be established. A summary is provided below at **TABLE G.3**.

TABLE G.3 'Maximum Scenario' Traffic Movements

Time	Staff	Waste	Maximum Scenario Total
AM Peak (08:00-09:00)	11	36	47
PM Peak (16:00-17:00)	9	36	45

The analysis indicates that in the 'maximum scenario' situation, the EfW CHP facility may be expected to generate 47 and 45 vehicle trips in the AM and PM peak hours, respectively.

In order to consider this quantum of trips within the context of the Transport Assessment, the traffic distribution(s) presented in Chapter 7 of the TA have been applied to the total estimated trip generation data presented above, such that the estimated vehicle movements can be considered in relation to the local highway network.

Turning Movement diagrams have therefore been prepared, illustrating the 'maximum' traffic movements for the AM and PM peak hours. These diagrams are shown at **FIGURES G.1** and **G.2**.

The associated traffic flows have subsequently been run through the junction models which have been developed as part of the Transport Assessment, for each of the junctions located within the TA study area. The results of this analysis are presented below, taking each of the junctions in turn:

Wolseley Road / Saltash Road – 2014 Do Something 'Maximum Scenario'

The results of the operational analysis for the Wolseley Road / Saltash Road junction are summarised below at **TABLE G.4** for the 2014 Do Something 'Maximum Scenario'.

TABLE G.4 Wolseley Road / Saltash Road – 2014 Do Something 'Maximum Scenario'

Approach	AM (0800-0900)		PM (1600-1700)	
	Sat (%)	MMQ	Sat (%)	MMQ
Wolseley Rd N Ahead	63.8	11.8	49.7	6.2
Wolseley Rd N Right	89.4	22.5	87.7	12.0
Wolseley Rd S Ahead + Left	86.7	7.8	89.1	10.2
Wolseley Rd S Ahead	85.3	7.6	87.7	9.8
Saltash Rd Left	28.5	2.0	84.3	13.4
Saltash Rd Right	8.7	0.5	11.0	0.6
Cycletime (secs)	81		61	
Practical Reserve Capacity (PRC)	89.3%		89.0%	

Table G.4 should be compared against Tables 7.2 and 7.3 of the Transport Assessment

The analysis presented above confirms that the junction is predicted to be able to cater for the traffic associated with the 'Maximum Scenario' with the junction continuing to operate within the recommended capacity thresholds, as per the 2014 Do Minimum and 2014 Do Something situations considered within the TA.

Wolseley Road / Weston Mill Drive – 2014 Do Something ‘Maximum Scenario’

The results of the operational analysis for the Wolseley Road / Weston Mill Drive junction are summarised below at **TABLE G.5** for the 2014 Do Something ‘Maximum Scenario’.

TABLE G.5 Wolseley Road / Weston Mill Drive – 2014 Do Something ‘Maximum Scenario’

Approach	AM (0800-0900)		PM (1600-1700)	
	Sat (%)	MMQ	Sat (%)	MMQ
Wolseley Rd N Ahead + Left	88.5	8.8	89.1	8.8
Wolseley Rd N Ahead + Right	87.8	9.3	87.5	9.2
Weston Mill Dr Left	89.9	8.8	59.6	10.5
Weston Mill Dr Ahead + Left	89.9	9.5	60.9	3.5
Weston Mill Dr Ahead + Right	69.5	5.3	55.4	3.0
Wolseley Rd S Ahead + Left	83.0	7.2	87.0	16.5
Wolseley Rd S Right	75.7	5.9	86.5	16.5
Dockyard Ahead + Left	34.0	1.5	89.3	11.9
Dockyard Right	29.6	1.4	28.0	2.6
Cycletime (secs)	65		90	
Practical Reserve Capacity (PRC)	89.9%		89.3%	

Table G.5 should be compared against Tables 7.4 and 7.5 of the Transport Assessment

The analysis presented above confirms that the junction is predicted to be able to cater for the traffic associated with the ‘Maximum Scenario’ with the junction continuing to operate within the recommended capacity thresholds, as per the 2014 Do Minimum and 2014 Do Something situations considered within the TA.

Weston Mill Drive / Carlton Terrace – 2014 Do Something ‘Maximum Scenario’

The results of the operational analysis for the Weston Mill Drive / Carlton Terrace junction are summarised below at **TABLE G.6** for the 2014 Do Something ‘Maximum Scenario’.

TABLE G.6 Weston Mill Drive / Carlton Terrace – 2014 Do Something ‘Maximum Scenario’

Approach	AM (0800-0900)		PM (1600-1700)	
	Sat (%)	MMQ	Sat (%)	MMQ
Carlton Terrace	75.0	4.3	50.3	3.8
Weston Mill Dr E Ahead + Left	88.9	13.6	94.4	18.0
Weston Mill Dr E Ahead + Right	89.3	14.8	93.4	18.6
Ferndale Rd	84.5	5.6	90.8	9.9
Weston Mill Dr W Ahead + Left	84.1	8.7	94.7	24.5
Weston Mill Dr W Ahead + Right	85.7	9.6	93.8	24.6
Cycletime (secs)	60		120	
Practical Reserve Capacity (PRC)	89.3%		95.3%	

Table G.6 should be compared against Tables 7.6 and 7.7 of the Transport Assessment

The analysis presented above confirms that the junction is predicted to be able to cater for the traffic associated with the ‘Maximum Scenario’ with the junction continuing to operate within the recommended capacity thresholds in the AM peak.

In the PM peak hour, the operation of the junction is reported as being slightly in excess of the optimum threshold of 90%, but within the theoretical capacity threshold of 100%. These findings are consistent with the results presented within the Transport Assessment.

Strategic Highway Network – 2014 Do Minimum, Do Something and Do Something ‘Maximum Scenario’

In addition to the operational effects of the proposed development on the highway junctions within the study area of the TA, the analysis presented within that report also considered the relative implications of the EfW CHP facility on the strategic road network, which is managed by the Highways Agency.

