Agenda Item: 19

Name of Committee:	**Cabinet**
Date of Meeting:	**18/02/2019**
Relevant Scrutiny Committee:	Environment and Regeneration
Report Title:	**Strategic Transport Improvements in Dinas Powys Update**
Purpose of Report:	To update Cabinet on the Draft WelTAG Stage 2 Report for Dinas Powys and make recommendations for next steps.
Report Owner:	Cabinet Member for Neighbourhood Services and Transport
Responsible Officer:	Miles Punter - Director of Environment and Housing Services
Elected Member and Officer Consultation:	Cabinet Member for Neighbourhood Services and Transport Cabinet Member for Regeneration and Planning Passenger Transport Manager Operational Manager Engineering Accountant Environment and Housing Services Operational Manager Finance Head of Regeneration and Planning Legal Services (Committee Reports)
Policy Framework:	This report is a matter for Executive Decision by Cabinet.

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Executive Summary:

This Report provides Cabinet with an update on progress of the transport assessments being undertaken in Dinas Powys and identifies, (following a meeting of the Review Group for this Study), that further work needs to be undertaken in respect of :

- Engaging with Network Rail to understand the constraints and potential costs associated with construction of a bypass and junction in the vicinity of the railway tunnel.
- Undertaking concept design, modelling and costing of suggested improvements to the Merrie Harrier junction to improve capacity. Consider costs in context of the bypass scheme costs (blue and green options).
- Commissioning strategic modelling using the South East Wales Transport Model of the bypass proposals (via Transport for Wales who manage the model).
- Updating the economic appraisal for the green alignment and provide appraisal for the blue alignment and update the transport case and the Stage Two report.
- Undertaking public consultation on the findings of the Stage Two report and finalising the Stage Two report and making recommendations for option(s) to be taken forward to a WelTAG Stage Three Full Business Case.

The report recommends that should grant funding not be available from Welsh Government for the completion of this work that the Head of Neighbourhood Services and Transport is authorised to seek any ways of funding it.

1. Recommendation

1.1 That Cabinet notes the progress made on the WelTAG studies relating to improving strategic transport in Dinas Powys and that this matter be referred to Scrutiny Committee (Environment and Regeneration) for consideration.

1.2 That should grant funding not be available from Welsh Government for the completion of the Stage 2 WelTAG work, as identified in paragraph 4.7 of this report, the Head of Neighbourhood Services and Transport be authorised to seek an alternative funding source.

2. Reasons for Recommendations

2.1 To update members on progress made on the scheme and to allow this report to be considered by the relevant Scrutiny Committee

2.2 To secure funding to deliver a final Stage 2 report for the Project.

3. Background

3.1 A Stage One Welsh Transport Appraisal Guidance (WelTAG) study of the Transport Network at Dinas Powys was undertaken in 2017 by Arcadis Consulting (UK) Limited.

3.2 The WelTAG Stage One report considered the problems, opportunities and constraints, established objectives and appraised a long list of options. The Stage One study was presented to Cabinet whereby the following options were confirmed to be taken forward for further consideration, following recommendation by the Council's Environment and Regeneration Scrutiny Committee on 14th September 2017:

- Do-minimum
- Bypass
- Multi-Modal Option
- Bypass and Multi-Modal Option

3.3 Following this, a Stage Two study was commissioned through competitive tender in November 2017, with the aim of preparing an Outline Business Case for the options recommended to be taken forward against a Do Minimum Option.

3.4 The Cabinet meeting on 16th April 2018 updated members on the Transport Network Study at Dinas Powys. Approval was sought to expand the scope for the WelTAG work that was being undertaken in Dinas Powys by Consultant Arcadis Consulting Limited on behalf of the Council.

3.5 A request had been received from the nominated representative who sits on the Review Group for Dinas Powys Community Council, to extend the scope of the Dinas Powys WelTAG study to incorporate a much wider area and additional bypass options than that which was being considered. This request was endorsed by Dinas Powys Community Council at an Extraordinary meeting on 21st February 2018. For completeness, this request had been made as part of a strategic proposition that would include the release of land for development to the west of Dinas Powys and to the east of Barry, alongside and part of a development proposal that would include the delivery of any new road link.

3.6 Having received advice from Arcadis Consulting Ltd. who were assisting the Council with this work it had been agreed that the most appropriate way of dealing with these further options would be to undertake a combined WelTAG Stage One and Stage Two assessment. This would involve a number of additional tasks to be undertaken as detailed in the previous Cabinet report, but in summary this involved:

- Highways design of an alignment which connected from the sections of the scheme already being developed in the Murch Road area southwards to the junction of Sully Moors Road and Hayes Road (as opposed to connecting to the A4055).
- Undertaking of further traffic surveys at the three junctions of Sully Moors Road/ Hayes Road, Ffordd y Mileniwm/ A4055 and Biglis Roundabout.
- An appraisal of the additional option would then need to be undertaken and a manual assessment of likely traffic using the route based on trip patterns, distance and likely journey times. This would enable a comparison to the business case of the existing alignment, without needing to undertake detailed cost benefit analysis.

3.7 This option would then be incorporated into the Stage Two report as an alternative Dinas Powys bypass option. Whilst such an alignment was likely to address different issues and objectives and have different impacts, it would enable a transparent comparison of options so that options with merit for detailed consideration in Stage Three could be recommended.

3.8 At the meeting on 16th April 2018 Cabinet resolved:

(1) that it be agreed to expand the scope of the WelTAG work at Dinas Powys to include the options suggested by Dinas Powys Community Council as contained at Appendix A attached to the report.

(2) that it be agreed to include a representative from each of the following community/ town councils to sit on the Review Group for the Dinas Powys WelTAG Stage 2: Llandough Community Council; Penarth Town Council; Barry Town Council and Sully Community Council.

(3) that Cabinet receive a further report following the receipt of the draft WelTAG Stage 2 report for Dinas Powys in Summer 2018.

(4) that an increase of £15,171.33 to the 2018/19 Capital Programme for WelTAG Stage 2 Dinas Powys to be funded from Neighbourhood Services and Transport's reserves be approved.

4. Key Issues for Consideration

Stage Two Study Draft Report and Review Group

4.1 The draft of the Stage Two report was provided by Arcadis Consulting Limited (Appendix A refers) and considered by the Review Group on 2nd October 2018. The minutes of the Review Group are attached at Appendix B.

4.2 There was general consensus reached by the Review Group to the following key points:

- The study had been completed in accordance with the assigned brief and extension to the study area to consider possible local benefits as a result of the options assessed.
- There is a need to consider the wider strategic impacts of the proposals including how extant capacity issues at the Merrie Harrier and Barons Court junctions affect the benefits realised as part of the Stage Two study completed.
- The importance of strategic modelling using the South East Wales Transport Model (SEWTM) was identified as a key driver in the assessment of any potential wider benefits beyond the Dinas Powys study area. The impact of other strategic proposals (e.g. M4 J34-A48 scheme proposals) was also raised and how these could impact on the Dinas Powys options. There is also a risk that local improvements to the highway network via a new bypass and/ or online highway improvements could exacerbate extant issues at the Barons Court junction with limited/ restricted opportunity to effectively mitigate.
- Once a public consultation programme was agreed, events should be considered outside of the Dinas Powys community to include locations in Barry and Penarth. Strategic assessment should however be completed prior to engaging with the public.
- There was strong support to consult with Network Rail at the earliest opportunity to assess the risk associated with the Vale of Glamorgan line tunnel situated to the south of the Merrie Harrier junction. There was concern that this could be a 'show stopper' and therefore represents a significant risk to the scheme.
- It was recommended that the Blue route (the additional route from Dinas Powys to Sully Moors roundabout and Hayes Road) needs additional analysis to recognise the potential wider strategic benefits and that this would require further consideration by the Council.
- It was recognised that commuters/ other users want safer routes to encourage cycling. Other sustainable improvements to transport hubs will also help to encourage sustainable travel by walking and cycling.

