Cyngor Castell-nedd Port Talbot
Neath Port Talbot Council

Replacement Local Development Plan

2023-2038

Strategic Highway Assessment - Stage 2

December 2024

Cynllun Datblygu Lleol
Local Development Plan

TECHNICAL NOTE: Summary of Transport Modelling Work for Stage 2 Assessment

1.1 Introduction

Background

1.2 Following on from the Stage 1 Strategic Modelling, due to concerns around Pen Y Wern Junction, NPTC worked with Transport for Wales (TfW) and their consultants WSP to undertake further detailed modelling of Pen Y Wern Junction to consider the impact of the proposed level of housing and employment growth on the highway network.

1.3 WSP has considered the capacity assessment for the existing junctions (**the base model**), calibrated to replicate the existing surveyed queue length. The junction assessment for the AM and PM periods was undertaken using the industry standard junctions modelling packages for priority junctions and signalised junctions namely, Junctions 10 (Version 10.1.1.1905).

1.4 In addition to the base model, WSP have undertaken a development test for the Neath Port Talbot (NPT) Replacement Local Development Plan (RLDP) taking into consideration developments proposed within the areas of the junction modelled, and undertaken an assessment of the quantum of development that could come before congestion in experienced at this junction.

Figure 1-1 – Site Location

Methodology Overview

1.5 A Pen Y Wern junction model has been re-created to reproduce modelling outputs provided by Asbri Transport, on behalf of Pobl in 2024; creation of this model is detailed in section 3.

2 Methodology

2.1 Two scenarios have been modelled in order assess the impact of the proposed development on Pen Y Wern Junction and understand the level of development that could come forward before congestion is experienced at this junction. These include:

- **Scenario 1 - 'Core'**: This represents the worst-case scenario, assuming everyone gets into their car.
- **Scenario 2 - 'Welsh Transport Strategy'**: This scenario reflects the Welsh Transport Strategy (WTS) and Welsh Government ambitions of increasing sustainable travel.

2.2 These scenarios have been modelled for both the current junction layout and a revised junction layout developed by the Council.

2.3 Consideration has also been given to future growth associated with population growth which would happen without the RLDP.

Base Flows

2.4 2024 is considered the base year for the junction assessment.

2.5 Traffic flow data for Pen Y Wern Junction was provided by NPTC and originates from a transport assessment (TA) undertaken for 250 dwellings at land off Leiros Park, Neath (Asbri Transport, 2024). Surveys were undertaken on 18th October 2023 which represents a neutral weekday. The surveyed traffic flows in 2023 are considered suitably close to traffic flows in 2024.

2.6 For the Pen Y Wern Junction, traffic flows have been taken directly from a junction model developed as part of work to support the TA.

Development Flows

2.7 Development traffic flows arising from a development test for NPTC's RLDP were derived from the SWMWTM strategic model, which is based on the 2019 base year. This development test is documented in the Stage 1 report.

2.8 Traffic flows from the strategic model were extracted and also factored using a PCU factor of 1 for Cars and LGVs, and 2.32 for HGVs (2.32 is used to represent the typical average length of a HGV, a standard assumption).

2.9 The 2019 strategic model development flows were combined with the 2023 / 2024 observed traffic flows for subsequent use in the junction assessment.

2.10 Development traffic flows have been extracted for the junction from the SWMWTM in terms of total flows from all developments.

- Flows have also been extracted using ‘flow bundle’ analysis in the SWMWTM for developments north of the Pen Y Wern junction as follows. There is the potential for developments in this area to deliver 780 units, which includes developments at;
- Leiros (existing allocation)
- Bryn Brych Farm, Rhos (existing allocation)
- Land east of Rhos

2.11 For Scenario 1, where flows have been taken only from the SWMWTM highway assignment model (HAM), no account has been taken of potential future mode shift. Under the current Welsh Transport Strategy, targets have been set for significant increases in travel by non-car modes. If these targets are achieved, the developments traffic flows predicted by the SWMWTM HAM are likely to be an overestimate. These have therefore been taken into consideration in Scenario 2.

Model Construction

2.12 Appendix M of the Leiros Park Transport Assessment (Pobl, 2024) provides geometries, flows and performance metrics for 2023.

2.13 Geometry at the junction has been entered into Junctions 9 software. This is a modular software package providing advanced roundabout, traffic signal and priority junctions modelling and analysis within a single graphical interface. Traffic flows for 2023 in the AM peak hour and PM peak hour have also been entered. The resulting model has been run and the results compared with the results given in the Leiros Park Transport Assessment. In both time periods the following were achieved:

- Ratio of Flow to Capacity (RFC) recreated exactly
- Delay correct to 1 decimal place
- RFC correct to 1 decimal place

2.14 Any small discrepancies between the original and ‘rebuilt’ model have been attributed to rounding in the model inputs and are not considered to be material.

3 Modelling results

3.1 Results have been provided for the AM and PM peak (busiest peaks) for a single scenario, these results include predicted queues and ratio of flow to capacity (RFC). RFC is a similar measure to Degree of Saturation (DoS), but is expressed in decimal format (between 0 and 1) as opposed to percentage format (between 0 and 100%). There is no national standard, with NPT highways using a 85% RFC. Elsewhere, ratios of 85-90% are generally being used, with in some cases ratios exceeding this as there is an acknowledgement that development would be unable to go ahead without significant investment/ an acknowledgement that congestion may lead to people seeking alternative methods of travel.

3.2 The results suggest that the junction reaches a RFC of 86% in the base year on the Cadoxton Road West arm with no additional development traffic.