A comparison of the 2014 Do Minimum and Do Something flows was therefore undertaken in the TA and the results of that analysis are re-produced below at **TABLE G.7**.

TABLE G.7 Strategic Highway Network – 2014 Do Minimum / Do Something Comparison

Approach	AM (0800-0900)			PM (1600-1700)		
	2014 DM	2014 DS	% Change	2014 DM	2014 DS	% Change
Weston Mill Drive / A38 WB On-slip	302	303	0.3%	873	874	0.1%
Weston Mill Drive / A38 WB Off-slip	436	448	2.8%	385	391	1.6%
Weston Mill Drive / A38 EB On-slip	448	454	1.3%	891	902	1.2%
Weston Mill Drive / A38 EB Off-slip	757	757	0.0%	316	316	0.0%

Table G.7 presented above is re-produced from the Transport Assessment (see Table 7.8 of that document)

As indicated above, the total flow at the respective junctions was compared for the 2014 Do Minimum and Do Something scenarios, for the two junctions (on and off slips) between Weston Mill Drive and the A38.

The analysis indicated that the EfW CHP facility will only lead to marginal changes in traffic flows at these junctions, during the peak hours. The largest predicted increase was estimated to be 2.8%, in the AM peak, at Weston Mill Drive / A38 Southern Junction (west bound off-slip). In this case, the increase in real terms would be equivalent to 12 additional vehicle movements, or one vehicle every five minutes.

In addition to the operational assessment presented above, consideration has also been given to the relative implications that could arise, according to the 'Maximum Scenario' discussed within this Annex. A comparison of the 2014 Do Minimum and Do Something (Maximum Scenario) flows is therefore presented below at **TABLE G.8**.

TABLE G.8 Strategic Highway Network – 2014 Do Minimum / Do Something (Maximum Scenario) Comparison

Approach	AM (0800-0900)			PM (1600-1700)		
	2014 DM	2014 DS 'Max'	% Change	2014 DM	2014 DS 'Max'	% Change
Weston Mill Drive / A38 WB On-slip	302	305	1.0%	873	877	4.6%
Weston Mill Drive / A38 WB Off-slip	436	467	7.1%	385	410	6.5%
Weston Mill Drive / A38 EB On-slip	448	473	5.6%	891	921	3.4%
Weston Mill Drive / A38 EB Off-slip	757	759	2.6%	316	319	0.9%

As indicated above, the total flow at the respective junctions has been compared for the 2014 Do Minimum and Do Something 'Maximum Scenario', for the two junctions (on and off slips) between Weston Mill Drive and the A38.

The analysis indicates that the EfW CHP facility will lead to marginal changes in traffic flows at these junctions, during the peak hours. The largest predicted increase has been estimated to be 7.1%, in the AM peak, at Weston Mill Drive / A38 Southern Junction (west bound off-slip).

Whilst this change in traffic flow is predicted to be greater than that presented in **TABLE G.7** above, it should be noted that the increase in real terms would be equivalent to 31 additional vehicle movements. Furthermore, the difference between the 'typical' forecast Do Something and the 'maximum' Do Something situation would be equivalent to 19 vehicles.

Signalised Site Access – 2014 Do Something 'Maximum Scenario'

As presented within the Transport Assessment, it is proposed that a signalised right turn-in, left turn-out site access will be provided, which will be incorporated as part of the existing Wolseley Road / Weston Mill Drive signalised junction.

An operational assessment of this proposed junction arrangement has been undertaken according to the 'maximum scenario' situation. The results of this analysis are presented below at **TABLE G.9**.

TABLE G.9 Wolseley Road / Weston Mill Drive / Site Access – 2014 Do Something ‘Maximum Scenario’

Approach	AM (0800-0900)		PM (1600-1700)	
	Sat (%)	MMQ	Sat (%)	MMQ
Wolseley Rd N Ahead + Left	89.9	9.3	87.7	8.4
Wolseley Rd N Ahead + Right	89.2	9.7	86.8	9.0
Weston Mill Dr Left	87.0	8.0	56.4	9.5
Weston Mill Dr Ahead + Left	87.8	8.8	44.4	1.9
Weston Mill Dr Ahead + Right	76.3	5.8	78.5	5.2
Wolseley Rd S Ahead + Left	71.3	6.0	88.8	17.1
Wolseley Rd S Right	65.1	5.2	88.5	17.0
Dockyard Ahead + Left	34.1	1.1	87.6	12.0
Dockyard Right	30.0	1.2	27.7	1.9
Site Access Left	9.6	0.9	13.4	1.5
Dockyard Ahead (Exit)	12.9	0.7	39.6	6.0
Cycletime (secs)	66		89	
Practical Reserve Capacity (PRC)	89.8%		88.7%	

Table G.9 should be compared against Table 7.9 of the Transport Assessment

The analysis presented above confirms that the junction is predicted to be able to cater for the traffic associated with the ‘Maximum Scenario’ with the junction operating within the recommended capacity threshold, as per the 2014 Do Something situations considered within the TA.

Summary

It is concluded that the analysis presented above is consistent with that presented within the Transport Assessment. As such, all of the junctions located within the TA study area are predicted to be able to cater for the traffic associated with the ‘Maximum Scenario’, in the 2014 Do Something scenario.

There is one exception to this, which relates to the junction between Weston Mill Drive and Carlton Terrace. At this location, during the PM peak hour, the junction is predicted to operate slightly in excess of its optimum capacity threshold, although within the theoretical capacity threshold. Notwithstanding this, this situation is expected to occur in 2014 prior to the EfW CHP facility coming online (Do Minimum scenario). The addition of traffic relating to the proposed development according to either the Do Something or Do Something ‘Maximum Scenario’ does not fundamentally alter the performance of the junction, as saturation and queue levels are similar in both cases, to the 2014 Do Minimum (without development) case.