4.3 In addition, as part of the meeting, the representative of the Dinas Powys Community Council suggested that issues had not been fully covered to make an informed decision. A document entitled 'Dinas Powys Transport Network; WelTAG Stage Two: Outline Business Case and Impacts Assessment Report was tabled by the Dinas Powys Council Representative containing a large number of questions for clarification on the WelTAG reports submitted. Some of the questions were initially considered within the meeting. However, a response to each point was subsequently provided by Arcadis Consulting Limited on behalf of the Vale of Glamorgan Council (this is attached as Appendix C) and distributed to the members of the Review group. Further discussions between the representative and the Council have also taken place. In summary, these concerns relate to how the additional Blue route has been considered and whether Arcadis Consulting Ltd. has considered two alignments in putting forward the Green and Pink routes and the scope of the assessment. A response to these issues is being separately provided to the representative of Dinas Powys Community Council but overall, officers are comfortable that the Scope for the Study (including the extension to scope) has been met and the main concerns form part of the recommended next steps.

Next Steps

4.4 As a result of the recommendations of the Draft WelTAG Stage 2 Report and consideration by the Review Group, a number of next steps are recommended in order to progress the Study.

4.5 The WelTAG guidance states that the purpose of the Stage Two: Outline Business Case is to ‘examine in greater detail the short list of options for tackling the problem under consideration’. During WelTAG Stage Two, the appraisal team needs to consider how the proposed solution will lead to the desired outcomes, maximising contribution to the objectives and well-being goals, and use this understanding to refine the design of the options and identify key dependencies and constraints. At the end of the stage, the report should provide the Review Group with the evidence required to select a preferred option to take forward for Stage Three.

4.6 The Draft Stage Two report provides the assessment of the options but concludes that further analysis is required prior to proceeding with a full WelTAG Stage Three study. This is within the spirit of WelTAG which is to enable a stepped decision-making process with prudent use of public resources.

4.7 The recommended next steps are therefore:

1) Engage with Network Rail to understand the constraints and potential costs associated with construction of a bypass and junction in the vicinity of the railway tunnel.

2) Merrie Harrier Junction: undertake concept design, modelling and costing of suggested improvements to the Merrie Harrier junction to improve capacity. Consider costs in context of the bypass scheme costs (blue and green options)

3) Commission strategic modelling using SEWTM of the bypass proposals (via Transport for Wales who manage the model).

The potential to add aspirational development in the south east Barry area with the blue alignment to inform LDP review will also be considered as part of the modelling commission.

4) Appraisal Updates: update the economic appraisal for the green alignment and provide appraisal for the blue alignment and update the transport case and the Stage Two report.

5) Public Consultation: undertake public consultation on the findings of the Stage Two report.

6) Stage Three recommendations: finalise Stage Two report and make recommendations for option(s) to be taken forward to a Stage Three Full Business Case.

5. How do proposals evidence the Five Ways of Working and contribute to our Well-being Objectives?

5.1 The provision of a reliable, efficient and value for money transport network is recognised by the Neighbourhood Services and Transport Plan (2018/19). The relevant Wellbeing Outcome is An Environmentally Responsible and Prosperous Vale with the relevant Wellbeing Objective being to promote regeneration, economic growth and employment. The WelTAG guidance states that 'when using WelTAG it is essential to comply with the duties set out in the Well-being of Future Generations (Wales) Act 2015. There is a need therefore to follow the sustainable development principle through following the five ways of working and set well-being objectives that maximise contribution to the seven well-being goals'. Table 6 of the Outline Business Case at Appendix A on page 9 shows a positive relationship between the objectives of the WelTAG Study which are to (1) Support Sustainable Connectivity in Cardiff City Region (2) Facilitate and Support Economic Growth (3) Improving Health and Wellbeing (4) Improved Safety and Security and (5) Benefits and Minimised Impacts on the Environment.

5.2 This table summarises the Relationship of the Study Objectives to Well-being Goals and should be read in conjunction with the Full WelTAG report attached at Appendix A.

Well-being of Future Generations (Wales) Act 2015 Outcomes		Objectives				
		1	2	3	4	5
Seven Well-being Goals	A prosperous Wales	++	+++	++	++	++
	A resilient Wales	++	+++	++	++	++
	A healthier Wales	++	++	+++	+	++
	A more equal Wales	++	++	+	++	+
	A Wales of cohesive communities	++	+	+	+	+
	A Wales of vibrant culture and Welsh language	0	+	+	0	0
	A globally responsible Wales	+++	++	++	0	+++

6. Resources and Legal Considerations

Financial

The total cost to date of the WelTAG work in Dinas Powys is £135k of which £120k was funding provided by Welsh Government.

6.1 The capital programme for 2018/19 provides £107k for WelTAG studies. An application for Welsh Government underspend for the Dinas Powys project of £80k was unsuccessful in December 2018. However, further requests have been made to Welsh Government seeking funding for this scheme for this financial year with the latest request being made by the Head of Neighbourhood Services and Transport on 7th February 2019 Further, a bid has been made for funding for WelTAG Stages 2 and 3 (part) in 2019/20 (Appendix D refers). The outcome of this 2019/20 funding bid application should be known in March 2019. Should the funding application to Welsh Government be unsuccessful it is proposed that the Head of Neighbourhood Services seek to secure an alternative funding source to complete the WelTAG Stage 2 work.The estimated costs of this additional work by task have been identified as follows:

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Step	Task Financial Year 2018/19	Consultant Fee (excl VAT) Financial Year 2018/2019	Third Party Costs Financial Year 2018/19
1	Railway Tunnel - Production of a feasibility technical note including the request for, and review of available information regarding the construction of the existing railway tunnel and high level review of the potential loading amendments to the tunnel from the construction of the proposed bypass. The fee assumes that record drawings and recent accurate examination reports are available from Network Rail. No site visits have been included in the following proposal. Two stakeholder meetings have been allowed for.	£7,562.48	Third party costs from Network Rail may be required as part of the BAPA agreement. We would recommend an initial budgetary allowance of £5k for early stage consultation fees for Network Rail's asset protection team, to develop the scope of the Basic Asset Protection Agreement (BAPA). There may be additional fees required to prepare the BAPA, dependent on the scope and extent of any agreements.
2	Merrie Harrier Junction Undertake concept design and costing of suggested improvements to the Merrie Harrier junction to improve capacity. Test layout using LinSig model to assess capacity impact Prepare costs for the works and combine these with the bypass scheme costs (blue and green	£7,109.93	-

	options)		
3	Strategic Modelling Commission strategic modelling using SEWTM of the bypass proposals, involving: 2026 and 2036 reference case Do Something: Green alignment Do Something: Blue alignment Do Something Green alignment + M4 J34 to A48 link and Eastern Bay Phase 2 Link Potential to add aspirational development in the south east Barry area with the blue alignment to inform LDP review	£3,257.45 (For specifying and overseeing model runs/ liaison with TfW modellers)	TfW model costs likely to be in the region of £40-50k and would be incurred directly by the Council
	Project Management and Client Liaison Project coordination 2 client meetings	£2,038.57	
	Total Costs	£19,968.43	£45-55k approximately

In addition to the above, the table below shows further steps that are likely to take place in the 2019/20 financial year following completion of the modelling. These are estimates only at this stage and are dependant on the results of the modelling work

Step	Future Steps Following Above	Consultants Fee	Third Party Costs
4	Update the economic appraisal for the green alignment and provide appraisal for the blue alignment Update the transport case and the Stage Two report	£10-15k	
5	Additional management, meetings and ongoing support (incl. 2 review group meetings)	£2.5k	
6	Consultation (following the above) – additional aspects including further event, detailed consultation report and banner production	£10k	
	TOTAL	£22.5k to £27.5k	

Employment

6.2 Consultants, Arcadis Consulting Limited have been commissioned to undertake the technical work on this Project because the technical skills required to do this work are not available within the Council. The Review Group is led by the Head of Neighbourhood Services and Transport and all technical documents are reviewed and amended as appropriate by the Council's professional officers.

Legal (Including Equalities)

Active Travel (Wales) Act (2013)

6.3 The Active Travel (Wales) Bill makes provision for the mapping of active travel routes and related facilities. The Act was passed by the National Assembly of Wales and also seeks to secure new and enhanced active travel routes and facilities; improving provision for walkers and cyclists. The purpose of the Bill is for local authorities to continuously improve their facilities and routes for pedestrians and cyclists e.g. through provision of shelter, resting and/or storage facilities. The Act further requires Welsh Ministers to publish public annual reports regarding the extent to which walkers and cyclists make active travel journeys in Wales.

Well-being of Future Generations (Wales) Act 2015

6.4 The Act strives to improve the social, economic, environmental and cultural well-being of Wales. The vision is 'in 2050, Wales will be the best place to live, learn, work and do business'. The Act makes the public bodies listed in the Act consider the longer-term perspective; engage with people and communities and each other; prevent problems; and to deliver a joined-up approach. The goals to represent what the long-term economic, social and environmental well-being of Wales would look like are: prosperous and innovative using a fair share of natural resources, Communities across are safe, cohesive and resilient with People in Wales participating in our shared culture, with a thriving living Welsh language and a healthier and more equal nation.