Table 1:Base Year

Junction Arm	Queue (PCU) AM	RFC AM	Queue (PCU) PM	RFC PM
1 - A - 1 - Cadoxton North	1.8	0.64	1.2	54%
1 - A - 2 - B4434	0.8	0.44	1.1	52%
1 - A - 3 - Cadoxton South	0.3	0.23	0.6	36%
2 - B - 1 - Cadoxton East	1.0	0.49	0.6	37%
2 - B - 2 - Golwg Y Gamlas	0.1	0.1	0.4	28%
2 - B - 3 - Cadoxton West	1.4	0.58	5.7	86%
2 - B - 4 – Pen Y Wern Road	3.0	0.75	2.2	69%

3.3 Taking into consideration background growth, the modelling suggests that by 2038, without any new development, the Cadoxton West arm is expected to be operating at 89% in the PM peak, equating to a delay of 30.26 seconds and a queue of 7.2 cars above the 85% RFC.

Table 2: No Development

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	2	7.54	66%	A	1.2	5.84	55%	A
1 - A - 2 - B4434	0.8	3.95	45%	A	1.1	4.44	53%	A
1 - A - 3 - Cadoxton South	0.3	3.14	24%	A	0.6	4.09	38%	A
2 - B - 1 - Cadoxton East	1	8.85	51%	A	0.6	6.62	39%	A
2 - B - 2 - Golwg Y Gamlas	0.1	7.43	10%	A	0.4	7.39	29%	A
2 - B - 3 - Cadoxton West	1.5	8.61	60%	A	7.2	30.26	89%	D
2 - B - 4 – Pen Y Wern Road	3.4	14.53	78%	B	2.4	12.61	71%	B

3.0. Scenario 1

3.4 With 100% of the development traffic at Pen Y Wern, the ratio of flow to capacity on the Cadoxton Road East arm increases to 103%, significantly above the 85% degree of saturation which is considered an acceptable by the Council's highway team.

Table 3: 100% Development (780 dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	2.7	9.47	73%	A	1.4	6.32	59%	A
1 - A - 2 - B4434	0.9	4.2	48%	A	1.4	4.98	58%	A
1 - A - 3 - Cadoxton South	0.3	3.21	25%	A	0.8	4.65	43%	A
2 - B - 1 - Cadoxton East	1.4	11.16	58%	B	0.7	7.31	42%	A
2 - B - 2 - Golwg Y Gamlas	0.1	8.73	13%	A	0.5	8.25	33%	A
2 - B - 3 - Cadoxton West	1.7	9.5	64%	A	31.4	104.43	103%	F
2 - B - 4 – Pen Y Wern Road	7	27.35	89%	D	3.3	15.9	77%	C

3.5 Further scenarios were tested with:

- 85% of development (663 dwellings);
- 75% of development (585 dwellings);
- 62.5% of development (488 dwellings);
- 50% of development (390 dwellings);
- 37.5% of development (293 dwellings);
- 25% of development (195 dwellings); and
- 12.5% of development (98 dwellings).

3.6 With 85% of development traffic at Pen Y Wern, the ratio of flow to capacity on the Cadoxton Road East arm decreases to 101%, which is still significantly above the 85% degree of saturation which is considered an acceptable by the Council's highway team.

Table 4: 85% Development (663 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	2.6	9.19	73%	A	1.4	6.26	58%	A
1 - A - 2 - B4434	0.9	4.16	47%	A	1.3	4.9	57%	A
1 - A - 3 - Cadoxton South	0.3	3.2	25%	A	0.7	4.57	42%	A
2 - B - 1 - Cadoxton East	1.3	10.81	57%	B	0.7	7.22	42%	A
2 - B - 2 - Golwg Y Gamlas	0.1	8.55	13%	A	0.5	8.13	33%	A
2 - B - 3 - Cadoxton West	1.7	9.38	63%	A	25.7	89.23	101%	F
2 - B - 4 - Pen Y Wern Road	6.3	24.76	87%	C	3.2	15.47	76%	C

3.7 With 75% of development traffic at Pen Y Wern, the ratio of flow to capacity on the Cadoxton Road East arm decreases to 99%, which is still significantly above the 85% degree of saturation which is considered an acceptable by the Council's highway team.

Table 5: 75% Development (585 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	2.5	8.92	72%	A	1.4	6.2	58%	A
1 - A - 2 - B4434	0.9	4.13	47%	A	1.3	4.83	57%	A
1 - A - 3 - Cadoxton South	0.3	3.19	25%	A	0.7	4.49	42%	A
2 - B - 1 - Cadoxton East	1.3	10.49	56%	B	0.7	7.13	41%	A
2 - B - 2 - Golwg Y Gamlas	0.1	8.37	12%	A	0.5	8.02	32%	A
2 - B - 3 - Cadoxton West	1.7	9.26	63%	A	20.9	75.68	99%	F
2 - B - 4 – Pen Y Wern Road	5.7	22.58	86%	C	3	15.05	76%	C

3.8 With 62.5% of development traffic at Pen Y Wern, the ratio of flow to capacity on the Cadoxton Road East arm decreases to 98%, which is still significantly above the 85% degree of saturation which is considered an acceptable by the Council's highway team.

Table 6: 62.5% Development (488 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	2.4	8.66	71%	A	1.4	6.13	58%	A
1 - A - 2 - B4434	0.9	4.1	47%	A	1.3	4.76	56%	A
1 - A - 3 - Cadoxton South	0.3	3.18	25%	A	0.7	4.42	41%	A
2 - B - 1 - Cadoxton East	1.2	10.17	55%	B	0.7	7.04	41%	A
2 - B - 2 - Golwg Y Gamlas	0.1	8.2	12%	A	0.5	7.9	32%	A
2 - B - 3 - Cadoxton West	1.6	9.15	62%	A	17	64.06	98%	F
2 - B - 4 – Pen Y Wern Road	5.2	20.71	85%	C	2.9	14.62	75%	B

3.9 With 50% of development traffic at Pen Y Wern, the ratio of flow to capacity on the Cadoxton Road East arm decreases to 96%, which is still significantly above the 85% degree of saturation which is considered an acceptable by the Council's highway team.