Consideration has also been given to the Highways Agency’s strategic road network, such that the analysis presented herein is consistent with the approach adopted in the TA. This analysis has indicated that the traffic flows associated with the ‘Maximum Scenario’ would be expected to have a slightly greater impact at the Weston Mill Drive / A38 junctions. The increases are relatively low however, and in real terms particularly, it is considered that a perceptible increase in traffic volumes would be unlikely to be experienced.

Furthermore, although the Transport Assessment and associated analyses have not specifically sought to quantify existing waste movements, it is recognised that traffic flows associated with existing waste collections and associated processes already occur on the transport networks in and around Plymouth. As such, it is unlikely that all of the vehicles associated with either the Do Something or Do Something 'Maximum Scenario' situations would be additional to the existing levels currently on the highway networks.

Finally, the proposed signalised site access arrangement has been considered, as per the TA, and the analysis has confirmed that the junction is expected to be able to suitably cater for the development related traffic, assuming the 'Maximum Scenario' traffic flows.

SECTION B VARIATION AND IMPACT ON THE STRATEGIC ROAD NETWORK

In addition to the analysis presented above relating to the strategic highway network, discussions with the HA, as well as PCC, indicated that the seasonal variability of traffic conditions and the impact of the EfW CHP facility more generally, should be considered in relation to the HA network.

To supplement this information, a sensitivity assessment has therefore been undertaken and is presented below:

Variation in Waste

The SWDWP have indicated that the impact of tourism has a relatively minor impact on the waste collected by the local authority.

Notwithstanding this, it was noted that there may be an increase in street cleansing and litter collection and that authority collections of commercial waste may also vary to some extent, over the course of a year.

In this context, the waste arising from tourism is usually classified as commercial waste when it arises from hotels, camp sites and commercial holiday accommodation. The same is true for places of entertainment, bars, cafes and restaurants.

In addition, residents in the area will also be taking holidays so there will be a flow of local people leaving the area as tourists are visiting. Tourism also tends to be less seasonal than it used to be as people visit the area for weekends and short breaks throughout the year, as opposed to more traditional summer holidays.

The SWDWP advised that these trends therefore have the effect of reducing the seasonal variability of waste generation and thus, the associated vehicle movements.

In addition, it should be borne in mind that commercial waste (which in this context includes 'tourist waste'), can only be accepted into the plant as a secondary input to contracted municipal waste. In reality therefore, the SWDWP have indicated that the commercial waste will have a relatively flat yearly profile and there is therefore a very limited scope to assessing the 'seasonal' waste processing of the EfW CHP facility, which as a commercial operation, will generally be optimised as much as possible.

Furthermore, the vehicle trips associated with the waste processing of the EfW CHP facility has been based on a number of different months worth of data, as supplied by the SWDWP and discussed within the Transport Assessment and Trip Generation Technical Note, to ensure that data anomalies can be avoided as much as possible.

Variation in Traffic Conditions

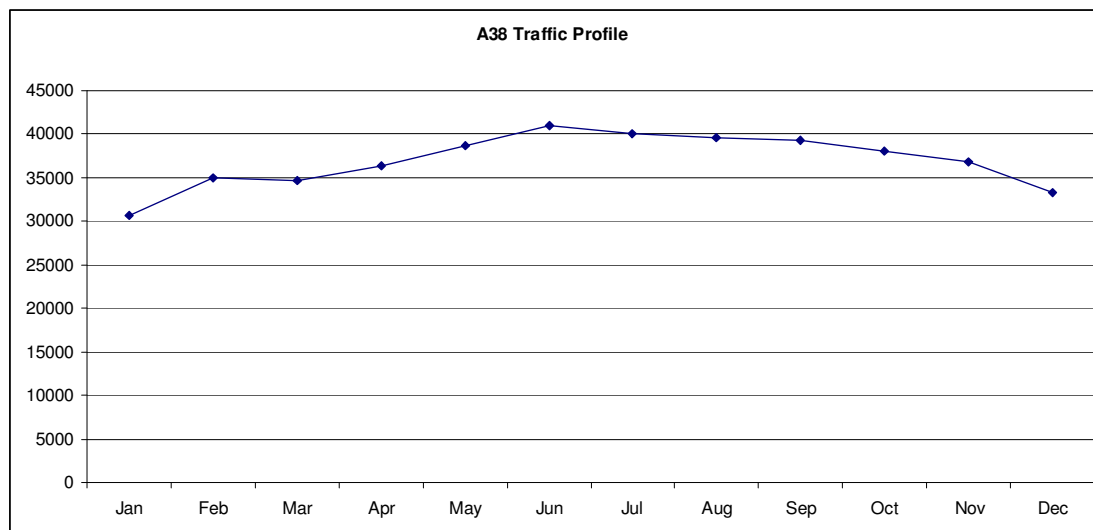
Notwithstanding the above, it is recognised that seasonal variations in traffic flows on the highway network in the vicinity of the proposed EfW CHP facility, including the Highways Agency's A38, will be likely to occur over the course of the year.

In order to take seasonal variations in traffic flow into consideration, the Highways Agency's TRADs database was interrogated. Using the Yearly Flow reporting function, Average Daily Traffic (ADT) data was collected for each month of 2010 for the A38 in the following locations:

- WB, A38, T/01/911, West of Forder Valley Main Carriageway before On slip
- EB, A38, T/01/909, West of Forder Valley Main Carriageway after Off slip

It should be noted that data was not available for January (EB) and April (WB). This data has therefore been calculated using directional percentage values. The seasonal two-way profile on the A38 is subsequently summarised in **FIGURE G.3** below.

FIGURE G.3 Profile of Two-Way Traffic on the A38 (2010), by Month



The data has also been summarised below in **TABLE G.10** which confirms that the busiest observed month in 2010 was June, with the quietest months occurring during the winter.