Vale of Glamorgan Adopted LDP (2017)

6.5 The Vale of Glamorgan's LDP (2011- 2026) was adopted by the Council on 28th June 2017. The LDP sets out the vision, objectives, strategy and policies for managing development in the Vale of Glamorgan. It also seeks to identify the infrastructure that will be required to meet the growth anticipated in the Vale of Glamorgan up to 2026. The relevant policies to the study area are those that relate to development in the South East Zone. The LDP strategy seeks to promote new development opportunities in the 'South East Zone' (which includes the urban settlements of Barry, Dinas Powys, Llandough (Penarth), Penarth and Sully. The South East Zone accommodates the majority of the Vale of Glamorgan's population and is said to benefit from a wide range of services and facilities including a choice of transport links to Cardiff and the wider region.

6.6 Barry is identified as a key settlement within the LDP Settlement Hierarchy. Penarth has been identified as a Service Centre Settlement and Dinas Powys a Primary Settlement. In Dinas Powys the aim is to Promote sustainable transport measures and related facilities in order to reduce dependence on the private car, including modernisation of the valley lines; Cycle routes at Barry Waterfront to Dinas Powys and bus priority measures at Merrie Harrier Cardiff Road Barry to Cardiff via Barry Road.

6.7 The LDP states that priority will be given to schemes that improve highway safety and accessibility, public transport, walking and cycling. The Plan notes how 'the South East Wales Transport Alliance (Sewta) Highway Strategy Study (2008) identifies the A4055 through Dinas Powys as a key problem area of the regional road network as a consequence of the scale of traffic and associated congestion. Barry Waterfront to Cardiff Link Road (Dinas Powys By-pass) was viewed as having dual benefits, helping to alleviate traffic congestion and improve road safety on the A4055 through Dinas Powys, while having the potential to improve access to the wider road network. Issues at the Cogan Spur and Merrie Harrier junctions, however, would be difficult to overcome."

6.8 The provision of a well organised transport network helps to increase mobility and accessibility.

7. Background Papers

Stage 1 WelTAG Report - Study of Transport Network at Dinas Powys 2017

DINAS POWYS TRANSPORT NETWORK

WelTAG Stage Two: Outline Business Case

DRAFT NO STATUS

JANUARY 2019

Incorporating

Dinas Powys Transport Network

WelTAG Stage Two: Outline Business Case

Author MF

Checker JH

Approver JH

Report No 10015022-ARC-XX-XX-RP-TP-0001

Date JANUARY 2019

VERSION CONTROL

Version	Date	Author	Changes
D01	31st August 2018	MF	DRAFT FOR CONSULTATION
D02	20th September 2018	MF	UPDATED FOLLOWING CLIENT COMMENTS
D03	28th January 2019	JH	UPDATED FOLLOWING REVIEW GROUP

This report dated 28 January 2019 has been prepared for Vale of Glamorgan Council (the "Client") in accordance with the terms and conditions of appointment dated 02 November 2017 (the "Appointment") between the Client and Arcadis Consulting (UK) Limited ("Arcadis") for the purposes specified in the Appointment. For avoidance of doubt, no other person(s) may use or rely upon this report or its contents, and Arcadis accepts no responsibility for any such use or reliance thereon by any other third party.

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1 Introduction

1.1 Purpose of the Study

Background

Arcadis Consulting (UK) Limited ('Arcadis') has been commissioned by Vale of Glamorgan Council to develop and appraise potential options for improving the transport network encompassing corridors from Biglis roundabout (Barry) through Dinas Powys, to Cardiff via Leckwith, Cogan and Penarth. The appraisal of options has been undertaken in accordance with the Welsh Government's latest version of WelTAG (December 2017[1]) including advice on the appraisal in relation to the Future Generations of Wales (2015) Act Well-being Goals[2].

This WelTAG report presents the development, appraisal and evaluation of the transport options recommended for further consideration at the end of Stage One. It is a Draft for Consultation and has been undertaken with the involvement of the Review Group. This report presents the Stage Two: Outline Business Case of the WelTAG process. The WelTAG Stage One report was prepared by Arcadis and considered the problems, opportunities and constraints, established objectives and appraised a long list of options. As a result, the following options were recommended to be taken forward for further investigation:

- Do-minimum
- Bypass
- Multi-Modal Option

The Stage One study was presented to the Vale of Glamorgan Cabinet whereby the following recommendations were confirmed following recommendation by the Council's Environment and Regeneration Scrutiny Committee on 14th September 2017[3]:

- Do-minimum
- Bypass
- Multi-Modal Option
- Bypass and Multi-Modal Option

Scope Extension

In addition to the original WelTAG Stage Two commission, an extension to the project scope was confirmed by Vale of Glamorgan Council on 3rd May 2018 following a request by Dinas Powys Community Council to assess alternative route options. The route options submitted by the community council have been included as Appendix A for information. It was subsequently confirmed that the scope extension will assess a combined Stage One and Stage Two assessment to involve the following key tasks:

- Highways design of an alignment which connects from the sections of the bypass scheme already being developed in the Murch Road area southwards to the junction of Sully Moors Road and Hayes Road (as opposed to connecting to the A4055 at a point south of Dinas Powys). This will be the same level of preliminary design as being completed for the original bypass alignments with the design team seeking to develop a route to achieve DMRB design standards (as with the rest of the bypass), whilst endeavouring to minimise environmental and property impacts. To allow for viable comparison, the additional route alignment will be costed using the same methodology as for the other bypass options.

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[1] https://beta.gov.wales/sites/default/files/publications/2017-12/welsh-transport-appraisal-guidance.pdf

[2] https://beta.gov.wales/sites/default/files/publications/2017-12/weltag-2017-supplementary-guidance-the-well-being-of-future-generations-wales-act-2015.pdf

[3] http://www.valeofglamorgan.gov.uk/en/our_council/Council-Structure/minutes,_agendas_and_reports/minutes/Scrutiny-ER/2017/17-09-14.aspx

- Additional traffic surveys to be undertaken at three junctions encompassing Sully Moors Road/ Hayes Road, Ffordd y Mileniwm/ A4055 and the Biglis Roundabout. This will involve manual classified counts and Automatic Number Plate Recognition (ANPR) surveys, which will provide an additional area of information to the existing traffic assessments being undertaken.
- An impact appraisal of the additional route alignment will be undertaken. A manual assessment of likely traffic using the route will be undertaken based on trip patterns, distance and likely journey times. This will enable a comparison to the business case of the existing alignment without a requirement to undertake detailed cost benefit analysis. The appraisal will be largely qualitative given the level of information available.
- The option would be incorporated and considered as part of the Stage Two report as an alternative Dinas Powys bypass option.

Whilst assessment of a new alignment introduced at Stage Two was considered likely to address a range of different issues and objectives (given the different impacts in Sully, for example) it will however enable a transparent comparison of options so that options with merit for detailed consideration in Stage Three can be recommended. At the end of the current Stage Two study, this would enable the Review Group followed by the public consultation to consider if the alternative option should be considered in more detail, as it has merits compared to the Stage Two options, prior to beginning a Stage Three.

It should be noted that each of the various options presented by the community council included a connection to Dinas Road in Penarth. As part of subsequent scoping discussions with Vale of Glamorgan Council Officers, it was confirmed that this connection would not be given further consideration as an outline review indicated that highway connectivity at this location would be through a Scheduled Ancient Monument, and which is also laid out as a public open space and forming part of the landscaping of residential development.

1.2 The Appraisal Area

The original appraisal area encompasses the existing transport corridors from Biglis Roundabout, Barry through Dinas Powys, to Cardiff via Leckwith, Cogan and Penarth. The assessment of existing transport corridors considers the highway network and public transport within, through and immediately surrounding Dinas Powys. In line with the approved scope extension, the appraisal area has been extended to accommodate the additional route alignment assessment from the Murch Road area southwards to the B4267 Sully Moors Road/ Hayes Road junction.