Table 7: 50% Development (390 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	2.3	8.42	70%	A	1.3	6.07	57%	A
1 - A - 2 - B4434	0.9	4.07	47%	A	1.2	4.69	56%	A
1 - A - 3 - Cadoxton South	0.3	3.17	25%	A	0.7	4.35	40%	A
2 - B - 1 - Cadoxton East	1.2	9.88	54%	A	0.7	6.96	40%	A
2 - B - 2 - Golwg Y Gamlas	0.1	8.03	12%	A	0.4	7.79	31%	A
2 - B - 3 - Cadoxton West	1.6	9.03	62%	A	14	54.35	96%	F
2 - B - 4 – Pen Y Wern Road	4.7	19.12	83%	C	2.8	14.19	74%	B

3.10 With 37.5% of development traffic at Pen Y Wern, the ratio of flow to capacity on the Cadoxton Road East arm decreases to 94%, which is still significantly above the 85% degree of saturation which is considered an acceptable by the Council's highway team.

Table 8: 37.5% Development (293 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	2.2	8.19	69%	A	1.3	6.01	57%	A
1 - A - 2 - B4434	0.9	4.04	46%	A	1.2	4.63	55%	A
1 - A - 3 - Cadoxton South	0.3	3.16	25%	A	0.7	4.28	40%	A
2 - B - 1 - Cadoxton East	1.2	9.6	54%	A	0.7	6.87	40%	A
2 - B - 2 - Golwg Y Gamlas	0.1	7.87	11%	A	0.4	7.69	31%	A
2 - B - 3 - Cadoxton West	1.6	8.92	61%	A	11.6	46.38	94%	E
2 - B - 4 – Pen Y Wern Road	4.3	17.74	82%	C	2.7	13.78	74%	B

3.11 With 25% of development traffic at Pen Y Wern, the ratio of flow to capacity on the Cadoxton Road East arm decreases to 93%, which is still significantly above the 85% degree of saturation which is considered an acceptable by the Council's highway team.

Table 9: 25% Development (195 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	2.1	7.96	68%	A	1.3	5.95	56%	A
1 - A - 2 - B4434	0.8	4.01	46%	A	1.2	4.57	55%	A
1 - A - 3 - Cadoxton South	0.3	3.15	25%	A	0.6	4.21	39%	A
2 - B - 1 - Cadoxton East	1.1	9.34	53%	A	0.7	6.79	40%	A
2 - B - 2 - Golwg Y Gamlas	0.1	7.72	11%	A	0.4	7.58	30%	A
2 - B - 3 - Cadoxton West	1.6	8.82	61%	A	9.8	39.83	93%	E
2 - B - 4 – Pen Y Wern Road	4	16.53	80%	C	2.6	13.37	73%	B

3.12 With 12.5% of development traffic at Pen Y Wern, the ratio of flow to capacity on the Cadoxton Road East arm decreases to 91%, which is still significantly above the 85% degree of saturation which is considered an acceptable by the Council's highway team.

Table 10: 12.5% Development (98 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	2	7.75	67%	A	1.3	5.89	56%	A
1 - A - 2 - B4434	0.8	3.98	46%	A	1.2	4.5	54%	A
1 - A - 3 - Cadoxton South	0.3	3.14	24%	A	0.6	4.15	38%	A
2 - B - 1 - Cadoxton East	1.1	9.09	52%	A	0.6	6.7	39%	A
2 - B - 2 - Golwg Y Gamlas	0.1	7.57	11%	A	0.4	7.48	29%	A
2 - B - 3 - Cadoxton West	1.5	8.71	60%	A	8.3	34.52	91%	D
2 - B - 4 – Pen Y Wern Road	3.7	15.47	79%	C	2.5	12.98	72%	B

Scenario 2

3.13 The scenarios above have also been re-run with the WTS Model. The Modelling work shows that with no development the ratio of flow to capacity on the Cadoxton Road East arm will be 89% in 2038 which is above the 85% degree of saturation which is considered acceptable by the Council's highway team.

Table 11: Scenario 2 - No Development

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	2	7.54	66%	A	1.2	5.84	55%	A
1 - A - 2 - B4434	0.8	3.95	45%	A	1.1	4.44	53%	A
1 - A - 3 - Cadoxton South	0.3	3.14	24%	A	0.6	4.09	38%	A
2 - B - 1 - Cadoxton East	1	8.85	51%	A	0.6	6.62	39%	A
2 - B - 2 - Golwg Y Gamlas	0.1	7.43	10%	A	0.4	7.39	29%	A
2 - B - 3 - Cadoxton West	1.5	8.61	60%	A	7.2	30.26	89%	D
2 - B - 4 – Pen Y Wern Road	3.4	14.53	78%	B	2.4	12.61	71%	B

3.14 The modelling work shows that for 100% of development ratio of flow to capacity on the Cadoxton Road East arm increases to 100% in 2038 which is above the 85% degree of saturation which is considered acceptable by the Council's highway team.

Table 12: Scenario 2 - 100% Development (780 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	2.5	8.98	72%	A	1.4	6.22	58%	A
1 - A - 2 - B4434	0.9	4.14	47%	A	1.3	4.86	57%	A
1 - A - 3 - Cadoxton South	0.3	3.19	25%	A	0.7	4.52	42%	A
2 - B - 1 - Cadoxton East	1.3	10.56	56%	B	0.7	7.17	42%	A
2 - B - 2 - Golwg Y Gamlas	0.1	8.41	12%	A	0.5	8.07	32%	A
2 - B - 3 - Cadoxton West	1.7	9.29	63%	A	22.8	81.16	100%	F
2 - B - 4 – Pen Y Wern Road	5.8	23.04	86%	C	3.1	15.22	76%	C

3.15 The modelling work shows that for 87.5% of development ratio of flow to capacity on the Cadoxton Road East arm decreases to 99% in 2038 which is above the 85% degree of saturation which is considered acceptable by the Council's highway team.