TABLE G.10 Two-Way Traffic Data on the A38 (2010), by Month

Month	Two-Way Flow (2010)
Jan	30595
Feb	35000
Mar	34733
Apr	36375
May	38642
Jun	41067
Jul	40059
Aug	39579
Sep	39312
Oct	38031
Nov	36827
Dec	33271
Mean Average	36958

The mean average two way traffic flow for the A38 in 2010 was 36,958. In June 2010, the observed two-way flow was 41,067; 11% higher than the mean average.

Sensitivity Assessment

To understand the impact of the proposed EfW CHP facility on the A38 at the peak AM and PM assessment times, mean average peak hour traffic flows have been abstracted from the TRADS database for Monday to Thursday for June 2010 (**TABLE G.11**). Data for Monday – Thursday has been specifically isolated as this conforms with the data employed as part of the Transport Assessment, when observed municipal waste trips have been observed to be at their greatest.

TABLE G.11 Peak Hour Flows on the A38, June 2010

Peak	Monday – Thursday Average
0800-0900	3712
1600-1700	3097

With the above, maximum background flows in mind, the proposed EfW CHP facility trips for the AM and PM peak hours have been distributed (based on the analysis presented within the Transport Assessment) to / from the site, to consider the number of development related trips which will occur on the A38, at these times.

A summary of this information and the calculated percentage impact of the related development traffic on the HA network is presented at **TABLE G.12** below.

TABLE G.12 Peak Hour Development Flows on the A38, and Percentage Impact

Peak	Monday – Thursday Average	Development Traffic	Percentage Impact
0800-0900	3712	21	0.57%
1600-1700	3097	18	0.58%

As a worst-case assessment, the development traffic has been factored up by 11% to reflect the observed seasonal nature of traffic on the A38 at its busiest time of the year, in June. The results of this analysis are presented in **TABLE G.13** below.

TABLE G.13 Peak Hour Factored Development Flows on the A38, and Percentage Impact

Peak	Monday – Thursday Average	Factored Development Traffic (by 11%)	Percentage Impact
0800-0900	3712	23	0.63%
1600-1700	3097	20	0.65%

When the seasonal variations in traffic are taken into consideration, the proportional impact of the EfW CHP facility is predicted to increase slightly, to a maximum 0.65% in the PM peak.

The analysis presented above is however, based on the Do Something development flows, as per the information presented within the Transport Assessment. In order to provide a comprehensive dataset for the consideration of PCC and the HA, an additional scenario has also been prepared, based on the development flows associated with the Do Something 'Maximum Scenario', discussed earlier in this Annex.

A summary of this information and the calculated percentage impact of the related 'maximum' development traffic on the HA network is presented at **TABLE G.14** below.

TABLE G.14 Peak Hour 'Maximum' Development Flows on the A38, and Percentage Impact

Peak	Monday – Thursday Average	Development Traffic	Percentage Impact
0800-0900	3712	63	1.70%
1600-1700	3097	62	2.00%

As a worst-case assessment, the 'maximum' development traffic has also been factored up by 11% to reflect the observed seasonal nature of traffic on the A38 at its busiest time of the year, in June. The results of this analysis are presented in **TABLE G.15** below.

TABLE G.15 Peak Hour Factored 'Maximum' Development Flows on the A38 and Percentage Impact

Peak	Monday – Thursday Average	Factored Development Traffic (by 11%)	Percentage Impact
0800-0900	3712	70	1.88%
1600-1700	3097	69	2.22%

When the seasonal variations in traffic are taken into consideration, the proportional impact of the 'maximum' traffic associated with the operation of the EfW CHP facility is predicted to increase slightly, to a maximum of 2.22% in the PM peak.

It is thus concluded that this level of impact is not significant, bearing in mind furthermore, that a number of these trips will already be occurring on the highway network as they will already be associated with the movement of waste within Plymouth and the surrounding area. As such some, if not all of the 'development traffic' is likely to already be included within the Monday – Thursday average traffic flow values presented above.

SECTION C WASTE MILES ASSESSMENT

Liaison with PCC indicated that a 'waste miles' assessment should be undertaken, comparing the distances (and time) travelled by waste related vehicles associated with the EFW CHP facility, with those of similar proposals at comparator sites.

The sites which were identified are the:

- Proposed MVV facility at Devonport (as detailed within the accompanying Transport Assessment)
- Potential facility at New England Quarry
- Potential facility at Ernesettle
- Potential facility at Coypool

Establishment of the 'Waste Miles' Assessment

A desk-based analysis has been undertaken, using an internet based route finding facility and information provided by the SWDWP. The analysis calculates the 'waste miles' according to the number of trips generated by each waste authority (as presented in the TA), and distance that would be travelled to each comparator site. A time has been assigned to each journey, based on the anticipated speed of vehicles on specific types of road.

The results of the analysis are presented below, based on the following assumptions:

- The analysis is based on traffic associated with municipal solid waste arising in 2014, (as calculated and presented within the TA)
- Account has not been taken of commercial and industrial waste (as it is not possible to identify all of the respective origins of such waste trips)
- Account has not been taken of IBA or APC, as it is assumed that they will be similar across each site
- All Plymouth waste traffic would travel directly to the Devonport, Ernesettle and Coypool sites. RCVs travelling to the New England Quarry site however, will be bulked at Chelson Meadow beforehand
 - Weighbridge data from Chelson Meadow has identified that the average payload of Plymouth RCVs is 7.3 tonnes, and that of outgoing bulked vehicles is 19.3 tonnes. This information has therefore been applied accordingly, as part of the calculations
- As Plymouth waste traffic would travel directly to the Devonport, Ernesettle and Coypool sites, no additional waste mileage has been calculated for these trips. This is due to the operation of these sites leading only to the re-distribution of Plymouth waste traffic internal to Plymouth, as opposed to new waste trips from outside the Plymouth area
- Where appropriate, route choice has been based on 'A' roads, even if there is a shorter route along unclassified / minor roads or through a major urban area
- Average speed of vehicles on the A38 Trunk Road is 50mph (i.e. speed limit for HGVs on a dual carriageway). Average speeds of 27mph and 22mph have been used for other 'A' roads and minor roads, respectively (as indicated by the SWDWP)