1.3 WelTAG Stage Two: Outline Business Case

The WelTAG guidance states that the purpose of the Stage Two: Outline Business Case is to ‘examine in greater detail the short list of options for tackling the problem under consideration’. During Stage Two, the appraisal team needs to consider how the proposed solution will lead to the desired outcomes, maximising contribution to the objectives and well-being goals, and use this understanding to refine the design of the options and identify key dependencies and constraints. At the end of the stage, the report should provide the Review Group with the evidence required to select a preferred option to take forward for Stage Three. As such, this Stage Two: Outline Business Case report:

- Sets out any changes that have occurred in the transport system and wider context since Stage One;
- Describes the process of developing the shortlisted options to a more developed solution for assessment;
- Describes how each option would meet the objectives set out in Stage One;
- Presents a Five Case Assessment for each option with a separate presentation of the strategic, transport, management, financial and commercial case for each option and the contribution towards the well-being goals;
- Determines whether there are any transport options that can address the issues identified, contributes positively to the well-being goals and objectives, and can be delivered within technical and financial constraints;

- Makes recommendations as to the preferred option to be taken forward to Stage Three, with recommendations for interim investigations, and establishes the methods to be used for further evidence and work to meet legislative requirements; and
- Documents the decisions of the Stage Two Review Group and the basis for these decisions.

This Stage Two report follows the principle of proportionate appraisal. For the key areas affecting decision making it provides a quantitative appraisal, and some areas of appraisal are largely qualitative. The guidance identifies that at the end of Stage Two the strategic and transport cases must be virtually complete, and more information provided on the delivery, commercial and financial cases for the shortlisted options. The aim of the report provides stakeholders and decision makers with sufficient information and understanding of the problems and potential solutions to commit further resources to taking forward options to Stage Three.

For this WelTAG Stage Two study, four options have been taken forward from Stage One. In some respects, the appraisal is a set between a Stage One long list of options, and Stage Two short list. As a result, as set out in the conclusions and recommendations section, there are aspects that require further consideration prior to proceeding with a full WelTAG Stage Three study, but this is within the spirit of WelTAG which is to enable a stepped decision-making process with prudent use of public resources.

In accordance with the WelTAG guidance the significance and scale of the impacts throughout the assessment has been appraised using a seven-point scale, as presented in Table 1.

Table 1 WelTAG Seven-Point Assessment Scale

Impact Description	Rating
Large beneficial	+++
Moderate beneficial	++
Slight beneficial	+
Neutral	0
Slight adverse	-
Moderate adverse	--
Large adverse	---

1.4 Wider Context

The Stage Two: Outline Business Case Impacts Assessment Report provides the wider circumstances and context of the issues that are the subject of the transport appraisal. The detailed evidence, data and analysis underlying the statements made in the Stage Two report is provided within the Impacts Assessment Report.

1.5 Report Structure

In accordance with the WelTAG guidance the structure of this report is as follows:

- Chapter 2: Strategic Case;
- Chapter 3: Transport Case;
- Chapter 4: Financial Case;
- Chapter 5: Commercial Case;
- Chapter 6: Management Case; and
- Chapter 7: Conclusions and Recommendations.

2 Strategic Case

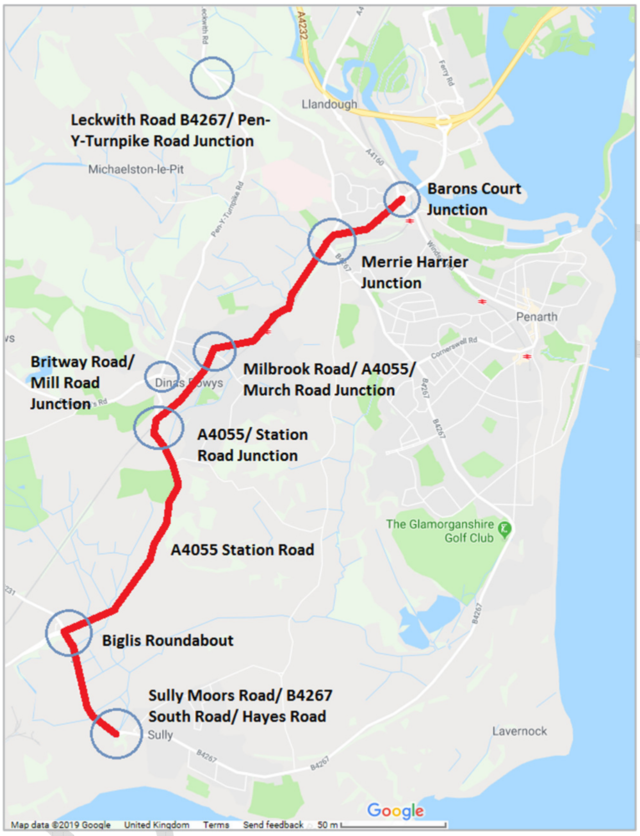
2.1 Overview

The Strategic Case addresses the need for change, providing an evidence-based description of the current situation, describes the likely funding situation if no action is taken and presents the reasons why an intervention is required. The strategic case includes analysis of the factors leading to the problem and the development of possible solutions, establishes objectives and provides a narrative as to how each of the solutions is intended to change the situation.

2.2 Scope

The scope of the study is to consider solutions to improve the strategic transport network encompassing the 5.2 km corridor from Biglis roundabout (Barry) through Dinas Powys, to Cardiff via Leckwith, Cogan and Penarth. Following the extension to the scope as set out in Chapter 1, the assessment area has extended to accommodate from the Murch Road area southwards to the B4267 Sully Moors Road/ Hayes Road junction. The study area is shown in Figure 1, including key junctions on the corridor.

Figure 1 Study Area



2.3 The Case for Change

2.3.1 Policy Context

The key policy and strategy documents at the local, regional and national levels highlighting the policies and proposed delivery programmes and schemes (subject to the availability of funding) that are relevant to this study are presented in the accompanying Impacts Assessment Report. Of particular relevance is the alignment with the headline national, regional and local policies, as follows:

- Improvements to the strategic transport network from Biglis roundabout (Barry) through Dinas Powys, to Cardiff via Leckwith, Cogan and Penarth have good potential to contribute to the **One Wales:**

Connecting the Nation – Wales Transport Strategy. In particular, improvements to the network would improve links and access between key settlements and sites including for journeys between Barry and Cardiff.

- The study also contributes to the key sustainable transport themes as set out within the **Wales Transport Strategy** including '*achieving greater use of the more sustainable and healthy forms of travel'.* The study area currently lacks an effective and encouraging sustainable transport network with limited rail capacity and a basic bus network, and poor walking and cycling connections. As such, options aimed at improving sustainable travel would contribute to the key sustainable transport themes of the strategy.
- The study is committed to investigating and establishing sustainable options which will improve the social, economic, environmental and cultural well-being of Wales. Investment in improved connectivity within the region would make a significant contribution to the goals of the **Well-being of Future Generations (Wales) Act 2015**. In particular, the study aims to put forward options for further assessment which contribute to the prosperity, safety, cohesiveness, resilience, health and equality of Wales.
- The **Vale of Glamorgan Local Transport Plan (LTP)** specifically targets bus priority and highway improvements schemes as key actions for Dinas Powys. The Vale of Glamorgan Council seeks to secure better conditions for pedestrians, cyclists and public transport users and to encourage a modal shift away from the single occupancy car.

  The Plan also considers traffic congestion as a key problem in the region, and also that highway improvements should be made for those commuters who may need to travel by car. The Plan therefore highlights a combination of improvements as needed to address all elements of the existing inefficiencies of the transport system.
- Investment in connectivity will make substantial contributions to the desired outcomes of the **Vale of Glamorgan Local Development Plan (LDP)**. Various objectives outline the desire for the development of sustainable communities and places which are effectively underpinned by the need for accessibility and connectivity within the region. The Plan also highlights the need for the required infrastructure to be identified to meet the growth anticipated in the Vale of Glamorgan up to 2026. Cycle and bus improvements within the study area are identified within Policy SP7 – Transportation.
- The Plan further notes how *'…the South East Wales Transport Alliance (Sewta) Highway Strategy Study (2008) identifies the A4055 through Dinas Powys as a key problem area of the regional road network as a consequence of the scale of traffic and associated congestion. Barry Waterfront to Cardiff Link Road (Dinas Powys Bypass) was viewed as having dual benefits, helping to alleviate traffic congestion and improve road safety on the A4055 through Dinas Powys, while having the potential to improve access to the wider road network. Issues at the Cogan Spur and Merrie Harrier junctions, however, would be difficult to overcome.'*

2.3.2 Summary of Problems, Opportunities and Objectives

The identified issues that require addressing are summarised below, which have been identified through analysing local data, reference to previous feasibility reports and policy, and consultation with stakeholders and members of the public as part of the Stage One WelTAG study. The identified problems are as presented in Table 2.