Table 13: Scenario 2 - 87.5% Development (663 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	2.5	8.78	71%	A	1.4	6.17	58%	A
1 - A - 2 - B4434	0.9	4.11	47%	A	1.3	4.8	57%	A
1 - A - 3 - Cadoxton South	0.3	3.19	25%	A	0.7	4.46	41%	A
2 - B - 1 - Cadoxton East	1.3	10.31	56%	B	0.7	7.1	41%	A
2 - B - 2 - Golwg Y Gamlas	0.1	8.28	12%	A	0.5	7.97	32%	A
2 - B - 3 - Cadoxton West	1.7	9.2	62%	A	19.3	71.01	99%	F
2 - B - 4 – Pen Y Wern Road	5.4	21.53	85%	C	3	14.87	76%	B

3.16 The modelling work shows that for 75% of development ratio of flow to capacity on the Cadoxton Road East arm decreases to 97% in 2038 which is above the 85% degree of saturation which is considered acceptable by the Council's highway team.

Table 14: Scenario 2 - 75% Development (585 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	2.4	8.58	71%	A	1.4	6.12	57%	A
1 - A - 2 - B4434	0.9	4.09	47%	A	1.3	4.75	56%	A
1 - A - 3 - Cadoxton South	0.3	3.18	25%	A	0.7	4.41	41%	A
2 - B - 1 - Cadoxton East	1.2	10.08	55%	B	0.7	7.03	41%	A
2 - B - 2 - Golwg Y Gamlas	0.1	8.14	12%	A	0.5	7.89	32%	A
2 - B - 3 - Cadoxton West	1.6	9.11	62%	A	16.4	62.2	97%	F
2 - B - 4 – Pen Y Wern Road	5	20.17	84%	C	2.9	14.54	75%	B

3.17 The modelling work shows that for 62.5% of development ratio of flow to capacity on the Cadoxton Road East arm decreases to 96% in 2038 which is above the 85% degree of saturation which is considered acceptable by the Council's highway team.

Table 15: Scenario 2 - 62.5% (488 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	2.3	8.4	70%	A	1.3	6.07	57%	A
1 - A - 2 - B4434	0.9	4.07	47%	A	1.2	4.7	56%	A
1 - A - 3 - Cadoxton South	0.3	3.17	25%	A	0.7	4.35	40%	A
2 - B - 1 - Cadoxton East	1.2	9.85	54%	A	0.7	6.96	40%	A
2 - B - 2 - Golwg Y Gamlas	0.1	8.02	12%	A	0.4	7.8	31%	A
2 - B - 3 - Cadoxton West	1.6	9.03	62%	A	14	54.46	96%	F
2 - B - 4 – Pen Y Wern Road	4.7	18.96	83%	C	2.8	14.2	74%	B

3.18 The modelling work shows that for 50% of development ratio of flow to capacity on the Cadoxton Road East arm decreases to 95% in 2038 which is above the 85% degree of saturation which is considered acceptable by the Council's highway team.

Table 16: Scenario 2 - 50% Development (390 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	2.2	8.21	69%	A	1.3	6.02	57%	A
1 - A - 2 - B4434	0.9	4.04	46%	A	1.2	4.64	55%	A
1 - A - 3 - Cadoxton South	0.3	3.16	25%	A	0.7	4.29	40%	A
2 - B - 1 - Cadoxton East	1.2	9.63	54%	A	0.7	6.89	40%	A
2 - B - 2 - Golwg Y Gamlas	0.1	7.89	11%	A	0.4	7.71	31%	A
2 - B - 3 - Cadoxton West	1.6	8.94	61%	A	12.1	47.98	95%	E
2 - B - 4 – Pen Y Wern Road	4.4	17.87	82%	C	2.7	13.86	74%	B

3.19 The modelling work shows that for 37.5% of development ratio of flow to capacity on the Cadoxton Road East arm decreases to 93% in 2038 which is above the 85% degree of saturation which is considered acceptable by the Council's highway team.

Table 17: Scenario 2 - 37.5% Development (293 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	2.2	8.04	68%	A	1.3	5.98	56%	A
1 - A - 2 - B4434	0.9	4.02	46%	A	1.2	4.59	55%	A
1 - A - 3 - Cadoxton South	0.3	3.16	25%	A	0.6	4.24	39%	A
2 - B - 1 - Cadoxton East	1.1	9.42	53%	A	0.7	6.82	40%	A
2 - B - 2 - Golwg Y Gamlas	0.1	7.77	11%	A	0.4	7.62	30%	A
2 - B - 3 - Cadoxton West	1.6	8.86	61%	A	10.5	42.32	93%	E
2 - B - 4 – Pen Y Wern Road	4.1	16.92	81%	C	2.7	13.54	73%	B

3.20 The modelling work shows that for 25% of development ratio of flow to capacity on the Cadoxton Road East arm decreases to 92% in 2038 which is above the 85% degree of saturation which is considered acceptable by the Council's highway team.

Table 18: Scenario 2 - 25% Development (195 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	2.1	7.87	68%	A	1.3	5.93	56%	A
1 - A - 2 - B4434	0.8	4	46%	A	1.2	4.54	54%	A
1 - A - 3 - Cadoxton South	0.3	3.15	25%	A	0.6	4.19	39%	A
2 - B - 1 - Cadoxton East	1.1	9.22	52%	A	0.7	6.75	39%	A
2 - B - 2 - Golwg Y Gamlas	0.1	7.65	11%	A	0.4	7.54	30%	A
2 - B - 3 - Cadoxton West	1.5	8.77	61%	A	9.2	37.6	92%	E
2 - B - 4 – Pen Y Wern Road	3.8	16.03	80%	C	2.6	13.22	72%	B

3.21 The modelling work shows that for 12.5% of development ratio of flow to capacity on the Cadoxton Road East arm decreases to 90% in 2038 which is above the 85% degree of saturation which is considered acceptable by the Council's highway team.