- Liaison with the SWDWP has identified that in the future, waste from each authority will first be processed at a Refuse Transfer Station (RTS), before being transferred to the final treatment facility (i.e. one of the comparator sites). The assessment has therefore taken the RTS as the start point of each journey, with the proposed comparator facility as the end point. **TABLE G.16** summarises the respective RTS that will be used for each site (as identified by the SWDWP)

TABLE G.16 SWDWP RTS, by Waste Authority

Waste Authority	Refuse Transfer Station
Torbay	Heathfield RTS
Teignbridge	Heathfield RTS
South Hams	No information provided – assumed Heathfield RTS
West Devon	Crowndale RTS
Plymouth	Direct to site or bulked at Chelson Meadow in the case of New England Quarry

Sensitivity Assessment

Based on the assumptions above, a comparison of ‘waste miles’ has been undertaken and a summary of the results are presented below at **TABLE G.17**. A full summary of the calculations are appended to this annex at **ANNEX G1**.

TABLE G.17 Two-Way ‘Waste Miles’ Comparison – Summary

EfW Location	Distance Travelled miles per week	Distance Travelled km per week	Time Travelled hours per week
Devonport	8729	14049	199
New England Quarry	10012	16112	258
Ernesettle	8865	14267	204
Coypool	7713	12413	180

The analysis indicates that the proposed MVV EfW CHP facility at Devonport would result in approximately 8729 waste miles (14049kms) and 199 hours of travelling, on a weekly basis. Only the Coypool comparator site is predicted to result in fewer ‘waste miles’ being travelled, than the proposed facility at Devonport.

It is noted however, that **TABLE G.16** indicates that waste generated in the Torbay and South Hams authorities will first be bulked at the Heathfield RTS, before being transported to the final treatment facility (i.e. one of the comparator sites).

For some of the comparator sites, this arrangement may be unlikely to occur as it would result in a diversion of waste vehicles, for example, waste traffic travelling to the Devonport site from South Hams would first travel east to the Heathfield RTS, and then west towards Plymouth.

A supplementary assessment has therefore been undertaken, whereby it has been assumed that the RTS within the boundary of each respective authority would be used. **TABLE G.18** presents these revised RTS assumptions.

TABLE G.18 Revised RTS Assumptions

Waste Authority	Refuse Transfer Station
Torbay	Torbay RTS
Teignbridge	Heathfield RTS
South Hams	Tor Quarry RTS
West Devon	Crowndale RTS
Plymouth	Direct to site or bulked at Chelson Meadow in the case of New England Quarry

The ‘waste miles’ assessment was subsequently re-visited, to take account of these revised RTS assumptions. A summary of the results of the analysis are presented in **TABLE G.19**, with a full summary of the calculations being appended to this annex at **ANNEX G2**.

TABLE G.19 Two-Way ‘Waste Miles’ Comparison – Summary (Revised RTS)

EfW Location	Distance Travelled miles per week	Distance Travelled km per week	Time Travelled hours per week
Devonport	7694	12383	219
New England Quarry	8910	14339	265
Ernesettle	7822	12588	223
Coypool	6686	10761	197

In this case, the analysis indicates that the proposed MVV EfW CHP facility at Devonport would result in approximately 7694 waste miles (12383kms) and 219 hours of travelling, on a weekly basis. It is noted that according to the assumptions, the distances travelled have reduced although the travel time has increased slightly, which reflects the associated vehicle routing and speeds.

The conclusions of the analysis are however, consistent with the initial assessment. Coypool is predicted to generate slightly fewer ‘waste miles’ than each of the other sites. The proposed MVV EfW CHP facility at Devonport would result in fewer ‘waste miles’ being travelled than both the Ernesettle and New England Quarry comparator sites.

SECTION D POTENTIAL DEVELOPMENT

At the request of PCC the incremental operational implications of two potential (but not committed) developments located in the vicinity of the EfW CHP facility have also been considered. This section of the sensitivity analysis therefore presents the estimated traffic generation associated with each of the potential developments, in relation to the proposed EfW CHP facility.

The Potential Developments

Devonport Landing Craft Co-location Project (DLCCP)

It is understood that the MoD propose to undertake a Devonport Landing Craft Co-location Project (DLCCP) within HM Naval Base Devonport at Weston Mill Lake. A planning application for this Landing Craft proposal has not been determined, however PCC have requested that the associated traffic movements are considered in relation to the EfW CHP proposals.

The draft Transport Assessment associated with the potential Landing Craft development has subsequently been obtained and the related trip generation and distribution has been discussed with the consultant author of the TA and PCC.

The Transport Assessment associated with the proposed EfW CHP facility has considered the AM and PM peak hours of 0800-0900 and 1600-1700, given that the site will not open until 0800 in the morning. To allow a robust sensitivity assessment to be undertaken, it was noted that the morning peak hour considered as part of the draft Landing Craft TA was earlier than that of the EfW CHP facility, being between 0700-0800. It was therefore agreed with PCC that as a worst-case, it would be assumed that 50% of the morning peak hour trip generation associated with the potential Landing Craft development would occur between 0800-0900.

The trip generation associated with the potential Landing Craft development is summarised below at **TABLE G.20** and turning movement diagrams are provided at **FIGURES G.4** and **G.5**, representing the AM and PM peak hours respectively.