Table 2 Identified Problems

Reference	Heading
P01	Poor quality bus stops with limited facilities.
P02	Poor interchange facilities at railway stations (including poor parking opportunities).
P03	Overcrowding on peak rail services.
P04	Overcrowding on peak bus services.

Reference	Heading
P05	Poor infrastructure and local connectivity by walking and cycling.
P06	A4055 creating severance within the community (e.g. access to schools and other facilities/ services).
P07	High local traffic flows leading to congestion, capacity issues at junctions, environmental impacts (air quality and noise pollution) and unreliable journey times.
P08	High use of the car for local and regional trips (e.g. journeys to work).
P09	Occurrence of accidents along key strategic routes, especially the A4055.
P10	Residential land use development within Vale of Glamorgan will compound existing traffic issues and increase pressure on public transport services.

The opportunities of the study area have been identified to assist in ensuring that the identified objectives and options are realistic as well as maximise opportunities and take into account the context of the study area. Following feedback from the stakeholder workshop and public consultation in Stage One, the opportunities have been identified as illustrated in Table 3.

Table 3 Identified Opportunities

Reference	Opportunity
O1	Proximity to major employment and services means large volume of transport movements to and from Cardiff, from Dinas Powys and Barry and Vale.
O2	Significant facilities and services in close proximity with potential for access by sustainable modes.
O3	Dinas Powys has good potential accessibility by non-car means.
O4	Metro improvements, including more frequent rail services.
O5	Bus priority and service enhancements.
O6	Walking and cycling improvements.
O7	Highway junction/ off-line capacity improvements.
O8	Road safety improvements.
O9	Interchange improvements in services and facilities.
O10	New Wales and Borders Rail Franchise
O11	Park and Ride facilities.
O12	Promotion and marketing of all transport modes.
O13	Reduce the adverse environmental impacts of the transport system.
O14	New development to be accessible by sustainable transport modes.

2.3.3 Involvement of Stakeholders

Stakeholders

The strategy has been to involve the stakeholders throughout the WelTAG stages, with key stakeholders also represented on the Review Group. The public have been consulted at Stage One to gain feedback on issues, objectives and options. The WelTAG Stage One report has also been taken through the political process, involving presentation to the Vale of Glamorgan Council. There are a wide range of stakeholders for this study, who are in summary:

- Interface with Dinas Powys Community Council. The community of Dinas Powys currently experience the existing traffic through the village and are also likely to be most affected by transport proposals.
- Transport operators including Cardiff Bus, New Adventure Travel and Arriva Trains Wales;
- Transport network providers including Welsh Government/ Transport for Wales and Network Rail;
- Sustrans;
- Road haulage businesses, represented by the Road Haulage Association; and
- Vale of Glamorgan Council.

Consultation

During Stage One, a stakeholder workshop was undertaken on Tuesday 7th March 2017 at the Parish Hall, Britway Road, Dinas Powys to which stakeholders from across the region representing key employers, public organisations, transport providers and local authorities were invited.

The workshop informed all of the key stages of the strategic case, whereby stakeholders were asked to discuss and identify problems, opportunities and constraints, set objectives and identify and discuss potential transport options. In order to inform the discussions at the workshops a draft list of problems, opportunities and constraints were presented. These were derived from a review of existing policy and background reports/ data specific to Dinas Powys.

Initial objectives were provided to initiate discussion, alongside a list of potential transport solutions. Throughout the workshop stakeholders discussed the problems, objectives and transport options in groups, which were then fed back to the group as a whole. The output from the stakeholder workshop have been used to inform this strategic case.

2.3.4 Public Consultation

During Stage One, a public consultation event was held on Monday 13th March 2017 between 13:30 and 18:30 at the Parish Hall. The event afforded members of the public the opportunity to provide feedback on the identified options, opportunities, and constraints, as well as consideration and suggestions for the objectives and potential transport options. The event was attended by members of the Arcadis project team and Vale of Glamorgan Council officers to facilitate discussion, with specific workstations and feedback forms provided to capture key information from attendees. The output of the public consultation has also been used to inform this strategic case.

Following submission of the draft Outline Business Case report to the assigned Review Group and consideration by the Vale of Glamorgan Cabinet/ Scrutiny, a Stage Two public consultation will be completed. The feedback from the consultation exercise will subsequently be collated and summarised for inclusion within the final Stage Two report.

Review Group

Key stakeholder representatives were invited to join the project's Review Group, who met at the outset of Stage Two process on Tuesday 16th January 2018 to receive a presentation on the findings of the Stage One report and the subsequent methodology and approach associated with development of the Stage Two study. It should be noted that representation on the Review Group has been widened following the receipt of additional options by Dinas Powys Community Council. The Review Group met on the 2nd October 2018 to consider the initial findings.

2.4 Objectives

2.4.1 Identification of Objectives

The objectives for the intervention have been derived from general and transport-specific objectives as set by the Welsh Government and through considering the national well-being goals as set out in the Future Generations of Wales (2015) Act. This report has set out how stakeholders have informed the development of the objectives and how the proposed objectives positively contribute to Welsh Government policy and well-being. The final objectives for the intervention are as outlined in Table 4. This includes an overview of what success would look like and how this can be measured in the Stage Two assessment.

Table 4 Final Proposed Objectives

Objective		What will success look like?	How will success be measured?
1	Support Sustainable Connectivity in Cardiff City Region	Improved efficiency, reliability, resilience, and connectivity of movement (people and freight by sustainable modes). Reduced community severance in Dinas Powys including improvements to local connectivity.	Journey times Traffic volumes Bus journey times
2	Facilitate and Support Economic Growth	Improved inclusive, integrated and affordable access to key services and employment. Reduce issues of over-capacity on travel modes.	Frequency and provision of public transport capacity
3	Improving Health and Wellbeing	Greater uptake of active travel (both recreation and necessary trips). Improved air quality and reduced noise pollution within the community.	Length of walking and cycling links provided or improved Air quality and noise pollution measurement
4	Improved Safety and Security	Improved actual and perceived safety and security of travel by all modes.	Accident rates per vehicle kilometre
5	Benefits and Minimised Impacts on the Environment	Reduction in the negative impacts on the local and global environment (natural and built). Reduce air and noise pollution within the community. Adaptation to the effects of climate change.	Number of ecological features affected Air quality and noise pollution measurement

2.4.2 Verification of Objectives

The objectives have been verified to determine how they contribute to:

- Resolving problems of the study area;
- The Well-being of Future Generations Act Well-being Goals;
- Wales Transport Strategy outcomes; and
- The Welsh Government's Strategic Priorities as set out in the Wales Transport Strategy.

Table 5 illustrates the extent to which the objectives address the identified transport problems. The appraisal demonstrates that each of the identified problems are directly addressed by at least one objective.

Table 5 Relationship of Objectives to Problems

Objectives	Potential Problems									
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10
1	++	++	++	++	++	+++	++	++	++	++
2	++	++	+++	+++	++	++	++	++	++	++
3	+	+	+	+	+	0	++	+	++	++
4	+	+	0	0	+	++	0	0	+++	++
5	++	++	++	++	++	+	++	++	+	++

The WelTAG guidance states that *'when using WelTAG it is essential to comply with the duties set out in the Well-being of Future Generations (Wales) Act 2015. They are to follow the sustainable development principle through following the five ways of working and set well-being objectives that maximise contribution to the seven well-being goals'.* Table 6 shows a positive relationship between the objectives and the seven well-being goals.

Table 6 Relationship of Objectives to Well-being Goals

Well-being of Future Generations (Wales) Act 2015 Outcomes		Objectives				
		1	2	3	4	5
Seven Well-being Goals	A prosperous Wales	++	+++	++	++	++
	A resilient Wales	++	+++	++	++	++
	A healthier Wales	++	++	+++	+	++
	A more equal Wales	++	++	+	++	+
	A Wales of cohesive communities	++	+	+	+	+
	A Wales of vibrant culture and Welsh language	0	+	+	0	0
	A globally responsible Wales	+++	++	++	0	+++

In addition, the objectives have been assessed against the Wales Transport Strategy outcomes as outlined in Table 7. A positive relationship has been identified.