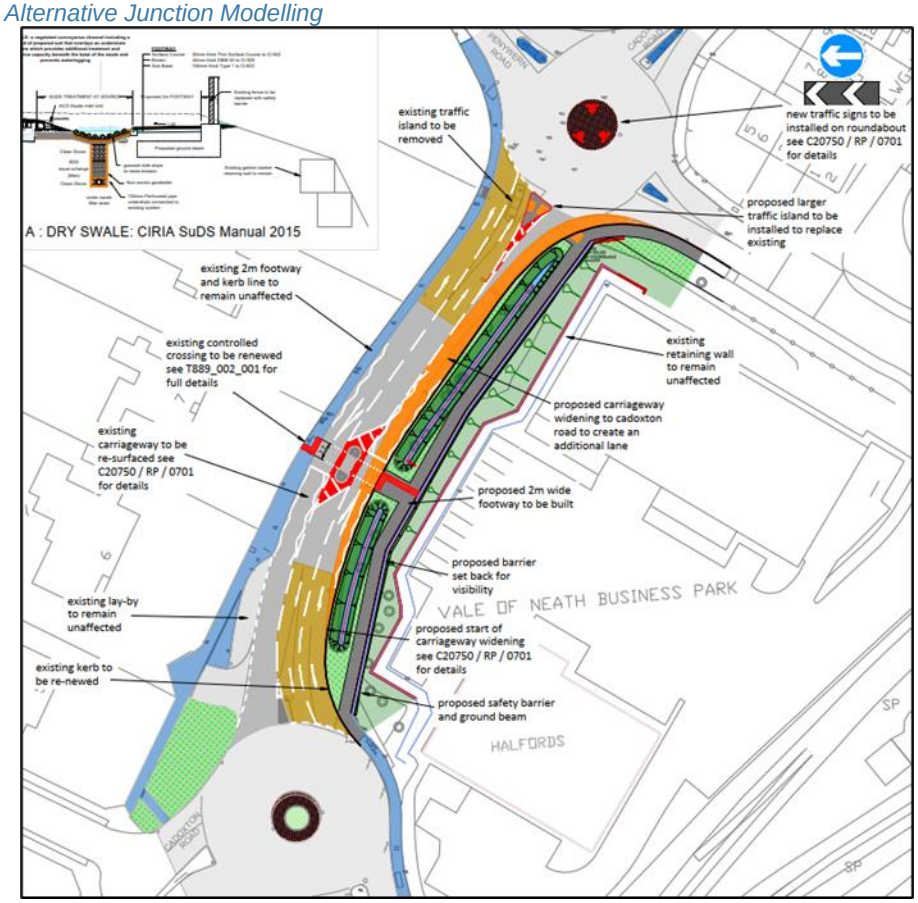
Table 19: Scenario 2 - 12.5% Development (98 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	2	7.7	67%	A	1.3	5.88	56%	A
1 - A - 2 - B4434	0.8	3.97	46%	A	1.2	4.49	54%	A
1 - A - 3 - Cadoxton South	0.3	3.14	24%	A	0.6	4.14	38%	A
2 - B - 1 - Cadoxton East	1.1	9.04	52%	A	0.6	6.68	39%	A
2 - B - 2 - Golwg Y Gamlas	0.1	7.54	11%	A	0.4	7.46	29%	A
2 - B - 3 - Cadoxton West	1.5	8.69	60%	A	8.1	33.61	90%	D
2 - B - 4 – Pen Y Wern Road	3.6	15.24	79%	C	2.5	12.9	72%	B

4 Alternative Junction Modelling

4.1 Given that all of these scenarios are above the 85% degree of saturation which is considered acceptable by the Council's highway team, the modelling has also taken into consideration the alternative junction layout which was prepared a number of years ago.

Figure 2: Alternative Junction Modelling



4.2 Both scenarios have been re-run and the results are presented below.

Scenario 1

4.3 The modelling work shows that with no development, all arms of the junction will be below the 85% degree of saturation which is considered acceptable by the Council's highway team in 2038.

Table 20: Alternative Junction Modelling - Scenario 1: No Development

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	1.4	5.3	58%	A	0.9	4.37	48%	A
1 - A - 2 - B4434	0.8	3.95	45%	A	1.1	4.44	53%	A
1 - A - 3 - Cadoxton South	0.3	3.14	24%	A	0.6	4.09	38%	A
2 - B - 1 - Cadoxton East	1	8.85	51%	A	0.6	6.62	39%	A
2 - B - 2 - Golwg Y Gamlas	0.1	7.43	10%	A	0.4	7.39	29%	A
2 - B - 3 - Cadoxton West	0.5	3.12	35%	A	1.1	4.3	52%	A
2 - B - 4 – Pen Y Wern Road	3.4	14.53	78%	B	2.4	12.64	71%	B

4.4 With 100% of development proposed, the modelling work shows that Pen Y Wern Road arm of the junction has a 89% degree of saturation which is above the 85% degree saturation which is considered acceptable by the Council's highway team. This results in an average queue of 7 cars and a delay of 27.37 seconds.

Table 21: Alternative Junction Modelling - Scenario 1: 100% Development (780 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	1.8	6.25	65%	A	1.1	4.65	51%	A
1 - A - 2 - B4434	0.9	4.2	48%	A	1.4	4.98	58%	A
1 - A - 3 - Cadoxton South	0.3	3.21	25%	A	0.8	4.65	43%	A
2 - B - 1 - Cadoxton East	1.4	11.16	58%	B	0.7	7.35	42%	A
2 - B - 2 - Golwg Y Gamlas	0.1	8.73	13%	A	0.5	8.25	33%	A
2 - B - 3 - Cadoxton West	0.6	3.23	37%	A	1.5	5.19	60%	A
2 - B - 4 – Pen Y Wern Road	7	27.37	89%	D	3.4	16.55	78%	C

4.5 With 87.5% of development proposed, the modelling work shows that the degree of saturation for Pen Y Wern Road arm of the junction falls to 85% degree of saturation which is in line with the degree of saturation considered acceptable by the Council's highway team.