TABLE G.20 Potential Landing Craft Trip Generation

Time Period	Arrivals	Departures	Total
AM Peak (0800-0900)*	38	0	38
PM Peak (1600-1700)	0	75	75

* The AM assessment peak for the potential Landing Craft development is 0700-0800, where as the AM assessment peak for the proposed EfW CHP facility is 0800-0900. It has therefore been agreed with PCC that 50% of the predicted Landing Craft traffic will occur between 0800-0900, for the purposes of this sensitivity assessment (as shown above)

Weston Mill District Centre

Discussions with PCC have identified that there is an aspiration for a District Centre to be developed at Weston Mill, in the vicinity of the Devonport Dockyard. Policy CS07 'Plymouth Retail Hierarchy' of PCCs Core Strategy summarises the desire for a medium sized food store to be provided. Subsequent liaison with PCC has indicated that a supermarket could be delivered, in the region of 1500 – 2000sqm in size.

A planning application has not been made in support of such a development however, and as such, supporting documentation such as a Transport Assessment is not currently available. In order for the traffic movements to be estimated for the 'District Centre' for the purposes of this sensitivity assessment therefore, vehicular trip rates have been derived from the industry standards TRICS database following discussions with PCC, for a supermarket, as it was anticipated that this would reflect a worst-case scenario

in traffic terms. The rates have subsequently been agreed with PCC, and are summarised below at **TABLE G.21**.

TABLE G.21 Agreed Vehicular Trip Rates – Supermarket (per 100sqm)

Time Period	Arrivals	Departures	Total
AM Peak (0800-0900)	6.609	4.465	11.074
PM Peak (1600-1700)	11.219	11.328	22.547

On the basis of a 2000sqm supermarket being developed, the vehicle trips summarised at **TABLE G.22** have been calculated as being potentially generated by a development of this kind.

TABLE G.22 Potential Supermarket Trip Generation

Time Period	Arrivals	Departures	Total
AM Peak (0800-0900)	132	89	221
PM Peak (1600-1700)	224	227	451

A trip distribution associated with the potential supermarket has also been agreed with PCC and turning movement diagrams are therefore provided at **FIGURES G.6** and **G.7**, representing the AM and PM peak hours respectively.

Sensitivity Assessment

In order to undertake this sensitivity assessment, it has been assumed that both of the potential developments will be granted planning permission and will be delivered by 2014, the year at which the proposed EfW CHP facility is expected to become operational.

On that basis, operational assessments of each of the junctions located with the TA study area have been undertaken. The modelling results are therefore based on the addition of the potential development traffic to the 2014 Do Something (with EfW CHP facility development) scenario, as presented within the Transport Assessment. A summary of the operational analyses is presented below at **TABLES G.23**, **G.24** and **G.25**.

TABLE G.23 Wolseley Road / Saltash Road – 2014 Do Something plus Potential Development

Approach	AM (0800-0900)		PM (1600-1700)	
	Sat (%)	MMQ	Sat (%)	MMQ
Wolseley Rd N Ahead	63.2	12.1	52.3	6.9
Wolseley Rd N Right	88.3	22.6	87.0	12.2
Wolseley Rd S Ahead + Left	85.4	8.0	89.4	10.8
Wolseley Rd S Ahead	84.0	7.8	87.7	10.2
Saltash Rd Left	28.7	2.1	84.4	13.9
Saltash Rd Right	9.0	0.5	11.4	0.6
Cycletime (secs)	84		63	
Practical Reserve Capacity (PRC)	88.0%		89.3%	

Table G.23 should be compared with Table 7.3 of the Transport Assessment (2014 Do Something)

TABLE G.24 Wolseley Road / Weston Mill Drive – 2014 Do Something plus Potential Development

Approach	AM (0800-0900)		PM (1600-1700)	
	Sat (%)	MMQ	Sat (%)	MMQ
Wolseley Rd N Ahead + Left	87.4	8.8	87.8	9.2
Wolseley Rd N Ahead + Right	86.1	9.3	83.4	9.1
Weston Mill Dr Left	89.6	8.9	62.1	11.7
Weston Mill Dr Ahead + Left	89.6	9.6	53.2	2.5
Weston Mill Dr Ahead + Right	73.5	5.8	82.2	5.6
Wolseley Rd S Ahead + Left	78.4	6.7	85.6	16.8
Wolseley Rd S Right	75.7	6.3	88.8	18.5
Dockyard Ahead + Left	26.8	1.3	89.8	12.7
Dockyard Right	25.1	1.2	29.0	2.8
Cycletime (secs)	67		95	
Practical Reserve Capacity (PRC)	89.6%		89.8%	

Table G.24 should be compared with Table 7.5 of the Transport Assessment (2014 Do Something)

TABLE G.25 Weston Mill Drive / Carlton Terrace – 2014 Do Something plus Potential Development

Approach	AM (0800-0900)		PM (1600-1700)	
	Sat (%)	MMQ	Sat (%)	MMQ
Carlton Terrace	59.9	4.4	56.5	4.4
Weston Mill Dr E Ahead + Left	88.3	15.4	104.3	26.7
Weston Mill Dr E Ahead + Right	89.2	17.0	105.1	30.6
Ferndale Rd	84.5	7.5	105.4	27.5
Weston Mill Dr W Ahead + Left	88.3	11.4	107.4	61.3
Weston Mill Dr W Ahead + Right	88.5	11.7	109.3	73.5
Cycletime (secs)	73		120	
Practical Reserve Capacity (PRC)	89.0%		111.4%	

Table G.25 should be compared with Table 7.7 of the Transport Assessment (2014 Do Something)

The analysis presented above indicates that all of the junctions located within the TA study area are expected to be able to cater for the additional traffic associated with the potential developments in the vicinity, in addition to that associated with the proposed EfW CHP facility, within the recommended capacity thresholds.

The only exception to this occurs during the PM peak hour at the junction between Weston Mill Drive and Carlton Terrace. According to the 2014 Do Something scenario at this location (see TA Table 7.7) the junction is predicted to operate slightly in excess of the optimum capacity threshold (90%) but within the theoretical capacity threshold (100%). In that scenario, the overall Practical Reserve Capacity (PRC) for the junction is modelled as being 92.0%.