Table 7 Objectives Relating to the WTS Outcomes

Wales Transport Strategy Outcomes		Objectives				
		1	2	3	4	5
Social	Improve access to healthcare	+	+++	0	0	0
	Improves access to education, training and lifelong learning	+	+++	0	0	0
	Improving access to shopping and leisure facilities	+	+++	0	0	0

Wales Transport Strategy Outcomes		Objectives				
		1	2	3	4	5
	Encourage healthy lifestyles	0	0	+++	0	0
	Improve the actual and perceived safety of travel	+	0	0	+++	0
Economic	Improve access to employment opportunities	+	+++	0	0	0
	Improve connectivity within Wales and internationally	+	0	0	0	0
	Improve the efficient, reliable and sustainable movement of people	+++	+++	++	0	++
	Improve access to visitor attractions	+	+++	0	0	0
Environmental	Increase the use of more sustainable materials	0	0	0	0	+++
	Reduce the contribution of transport to Greenhouse gas emissions	+	0	++	0	+++
	Adapt to the impacts of climate change	+	0	++	0	+++
	Reduce the contribution of transport to air pollution and other harmful emissions	+	0	++	0	+++
	Improve the impact of transport on the local environment	+	0	++	0	+++
	Improve the impact of transport on our heritage	0	+	0	0	+++
	Improve the impact of transport on biodiversity	0	0	++	0	+++

In addition, Table 8 shows a positive relationship between the objectives and the Strategic Priorities as set out in the Wales Transport Strategy.

Table 8 Objectives Relating to the Wales Transport Strategy: Strategic Priorities

Strategic Priorities	Objectives				
	1	2	3	4	5
Reducing Greenhouse gas emissions and other environmental impacts from transport	0	++	++	0	+++
Integrating local transport	++	+++	++	+	0
Improving access between key settlements and sites	+++	+++	0	0	0
Enhancing international connectivity	++	0	0	0	0
Increasing safety and security	+	0	0	+++	0

2.5 Stage One Short List of Options

Following the appraisal of the seven options in the Stage One study, including the stakeholder engagement and recommendation from the Vale of Glamorgan Council Environment and Regeneration Scrutiny Committee, the Strategic Outline Case report recommended that the following options should be taken forward for further investigation in Stage Two:

- Do-minimum
- Bypass
- Multi-Modal
- Bypass and Multi-Modal Option

As noted in Chapter One, an additional bypass route alignment interconnecting with the B4267 Sully Moors Road/ Hayes Road roundabout has been considered following confirmation of an approved scope extension.

- Bypass (east and south of Dinas Powys, interconnecting between the A4055 at Merrie Harrier and the B4267 Sully Moors Road/ Hayes Road roundabout)

2.6 Stage Two Option Development

This section identifies the process undertaken to develop options to enable the appraisal and provides an overview of the options.

2.6.1 Bypass / Green and Pink Alignments (east of Dinas Powys interconnecting with the A4055 at Cardiff Road and the Merrie Harrier Junction)

The following section outlines design development of two alignments interconnecting between the A4055 at Cardiff Road and the Merrie Harrier junction, herewith referred to as the Green alignment (refer to drawing numbers 10015022-ARC-XX-XX-DR-HE-0004, 0005, 0006 and 0007) and the Pink alignment (refer to drawings number 10015022-ARC-XX-XX-DR-HE-0008, 0009, 0010 and 0011).

The Green alignment seeks to avoid existing environmental constraints to form a route between a location south of Dinas Powys on Cardiff Road and the Merrie Harrier junction. The Pink alignment follows the same principles but allows for a roundabout to be developed that could link to Murch Road, to the east of Dinas Powys. The alignments as shown in Appendix B are subsequently based on the following assumptions:

- Alignments comply with Design Manual for Roads and Bridges (DMRB) and contains no departures from standard for a 60mph speed limit (100kph design speed) single carriageway. Carriageway width of 3.65m per lane + 1m hardstrips (total carriageway width of 9.3m) plus verge width of 2.5m either side of the carriageway.
- A 3.5m wide cycleway has been included to one side of the bypass.
- A total cross section width of 17.8m plus earthworks slopes where required.
- The alignment has been developed to fit into the landscape and where possible avoid constraints as provided by Vale of Glamorgan Council.
- The vertical alignment is based on 5m OS contours which have an accuracy to +/- 2m.
- Earthworks are assumed to be 1 in 3 embankment and cutting slopes – to be confirmed at a later stage subject to ground investigation and the materials present.
- Outfall points for drainage are not known at this stage and therefore costs have been estimated.

It should be noted that this is a feasibility option study and in order to confirm its accuracy further surveys, investigations and design development will be required including topographical survey, environmental surveys, ground investigation and stakeholder consultation.

Standards Used

The alignments considered are compliant with DMRB and in accordance with TD 9, TD 27 and TA 90.

Junctions

The alignments include for junctions at locations highlighted on drawing numbers 10015022-ARC-XX-XX-DR-HE-0004 and 0008). However, the junctions shown have not been detail designed as part of the current proposals and have subsequently been shown for illustrative purposes. Traffic data and survey work would be required in order to inform the design of each junction.

Murch Road Roundabout

The Pink alignment allows for a roundabout to be incorporated which could link to Murch Road. The design arrangement has been based on a normal roundabout with an Inscribed Circle Diameter (ICD) of 45.2m to accommodate a potential new access to/ from Murch Road and potentially the proposed St Cyres development.

It is assumed that a compliant access to/ from Murch road and potentially the proposed St Cyres development from the roundabout can be achieved (this would be subject to a fully compliant design and confirmation from planning) although costs for developing this access have not been included within the estimates provided. The roundabout is shown for illustrative purposes only to demonstrate the potential for accessibility. Earthworks have been estimated and additional design work would be required to confirm detailed design development.

Merrie Harrier Junction

The two options were initially developed to allow the bypass alignment to interconnect with the Merrie Harrier junction. The two options are outlined below:

- Option 1– A standard roundabout to the south west of Merrie Harrier with connection to Cardiff Road, Redlands Road and a new bypass. The northern leg connects to the existing Merrie Harrier junction: this alignment allows for access to remain at all existing arms, including the one-way system through Andrew Road. This provides minimal disruption to the existing Merrie Harrier junction itself although does connect onto the existing alignment.
- Option 2 – Development of Option 2 as outlined in the Briefing Paper for Bypass Petition with the objective towards reducing pinch point congestion at the Merrie Harrier by increasing junction capacity. A double roundabout arrangement is suggested: it is likely that this option will require the purchase of land in 3rd party ownership, not currently owned by Vale of Glamorgan Council.

  The arrangement doesn't allow for a connection onto Andrew Road, a one-way system to the east of the northern roundabout. Arcadis has drawn the option and it should be noted that the space between the Barry Road and Penlan Road arms is not sufficient to fit the entry and exit kerb radius required to meet current design standards. Moreover, the junction arrangement would not provide traffic capacity for the movements at the junction.

As a result of the above option development, Option 1 is considered to be the only appropriate option to link a bypass to the Merrie Harrier junction and is included on both alignment drawings (Drawing Number 10015022-ARC-XX-XX-DR-HE-0004 and 0008).

The option has not been individually priced within the construction cost estimate due to available data to make an informed assessment. However, it is considered that given the amount of optimism bias allowed for within the estimate, there is sufficient allowance to include for the junction improvements.

Public Rights of Way

There are a number of Public Rights of Way (PRoW) affected by both of the considered options. It is anticipated that crossings will be rationalised by PRoW re-alignment and provision of crossing points under/ over the bypass alignment to maintain existing PRoW. Where PRoW cross the bypass alignment in-fill, culverts have been considered and where it crosses in-cut, 3m wide bridges have been used.

Constraints

Table 9 outlines the potential constraints associated with the route alignments.