Table 22: Alternative Junction Modelling - Scenario 1: 87.5% Development (663 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	1.7	5.92	63%	A	1	4.56	50%	A
1 - A - 2 - B4434	0.9	4.11	47%	A	1.3	4.81	57%	A
1 - A - 3 - Cadoxton South	0.3	3.19	25%	A	0.7	4.46	41%	A
2 - B - 1 - Cadoxton East	1.3	10.31	56%	B	0.7	7.11	41%	A
2 - B - 2 - Golwg Y Gamlas	0.1	8.28	12%	A	0.5	7.97	32%	A
2 - B - 3 - Cadoxton West	0.6	3.2	37%	A	1.4	4.89	57%	A
2 - B - 4 – Pen Y Wern Road	5.4	21.54	85%	C	3.1	15.15	76%	C

4.6 With 75% of development proposed, the modelling work shows that the degree of saturation for Pen Y Wern Road arm of the junction falls to 84% which is below the 85% degree of saturation considered acceptable by the Council's highway team.

Table 23: Alternative Junction Modelling - Scenario 1: 75% Development (585 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	1.6	5.82	62%	A	1	4.54	50%	A
1 - A - 2 - B4434	0.9	4.09	47%	A	1.3	4.75	56%	A
1 - A - 3 - Cadoxton South	0.3	3.18	25%	A	0.7	4.41	41%	A
2 - B - 1 - Cadoxton East	1.2	10.08	55%	B	0.7	7.04	41%	A
2 - B - 2 - Golwg Y Gamlas	0.1	8.14	12%	A	0.5	7.89	32%	A
2 - B - 3 - Cadoxton West	0.6	3.19	36%	A	1.3	4.79	57%	A
2 - B - 4 – Pen Y Wern Road	5	20.18	84%	C	3	14.74	75%	B

4.7 With 62.5% of development proposed, the modelling work shows that the degree of saturation for Pen Y Wern Road arm of the junction falls to 83% which is below the 85% degree of saturation considered acceptable by the Council's highway team.

Table 24: Alternative Junction Modelling - Scenario 1: 62.5% Development (488 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	1.6	5.73	61%	A	1	4.51	50%	A
1 - A - 2 - B4434	0.9	4.07	47%	A	1.2	4.7	56%	A
1 - A - 3 - Cadoxton South	0.3	3.17	25%	A	0.7	4.35	40%	A
2 - B - 1 - Cadoxton East	1.2	9.85	54%	A	0.7	6.97	41%	A
2 - B - 2 - Golwg Y Gamlas	0.1	8.02	12%	A	0.4	7.8	31%	A
2 - B - 3 - Cadoxton West	0.6	3.17	36%	A	1.3	4.7	56%	A
2 - B - 4 – Pen Y Wern Road	4.7	18.97	83%	C	2.9	14.35	75%	B

4.8 With 50% development proposed, the modelling work shows that the degree of saturation for Pen Y Wern Road arm of the junction falls to 82% which is below the 85% degree of saturation considered acceptable by the Council's highway team.

Table 25: Alternative Junction Modelling - Scenario 1: 50% Development (390 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	1.5	5.64	61%	A	1	4.48	49%	A
1 - A - 2 - B4434	0.9	4.04	46%	A	1.2	4.64	55%	A
1 - A - 3 - Cadoxton South	0.3	3.16	25%	A	0.7	4.29	40%	A
2 - B - 1 - Cadoxton East	1.2	9.63	54%	A	0.7	6.9	40%	A
2 - B - 2 - Golwg Y Gamlas	0.1	7.89	11%	A	0.4	7.71	31%	A
2 - B - 3 - Cadoxton West	0.6	3.16	36%	A	1.2	4.61	55%	A
2 - B - 4 – Pen Y Wern Road	4.4	17.88	82%	C	2.8	13.97	74%	B

4.9 With 37.5% of development proposed, the modelling work shows that the degree of saturation for Pen Y Wern Road arm of the junction falls to 81% which is below the 85% degree of saturation considered acceptable by the Council's highway team.

Table 26: Alternative Junction Modelling - Scenario 1: 37.5% Development (293 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	1.5	5.55	60%	A	1	4.45	49%	A
1 - A - 2 - B4434	0.9	4.02	46%	A	1.2	4.59	55%	A
1 - A - 3 - Cadoxton South	0.3	3.16	25%	A	0.6	4.24	39%	A
2 - B - 1 - Cadoxton East	1.1	9.43	53%	A	0.7	6.83	40%	A
2 - B - 2 - Golwg Y Gamlas	0.1	7.77	11%	A	0.4	7.62	30%	A
2 - B - 3 - Cadoxton West	0.6	3.15	36%	A	1.2	4.53	54%	A
2 - B - 4 – Pen Y Wern Road	4.1	16.92	81%	C	2.7	13.61	73%	B

4.10 With 25% of development proposed, the modelling work shows that the degree of saturation for Pen Y Wern Road arm of the junction falls to 80% which is below the 85% degree of saturation considered acceptable by the Council's highway team.

Table 27: Alternative Junction Modelling - Scenario 1: 25% Development (195 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	1.5	5.46	59%	A	1	4.43	49%	A
1 - A - 2 - B4434	0.8	4	46%	A	1.2	4.54	54%	A
1 - A - 3 - Cadoxton South	0.3	3.15	25%	A	0.6	4.19	39%	A
2 - B - 1 - Cadoxton East	1.1	9.22	52%	A	0.7	6.76	39%	A
2 - B - 2 - Golwg Y Gamlas	0.1	7.65	11%	A	0.4	7.54	30%	A
2 - B - 3 - Cadoxton West	0.6	3.14	36%	A	1.2	4.45	53%	A
2 - B - 4 – Pen Y Wern Road	3.8	16.04	80%	C	2.6	13.27	73%	B

4.11 With 12.5% of development proposed, the modelling work shows that the degree of saturation for Pen Y Wern Road arm of the junction falls to 84% which is below the 85% degree of saturation considered acceptable by the Council's highway team.