The addition of the potential development traffic however, significantly influences the operation of the junction, leading to all except one of the link approaches being over-saturated (i.e. saturation in excess of 100%). In this case, the PRC for the junction is modelled as being 111.4%.

Finally, one further assessment has been undertaken of the signalised junction between Wolseley Road and Weston Mill Drive, assuming that the proposed signalised right turn-in, left turn-out access is provided at the EfW CHP facility and linked into the existing junction. The results of the associated analysis are presented below at **TABLE G.26**.

TABLE G.26 Wolseley Road / Weston Mill Drive / Site Access – 2014 Do Something plus Potential Development

Approach	AM (0800-0900)		PM (1600-1700)	
	Sat (%)	MMQ	Sat (%)	MMQ
Wolseley Rd N Ahead + Left	87.4	8.8	86.4	9.3
Wolseley Rd N Ahead + Right	86.1	9.3	81.4	9.0
Weston Mill Dr Left	89.8	9.0	58.8	11.2
Weston Mill Dr Ahead + Left	89.5	9.6	48.9	2.1
Weston Mill Dr Ahead + Right	72.9	5.7	82.8	6.2
Wolseley Rd S Ahead + Left	78.4	6.7	86.6	17.7
Wolseley Rd S Right	75.2	6.2	89.8	19.6
Dockyard Ahead + Left	26.8	1.2	88.6	12.9
Dockyard Right	25.1	1.1	28.7	2.6
Site Access Left	2.9	0.3	9.1	0.7
Dockyard Ahead (Exit)	11.6	0.7	30.8	3.8
Cycletime (secs)	67		99	
Practical Reserve Capacity (PRC)	89.8%		89.7%	

Table G.26 should be compared with Table 7.9 of the Transport Assessment (2014 Do Something)

The analysis indicates that the revised junction arrangement, incorporating a signalised access serving the EfW CHP facility is predicted to be able to cater for the traffic modelled as part of the 2014 Do Something scenario, plus the additional traffic relating to the two potential developments.

Sensitivity Assessment – ‘Maximum Scenario’

In addition, to the sensitivity assessment presented above, consideration has also been given to the ‘maximum scenario’ which has been analysed at the request of PCC and the HA, in relation to the proposed EfW CHP facility. The traffic associated with the potential developments has therefore been added to the 2014 ‘Maximum Scenario’ and the results of the associated analysis are presented below at **TABLES G.27, G.28 and G.29**.

TABLE G.27 Wolseley Road / Saltash Road – 2014 Do Something ‘Maximum Scenario’ plus Potential Development

Approach	AM (0800-0900)		PM (1600-1700)	
	Sat (%)	MMQ	Sat (%)	MMQ
Wolseley Rd N Ahead	64.4	12.3	52.6	7.0
Wolseley Rd N Right	89.4	23.0	88.7	12.8
Wolseley Rd S Ahead + Left	86.2	8.2	85.8	10.0
Wolseley Rd S Ahead	85.1	8.0	84.5	9.8
Saltash Rd Left	29.0	2.1	86.0	14.8
Saltash Rd Right	8.9	0.5	11.5	0.6
Cycletime (secs)	83		64	
Practical Reserve Capacity (PRC)	89.4%		88.6%	

Table G.27 should be compared with Table G.4 of this Annex (Annex G) under the heading ‘Maximum Scenario’

TABLE G.28 Wolseley Road / Weston Mill Drive – 2014 Do Something ‘Maximum Scenario’ plus Potential Development

Approach	AM (0800-0900)		PM (1600-1700)	
	Sat (%)	MMQ	Sat (%)	MMQ
Wolseley Rd N Ahead + Left	88.1	9.0	88.5	9.5
Wolseley Rd N Ahead + Right	88.0	9.8	87.9	10.2
Weston Mill Dr Left	87.6	8.4	66.6	13.4
Weston Mill Dr Ahead + Left	88.4	9.4	72.5	4.7
Weston Mill Dr Ahead + Right	79.7	6.7	85.4	6.2
Wolseley Rd S Ahead + Left	73.5	6.3	86.5	17.6
Wolseley Rd S Right	70.2	5.9	88.9	19.0
Dockyard Ahead + Left	35.6	1.6	89.6	13.4
Dockyard Right	30.9	1.5	30.1	3.2
Cycletime (secs)	68		98	
Practical Reserve Capacity (PRC)	88.2%		89.5%	

Table G.28 should be compared with Table G.5 of this Annex (Annex G) under the heading ‘Maximum Scenario’

TABLE G.29 Weston Mill Drive / Carlton Terrace – 2014 Do Something ‘Maximum Scenario’ plus Potential Development

Approach	AM (0800-0900)		PM (1600-1700)	
	Sat (%)	MMQ	Sat (%)	MMQ
Carlton Terrace	58.7	5.1	57.2	4.4
Weston Mill Dr E Ahead + Left	88.1	18.2	111.6	38.9
Weston Mill Dr E Ahead + Right	89.2	20.3	111.0	41.5
Ferndale Rd	88.6	9.5	110.4	34.4
Weston Mill Dr W Ahead + Left	87.7	13.3	108.3	66.6
Weston Mill Dr W Ahead + Right	88.1	13.9	109.9	78.4
Cycletime (secs)	88		120	
Practical Reserve Capacity (PRC)	89.1%		114.0%	

Table G.29 should be compared with Table G.6 of this Annex (Annex G) under the heading ‘Maximum Scenario’

The analysis presented above indicates that all of the junctions located within the TA study area are expected to be able to cater for the proposed EfW CHP facility according to the ‘Maximum Scenario’ which has been considered as part of this sensitivity assessment plus the additional traffic associated with the potential developments, within the recommended capacity thresholds.