Table 9 Constraints – Green/ Pink Alignments

Constraint	Description
Floodplain within proximity to Cardiff Road	To the south of each alignment where they tie into Cardiff Road, a floodplain is shown (refer drawings: 10015022-ARC-XX-XX-DR-HE-0006 and 0010). It is likely a Flood Consequence Assessment (FCA) will need to be produced and agreed with Natural

Constraint	Description
	Resources Wales (NRW) and it is likely some form of flood compensation mitigation will be required. In addition, and to use for mitigation, both options show a surplus of material which if required could be utilised to slightly lift the road, however this may impact on the tie in to Cardiff Road so would therefore need to be considered in further detail once flood levels are known.
Development Site	All options have been designed to avoid impacting on the consented development site situated to the east of Dinas Powys. The Pink alignment utilises a roundabout which will allow the addition of an entrance and exit arm from Murch Road, however only the roundabout has been included within the estimated costs, the entrance/ exit arm would be additional.
Ancient Woodland	The study area contains areas of ancient woodland. The highway alignments have been optimised to minimise impact, but in some locations small impacts are possible although would be limited to the outer areas.
Dinas Powys/ Penarth/ Sully	The Green and Pink alignments both bypass the village of Dinas Powys to the east and avoid Penarth and Sully to the east and south.
Archaeology	Similar to the ancient woodland, the area currently under consideration is also scattered with archaeology. It could be expected that there is unknown archaeology within the area, of which cannot be shown on the constraints plans. Considered options have been developed to avoid known archaeology within the area and based on their existing alignments, the options do not affect any known archaeology shown on the plans provided by Vale of Glamorgan Council.
Merrie Harrier Junction	The Merrie Harrier junction is seen as one of the key constraints. To accurately inform a new junction proposal, survey data and traffic modelling information is required to assess updated junction capacity forecasts. Junction and network modelling using LinSig and Vissim programs has been undertaken alongside the WelTAG Stage Two study and the results are reported in a Technical Note contained in Appendix C.
Railway Tunnel	The railway tunnel lying to the south of the A4055 is considered a major risk to the delivery of the bypass scheme, as the depth to soffit below existing ground level, condition and strength of the tunnel are all unknown.

Risks

Table 10 outlines the potential risks associated with the bypass alignments.

Table 10 Route Alignment Risks

Risk	Description
Topographic Survey Data	Topographic survey data is OS contours at 5m intervals and is accurate to +/- 2m which could affect earthworks and accuracy of design.
Unknown Archaeology	Unknown archaeology could be encountered during construction.
Railway Tunnel	In both options the railway tunnel may require strengthening and further works to be suitable for possible future traffic loadings. This will need a condition survey and assessment at future stages.

Risk	Description
Excavated Material	Excavated material to be used as suitable fill material may be classed as unsuitable, therefore requiring import or additional import of suitable fill material and export of unsuitable.
Health and Safety	All considered health and safety hazards have been highlighted on drawings numbers 10015022-ARC-XX-XX-DR-HE-0016 and 10015022-ARC-XX-XX-DR-HE-0017.

Assumptions

As shown on drawing numbers 10015022-ARC-XX-XX-DR-HE-0004 and 0008, access along Cross Common Road would need to be terminated, with access from either end to properties along the route and no direct through route will be allowed. A junction with the bypass alignment at Green Lane would need to be incorporated into the design. A full compliant design has not been undertaken on the junctions, but it is considered that costs for the construction of the possible accesses are allowed for within the optimism bias and risk allowance.

Environmental Constraints

Environmental constraints provided by Vale of Glamorgan Council have been used to help inform the design. Alignments have been developed and where possible have been designed to avoid environmentally sensitive areas.

2.6.2 Multi-Modal Option

Overview

The provision of a multi-modal option was identified as part of the Stage One study. The multi-modal option would provide the residents of Dinas Powys, as well as people who travel through Dinas Powys to access Barry, Penarth and Cardiff with alternative modes of transport to the private car. For the Stage Two study a more detailed multi-modal option has been developed. The multi-modal option covers all sustainable modes of transport namely bus, rail and walking and cycling and is summarised in Table 11 under the four sub-headings accordingly. The multi-modal option provides a programme of individual projects across all sustainable travel modes, which range from projects that are currently being developed in order to apply for Welsh Government funding in the short-term to projects that are programmed regionally in the medium to long-term. The supporting multi-modal plans have been included as Appendix D.

Bus Park and Ride

A Bus Park and Ride scheme on the western side of Dinas Powys has been included as part of the multi-modal option. The Park and Ride could be located within Parc Bryn y Don and could be accessed by the existing junction with Cardiff Road.

Car Park Area

An area covering approximately 14,780m² for the Park and Ride car park has been identified. The area is to the west of the C2 Flood Zone. The Vale of Glamorgan Supplementary Planning Guidance (SPG) – Parking Standards (March 2015) requires standard parking spaces to be 4.8m x 2.6m with internal roads a minimum of a 6m width to facilitate suitable manoeuvrability.

Disabled car parking spaces need to be 4.8m x 3.6m. The dimensions have been applied to estimate the number of car parking spaces that could be accommodated at Bryn y Don. Based on the available data and a preliminary desk-top exercise, approximately 500 standard parking spaces could be provided inclusive of disabled parking bays.

Table 11 Multi-Modal Option

Bus Enhancements	•Bus Service Enhancements •Bus Stop Enhancements •Merrie Harrier Junction •Merrie Harrier to Barons Court Junction Bus Lane
Rail Enhancements	•Eastbrook Station Upgrade •Dinas Powys Station Upgrade •Vale of Glamorgan Line Service/ Capacity Enhancement
Walking and Cycling	•Barry to Dinas Powys Cycle Route •Merrie Harrier to Barons Court •Dinas Powys to Penarth Connections •Dinas Powys Network
Bus Park and Ride	•Bryn y Don Park and Ride

Additional detailed analysis would need to be undertaken, including detailed topographical surveys to confirm with greater accuracy the number of spaces that could be provided as well as further understanding of land ownership constraints. Using Spons to determine an overall cost rate, an average of £123.20 per m² has been identified with preliminaries of around 25%. Taking this into account, a cost estimate for the carpark has been calculated at £2.3m. Detailed topographical surveys would be required along with a detailed cost estimate.

Bus Service Connections

Following consultation with the local bus operators, the options of either providing a dedicated bus service to facilitate the Park and Ride or to utilise existing bus services operating along the A4055 Cardiff Road past Parc Bryn y Don (with an enhanced frequency) were discussed. It is considered that existing services with an enhanced service frequency together with the option to provide additional express services to/ from the Cardiff City centre would be the most suitable option, which would have the added benefit of providing enhanced service frequency at bus stops along the existing route through Dinas Powys. It would be proposed that a service calling at the Park and Ride site every 20 minutes would be suitable, (increasing to a preferred service frequency of every 15 minutes). However, the exact details would need to be further discussed with bus operators in due course.

For example, the current frequency of Cardiff Bus service 95 is every 30 minutes. If the frequency were to increase to every 20 minutes, this would require an additional three buses. To double frequency to every 15 minutes would need six buses. Cardiff Bus currently use six buses for the 30 minutes frequency. If this service could be improved to every 15 minutes, then the service could potentially be split so alternate journeys are able to operate more quickly between Dinas Powys and Cardiff.

Rail Enhancements

The rail enhancements have been included as Table 12 and cover three main elements encompassing Eastbrook Rail Station upgrade, Dinas Powys Station Upgrade, and Vale of Glamorgan (Rail) Line Service Enhancements.

Consultation with Transport for Wales, Network Rail and the incumbent Wales and Borders rail franchisee (KeolisAmey from October 2018) would be required in order to determine the proposed interventions and timescales.

In addition, the individual aspects of each of the rail station enhancements projects would require specific consideration to determine their viability in the long run. This would include an evaluation of station improvements, their costing and delivery timescales.

Table 12 Rail Enhancement Proposals

Proposal	Description
Eastbrook Rail Station Upgrade	Station Travel Plan New enclosed waiting shelters Additional secure cycle storage Additional lighting Improved CCTV Additional of customer help points Improved customer information General improvements to the station environment Explore option to reconfigure the car park reconfiguration (to increase availability of spaces) Explore feasibility of providing step free access to the platforms Explore option of providing additional car parking capacity off Cardiff Road to the north-west of Eastbrook Station (site to be identified)
Dinas Powys Rail Station Upgrade	Station Travel Plan New enclosed waiting shelters Additional secure cycle storage Additional lighting Improved CCTV Additional of customer help points Improved customer information General improvements to the station environment
Vale of Glamorgan Line Service Enhancements	As part their commitment to the South East Wales Metro Programme under their Wales and Borders rail franchise, KeolisAmey have outlined a number of proposals the following of which will affect the rail corridor either directly or indirectly through Dinas Powys[4]: • Two trains per hour between Cardiff and Bridgend via Vale of Glamorgan from December 2023; • Remove Pacer trains by December 2019; • Retain the link from Penarth, Barry and Bridgend to destinations north of Cardiff Central using new tri-mode trains (overhead electric, battery and diesel) from December 2023; • Introduce three new Community Rail Partnerships, recruiting a Community and Stakeholder Manager and nine Community and Customer Ambassadors by 2021; • Provide ticket machines at all South Wales Metro stations by April 2019; and • Introduce pay-as-you-go for users of smartcards by April 2020.