Table 28: Alternative Junction Modelling - Scenario 1: 12.5% Development (98 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	1.4	5.38	59%	A	0.9	4.4	48%	A
1 - A - 2 - B4434	0.8	3.97	46%	A	1.2	4.49	54%	A
1 - A - 3 - Cadoxton South	0.3	3.14	24%	A	0.6	4.14	38%	A
2 - B - 1 - Cadoxton East	1.1	9.04	52%	A	0.6	6.69	39%	A
2 - B - 2 - Golwg Y Gamlas	0.1	7.54	11%	A	0.4	7.46	29%	A
2 - B - 3 - Cadoxton West	0.6	3.13	35%	A	1.1	4.37	53%	A
2 - B - 4 – Pen Y Wern Road	3.6	15.24	79%	C	2.5	12.95	72%	B

Scenario 2

4.12 Incorporating the WTS assumptions, the Table below shows that with no development all arms of the junction will be below the 85% degree of saturation considered acceptable by the Council's highway team.

Table 29: Alternative Junction Modelling - Scenario 2: No Development

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	1.4	5.3	58%	A	0.9	4.37	48%	A
1 - A - 2 - B4434	0.8	3.95	45%	A	1.1	4.44	53%	A
1 - A - 3 - Cadoxton South	0.3	3.14	24%	A	0.6	4.09	38%	A
2 - B - 1 - Cadoxton East	1	8.85	51%	A	0.6	6.62	39%	A
2 - B - 2 - Golwg Y Gamlas	0.1	7.43	10%	A	0.4	7.39	29%	A
2 - B - 3 - Cadoxton West	0.5	3.12	35%	A	1.1	4.3	52%	A
2 - B - 4 - Pen Y Wern Road	3.4	14.53	78%	B	2.4	12.64	71%	B

4.13 With 100% of the proposed development, the Table below shows that with the amended junction, all arms of the junction are below the 85% degree of saturation considered acceptable by the Council's highway team apart from the Pen Y Wern Road arm which has a 86% degree of saturation in the AM peak. This is equivalent to a 5.8 average queue and 23.05 second time delay.

Table 30: Alternative Junction Modelling - Scenario 2: 100% Development (780 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	1.7	6.02	63%	A	1	4.59	51%	A
1 - A - 2 - B4434	0.9	4.14	47%	A	1.3	4.86	57%	A
1 - A - 3 - Cadoxton South	0.3	3.19	25%	A	0.7	4.52	42%	A
2 - B - 1 - Cadoxton East	1.3	10.56	56%	B	0.7	7.19	42%	A
2 - B - 2 - Golwg Y Gamlas	0.1	8.41	12%	A	0.5	8.07	32%	A
2 - B - 3 - Cadoxton West	0.6	3.21	37%	A	1.4	4.98	58%	A
2 - B - 4 - Pen Y Wern Road	5.8	23.05	86%	C	3.2	15.6	77%	C

4.14 With 87.5% of proposed development, the Table below shows that the Pen Y Wern Road arm degree of saturation falls to 85% which is in line with the 85% degree of saturation considered acceptable by the Council's highway team.

Table 31: Alternative Junction Modelling - Scenario 2: 87.5% Development (663 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	1.7	5.92	63%	A	1	4.56	50%	A
1 - A - 2 - B4434	0.9	4.11	47%	A	1.3	4.81	57%	A
1 - A - 3 - Cadoxton South	0.3	3.19	25%	A	0.7	4.46	41%	A
2 - B - 1 - Cadoxton East	1.3	10.31	56%	B	0.7	7.11	41%	A
2 - B - 2 - Golwg Y Gamlas	0.1	8.28	12%	A	0.5	7.97	32%	A
2 - B - 3 - Cadoxton West	0.6	3.2	37%	A	1.4	4.89	57%	A
2 - B - 4 - Pen Y Wern Road	5.4	21.54	85%	C	3.1	15.15	76%	C

4.15 With 75% of proposed development, the Table below shows that the Pen Y Wern Road arm degree of saturation falls to 84% which is below the 85% degree of saturation considered acceptable by the Council's highway team.

Table 32: Alternative Junction Modelling - Scenario 2: 75% Development (585 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	1.6	5.82	62%	A	1	4.54	50%	A
1 - A - 2 - B4434	0.9	4.09	47%	A	1.3	4.75	56%	A
1 - A - 3 - Cadoxton South	0.3	3.18	25%	A	0.7	4.41	41%	A
2 - B - 1 - Cadoxton East	1.2	10.08	55%	B	0.7	7.04	41%	A
2 - B - 2 - Golwg Y Gamlas	0.1	8.14	12%	A	0.5	7.89	32%	A
2 - B - 3 - Cadoxton West	0.6	3.19	36%	A	1.3	4.79	57%	A
2 - B - 4 - Pen Y Wern Road	5	20.18	84%	C	3	14.74	75%	B

4.16 With 62.5% of proposed development, the Table below shows that the Pen Y Wern Road arm degree of saturation falls to 83% which is below the 85% degree of saturation considered acceptable by the Council's highway team.

Table 33: Alternative Junction Modelling - Scenario 2: 62.5% Development (488 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	1.6	5.73	61%	A	1	4.51	50%	A
1 - A - 2 - B4434	0.9	4.07	47%	A	1.2	4.7	56%	A
1 - A - 3 - Cadoxton South	0.3	3.17	25%	A	0.7	4.35	40%	A
2 - B - 1 - Cadoxton East	1.2	9.85	54%	A	0.7	6.97	41%	A
2 - B - 2 - Golwg Y Gamlas	0.1	8.02	12%	A	0.4	7.8	31%	A
2 - B - 3 - Cadoxton West	0.6	3.17	36%	A	1.3	4.7	56%	A
2 - B - 4 - Pen Y Wern Road	4.7	18.97	83%	C	2.9	14.35	75%	B

4.17 With 50% of proposed development, the Table below shows that the Pen Y Wern Road arm degree of saturation falls to 82% which is below the 85% degree of saturation considered acceptable by the Council's highway team.