The only exception to this occurs during the PM peak hour at the junction between Weston Mill Drive and Carlton Terrace. According to the 2014 Do Something ‘Maximum Scenario’ at this location (see Annex Table G.6) the junction is predicted to operate slightly in excess of the optimum capacity threshold (90%) but within the theoretical capacity threshold (100%). In that scenario, the overall Practical Reserve Capacity (PRC) for the junction is modelled as being 95.3%.

The addition of the potential development traffic however, significantly influences the operation of the junction, leading to all except one of the link approaches being over-saturated (i.e. saturation in excess of 100%). In this case, the PRC for the junction is modelled as being 114.0%.

It is therefore recognised that improvements to the junction between Weston Mill Drive and Carlton Terrace may be required, should all of the developments referred to above, be delivered. Discussions with PCC have identified that it is anticipated that the responsibility to improve the junction would be likely to be for the developer of the supermarket. This would be due to the development having the greatest level of impact and effectively acting as the ‘trigger’ when the operation of the junction would be expected to exceed its theoretical capacity.

Notwithstanding this, it is recognised that the proposed EfW CHP facility and the potential Landing Craft and Supermarket developments will each impact upon the junction to some extent, and that each are therefore likely to be expected to make a contribution towards associated improvements, should they be required. A comparison has therefore been made of the expected traffic generations which will arise from each of the developments, during the PM peak hour, when the junction has been predicted as being over capacity (according to the 2014 Do Something plus Potential Development scenario). This analysis is summarised below at **TABLE G.30**.

TABLE G.30 Comparison of Development Traffic Generations

Development	Development Traffic*	Proportion of Total Development Traffic
EfW CHP Facility	18	4.8%
Landing Craft	41	10.9%
Supermarket	316	84.3%
Total	375	100.0%

*Development Traffic refers to the number of vehicles which are expected to be generated by the respective development during the PM peak hour (1600-1700) and pass through the junction at Weston Mill Drive / Carlton Terrace

The analysis has identified that the proposed EfW CHP facility is expected to contribute 4.8% of the development related traffic passing through the Weston Mill Drive / Carlton Terrace junction. On this basis, MVV may be expected to contribute 4.8% of the junction improvement costs.

Assuming that the worst-case 'maximum scenario' occurs, the traffic associated with the proposed EfW CHP facility would comprise 14.8% of the development related traffic at the junction, as summarised at **TABLE G.31** below.

TABLE G.31 Comparison of Development Traffic Generations – 'Maximum Scenario'

Development	Development Traffic*	Proportion of Total Development Traffic
EfW CHP Facility – 'Maximum Scenario'	62	14.8%
Landing Craft	41	9.8%
Supermarket	316	75.4%
Total	419	100.0%

*Development Traffic refers to the number of vehicles which are expected to be generated by the respective development during the PM peak hour (1600-1700) and pass through the junction at Weston Mill Drive / Carlton Terrace

Finally, one further assessment has been undertaken of the signalised junction between Wolseley Road and Weston Mill Drive, assuming that the proposed signalised right turn-in, left turn-out access is provided at the EfW CHP facility and linked into the existing junction. The results of the associated analysis are presented below at **TABLE G.32**.

TABLE G.32 Wolseley Road / Weston Mill Drive / Site Access – 2014 Do Something ‘Maximum Scenario’ plus Potential Development

Approach	AM (0800-0900)		PM (1600-1700)	
	Sat (%)	MMQ	Sat (%)	MMQ
Wolseley Rd N Ahead + Left	88.7	9.2	89.6	11.9
Wolseley Rd N Ahead + Right	87.5	9.7	83.3	10.9
Weston Mill Dr Left	88.7	9.1	58.0	13.5
Weston Mill Dr Ahead + Left	89.8	10.2	40.3	2.3
Weston Mill Dr Ahead + Right	79.2	6.2	84.4	9.0
Wolseley Rd S Ahead + Left	68.2	5.9	88.1	21.6
Wolseley Rd S Right	65.7	5.6	89.8	22.9
Dockyard Ahead + Left	36.0	1.7	89.1	16.1
Dockyard Right	30.9	1.2	29.7	2.8
Site Access Left	9.3	0.9	12.2	1.9
Dockyard Ahead (Exit)	12.8	0.8	44.4	9.5
Cycletime (secs)	68		120	
Practical Reserve Capacity (PRC)	89.8%		89.7%	

Table G.32 should be compared with Table G.9 of this Annex (Annex G) under the heading ‘Maximum Scenario’

The analysis indicates that the revised junction arrangement, incorporating a signalised access serving the EfW CHP facility is predicted to be able to cater for the traffic modelled as part of the 2014 Do Something ‘Maximum Scenario’, plus the additional traffic relating to the two potential developments.

Summary

The analysis presented above has confirmed that each of the junctions located within the TA study area are expected to operate within the recommended capacity thresholds according to both the 2014 Do Something and 2014 Do Something ‘Maximum Scenario’ situations, including the addition of traffic related to the two potential developments which have been identified by PCC.

The only exception to this relates to the junction between Weston Mill Drive and Carlton Terrace during the PM peak hour. At this location, the modelling analysis has previously identified that the junction is predicted to operate in excess of the recommended capacity threshold in the PM peak hour, in the 2014 Do Minimum scenario (prior to the introduction of traffic relating to the proposed EfW CHP facility).

The addition of the proposed EfW CHP facility in the 2014 Do Something scenario is predicted to slightly increase saturation levels at the junction, although the operation is still predicted to be within the theoretical capacity limits.

The introduction of traffic relating to the potential developments, and most notably the supermarket, in addition to the above however has been predicted to significantly impact on the operation of the junction during the PM peak, with the model estimating that the junction would be operating in excess of its theoretical capacity threshold. It is therefore suggested that the implications of a supermarket development would need to be considered in detail in relation to this junction, as part of any future planning application.