Table 34: Alternative Junction Modelling - Scenario 2: 50% Development (390 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	1.5	5.64	61%	A	1	4.48	49%	A
1 - A - 2 - B4434	0.9	4.04	46%	A	1.2	4.64	55%	A
1 - A - 3 - Cadoxton South	0.3	3.16	25%	A	0.7	4.29	40%	A
2 - B - 1 - Cadoxton East	1.2	9.63	54%	A	0.7	6.9	40%	A
2 - B - 2 - Golwg Y Gamlas	0.1	7.89	11%	A	0.4	7.71	31%	A
2 - B - 3 - Cadoxton West	0.6	3.16	36%	A	1.2	4.61	55%	A
2 - B - 4 - Pen Y Wern Road	4.4	17.88	82%	C	2.8	13.97	74%	B

4.18 With 37.5% of proposed development, the Table below shows that the Pen Y Wern Road arm degree of saturation falls to 81% which is below the 85% degree of saturation considered acceptable by the Council's highway team.

Table 35: Alternative Junction Modelling - Scenario 2: 37.5% Development (293 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	1.5	5.55	60%	A	1	4.45	49%	A
1 - A - 2 - B4434	0.9	4.02	46%	A	1.2	4.59	55%	A
1 - A - 3 - Cadoxton South	0.3	3.16	25%	A	0.6	4.24	39%	A
2 - B - 1 - Cadoxton East	1.1	9.43	53%	A	0.7	6.83	40%	A
2 - B - 2 - Golwg Y Gamlas	0.1	7.77	11%	A	0.4	7.62	30%	A
2 - B - 3 - Cadoxton West	0.6	3.15	36%	A	1.2	4.53	54%	A
2 - B - 4 - Pen Y Wern Road	4.1	16.92	81%	C	2.7	13.61	73%	B

4.19 With 25% of proposed development, the Table below shows that the Pen Y Wern Road arm degree of saturation falls to 80% which is below the 85% degree of saturation considered acceptable by the Council's highway team.

Table 36: Alternative Junction Modelling - Scenario 2: 25% Development (195 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	1.5	5.46	59%	A	1	4.43	49%	A
1 - A - 2 - B4434	0.8	4	46%	A	1.2	4.54	54%	A
1 - A - 3 - Cadoxton South	0.3	3.15	25%	A	0.6	4.19	39%	A
2 - B - 1 - Cadoxton East	1.1	9.22	52%	A	0.7	6.76	39%	A
2 - B - 2 - Golwg Y Gamlas	0.1	7.65	11%	A	0.4	7.54	30%	A
2 - B - 3 - Cadoxton West	0.6	3.14	36%	A	1.2	4.45	53%	A
2 - B - 4 - Pen Y Wern Road	3.8	16.04	80%	C	2.6	13.27	73%	B

4.20 With 12.5% of proposed development, the Table below shows that the Pen Y Wern Road arm degree of saturation falls to 79% which is below the 85% degree of saturation considered acceptable by the Council's highway team.

Table 37: Alternative Junction Modelling - Scenario 2: 12.5% Development (98 Dwellings)

Junction Arm	Average Queue AM	Delay (s) AM	RFC AM	LOS AM	Average Queue PM	Delay (s) PM	RFC PM	LOS PM
1 - A - 1 - Cadoxton North	1.4	5.38	59%	A	0.9	4.4	48%	A
1 - A - 2 - B4434	0.8	3.97	46%	A	1.2	4.49	54%	A
1 - A - 3 - Cadoxton South	0.3	3.14	24%	A	0.6	4.14	38%	A
2 - B - 1 - Cadoxton East	1.1	9.04	52%	A	0.6	6.69	39%	A
2 - B - 2 - Golwg Y Gamlas	0.1	7.54	11%	A	0.4	7.46	29%	A
2 - B - 3 - Cadoxton West	0.6	3.13	35%	A	1.1	4.37	53%	A
2 - B - 4 - Pen Y Wern Road	3.6	15.24	79%	C	2.5	12.95	72%	B

5 Conclusion

For Pen Y Wern Junction, the findings reveal that:

- The junction already operates slightly above the 85% RFC threshold which is considered acceptable by NPT highways. The Cadoxton West arm operates at 86% in the PM peak which equates to a 5.7 average length queue.

- With no development the junction will increasingly operate beyond this capacity. The Cadoxton West arm will operate at 89% during the PM peak, equating to a delay of 30.26 seconds and a queue of 7.2 cars.

- The proposed development to the north of Pen Y Wern junction will generate traffic which is likely to increase the RFC at the junction, leading to an increase in queueing and delays. With 100% of development, under Scenario 1 the RFC increases to 103% (31 average queue length and 104 second delay). When taking into the WTS under Scenario 2 this decreases 100% RFC (23 average queue length and 82 second delay). A number of levels of development have been assessed for both scenarios.

- Given that the junction is currently operating above the 85% RFC which is considered to be acceptable by NPT Highways, consideration has been given to the alternative junction design which was developed by the Council. With this alternative junction design, with no development all arms of the junction operate below the 85% degree of saturation for both Scenarios. With 100% of development proposed under Scenario 1 the PM RFC increases to 89% degree of saturation on the Pen Y Wern Road arm junction which equates to an average queue of 7 cars and a delay of 27.37 seconds. Taking into consideration the WTS, Scenario 2 shows all arms of the junction operating below the 85% degree of saturation, with the exception of Pen Y Wern Road which operates at 86%. A number of levels of development have also been assessed for both scenarios.

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