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[4] http://tfw.gov.wales/whats-happening-south-east-wales

Bus Service and Infrastructure Enhancements

The bus enhancement proposals include infrastructure improvements, such as bus stop enhancements and improvements at the Merrie Harrier Junction and a bus lane between Merrie Harrier and Baron Court Junctions, together with bus service enhancements. The options have been developed in initial consultation with local bus operators.

The suggested elements of the bus service and infrastructure enhancements is provided within Table 13. This focuses on potential options that could be delivered to improve service provision. Following initial consultation with local bus operators there is considered to be scope to increase both the enhancement of existing services and provision of additional services.

For the service enhancements, further detailed consultations would be required with local bus operators, as well as neighbouring local authorities (i.e. Cardiff Council). It is essential that the whole route of the bus services is considered, as the performance of the bus services through Dinas Powys are impacted by other sections of the route such as delays along Leckwith Road on the route into Cardiff city centre.

Table 13 Bus Enhancements

Item	Description
Bus Service Enhancement	This option focuses on enhancing the existing bus service provision operating through Dinas Powys. This could include for example increasing the frequency of the existing Cardiff Bus 93 service from every 30 minutes to hourly and the Cardiff Bus 95 service to every 15 or 20 minutes, with the option of providing some of these services as express services into and out of Cardiff city centre. Likewise, the 89A and 304 services operated by New Adventure Travel could also be increased. Another potential option would be to extend frequency and route of the daytime services operated along the routes into the evening and weekends. There is potential for additional routes connecting Dinas Powys to neighbouring settlements, places of employment etc.
Bus Stop Enhancement	Deliver the improvements required at each of the bus stops in order to achieve the recognised standard as set out in the Sustainable Transport Assessment Background Paper (further information in Table 14).
Merrie Harrier Junction	Junction modification proposals to improve operation of the junction. Traffic coming from Llandough would have one dedicated right turn lane and one shared right and left turn lane. For the approach from Barons Court, the two lanes are still marked as one lane for straight ahead (towards Dinas Powys) and one lane for right turning traffic (towards Llandough) with white lines to demarcate the movements from Barons Court (in order to avoid any unnecessary lane changing and improve safety). This option reverts back to the bonus Green for right turning traffic rather than the dedicated stage. Provides an additional lane heading towards Barons Court after the end of the bus lane, as well as the additional flared lane exiting Redlands Road.
Merrie Harrier to Barons Court Bus Lane	Provide a bus lane and bus gate on the Barry Road link before the Barons Court junction, in order to allow buses to make all possible turning movements in a controlled manner. The option creates a new third lane heading eastbound and utilising some of the land on the northern side of the carriageway. This will retain the two general traffic lanes heading eastbound, but still create bus priority on the link, with a bus lane of approximately 270m. Furthermore, provision has been made for a 2.5m wide combined footway/ cycleway on the north side of the link, directly adjacent to the proposed bus lane. In order to accommodate both the bus lane and footway/ cycleway provision, there will be a requirement to install approximately 300m of retaining wall of varying height (max 2.4m).

With regards to bus stop infrastructure, it is anticipated that standards for bus stop infrastructure will be developed as part of the Metro, with a consistent approach across the Capital City Region. However, at present the upgrade of bus stops in line with the Vale of Glamorgan Council proposals is included in the multi-modal package. The Council proposes to improve bus stop infrastructure by introducing Gold, Silver and Bronze standards depending on bus stop location, land availability and usage for example (Vale of Glamorgan LDP 2011-2026 Sustainable Transport Assessment Background Paper, September 2013). The bus stop standards are summarised in Table 14.

Table 14 Bus Stop Standards

Gold Standard	• Clear Channel type/ supplied shelter (four sided accessible to wheelchairs) with integral timetable case, perch seating, lighting, electric supply/ ducting for future real time information display, bus stop flag and its attachment pole/ bracket. • Hard standing area with raised kerb platform with transition kerbs both sides and any other normally required pavement edges. • Dropped kerb access on both sides of road. • Bus stop protective road markings (including legal costs). • Refuse bin.
Silver Standard	• Bus Shelters Wales Transit type/ supplied shelter (four sided accessible to wheelchairs) with integral timetable case, perch seating, lighting, electric supply/ ducting for future real time information display, bus stop flag and its attachment pole/ bracket. • Hard standing area with raised kerb platform with transition kerbs both sides and any other normally required pavement edges. • Dropped kerb access on both sides of road. • Bus stop protective road markings (including legal costs). • Refuse bin.
Bronze Standard	• Bus stop flag pole. • Bissell style timetable case. • Bus stop flag. • Hard standing area with raised kerb platform with transition kerbs both sides and any other normally required pavement edges. • Dropped kerb access on both sides of road. • Bus stop protective road markings (including legal costs). • Refuse bin.

Within Appendix 5 of the Sustainable Transport Assessment Background Paper, the Vale of Glamorgan Council has listed the recognised standard of Gold, Silver or Bronze for each bus stop in Dinas Powys. An assessment of bus stop standards has subsequently been completed as part of the Capita Dinas Powys to Cardiff Corridor Bus Priority Measures Report (May 2015) which identified works to establish one gold bus stop, two silver bus stops and six bronze bus stops. These proposals have subsequently been costed as part of the Financial Case for the multi-modal option.

Walking and Cycling

The walking and cycling proposals cover connections within Dinas Powys, as well as connecting Dinas Powys to nearby settlements such as Barry, Penarth and Cardiff. The walking and cycling proposals are summarised in Table 15.

Table 15 Walking and Cycling Proposals

Item	Description
Barry to Dinas Powys Cycle Route	• A new pedestrian and cycling link along the A4055 Cardiff Road between the Biglis Roundabout and Dinas Powys. It is recognised that a continuous cycle lane along the A4055 through Dinas Powys is difficult to achieve but improvements would be sought. • This is a strategic link to connect Barry and Cardiff as two of the key settlements in South East Wales, as well as to providing a localised connection between Barry and Dinas Powys. • Feasibility study/ design planned for 2018/19.
Merrie Harrier to Barons Court	• A4055 Barry Road - Along the north side of the A4055 between the Merrie Harrier junction to the Barons Court junction – provide a 3m shared walking and cycling facility (along the majority of its length) alongside the proposed bus lane. • Project delivery proposed as part of the bus lane delivery but can be delivered as a standalone project. • Merrie Harrier Junction - A shared use facility along the north side of the A4055 Cardiff Road between the existing pedestrian/ cycleway to the west of the Merrie Harrier junction and Penlan Road. • Provision of a shared use facility between Andrews Road and Redland Road • Project delivery could be delivered as part of junction modification proposals but can be delivered as a standalone project.
Dinas Powys to Penarth Connections	• Connections between Dinas Powys and Cosmeston. • Scheme funding already part secured through S.106 monies.
Dinas Powys Network	• Based on the improvements identified in Vale of Glamorgan Council's Pedestrian and Cycling Integrated Network Maps produced for Dinas Powys (a requirement of the Active Travel (Wales) Act 2013). • Feasibility/ design planned on some of these projects for 2018/19. • The other walking and cycling proposals presented (i.e. the Barry to Dinas Powys Cycle Route, Merrie Harrier to Barons Court and Dinas Powys to Penarth Connections) are also included in the Integrated Network Maps for Dinas Powys.

2.6.3 Bypass – Green Alignment (east of Dinas Powys interconnecting with the A4055 at Cardiff Road and the Merrie Harrier Junction) and Multi-Modal Option

For the purposes of the Stage Two WelTAG assessment, the bypass and multi-modal option is inclusive of the Green alignment proposal. The option description is subsequently a combination of the options as outlined in sections 2.6.1 and 2.6.2 accordingly.

2.6.4 Bypass – Blue Alignment (east and south of Dinas Powys, interconnecting between the A4055 at Merrie Harrier and the B4267 Sully Moors Road/ Hayes Road roundabout)

The Blue alignment has been developed in response to the project scope extension as clarified in Chapter One of this report (refer to drawing numbers 10015022-ARC-XX-XX-DR-HE-0023, 0024, 0025 and 0026). The option is extensively similar to the Green and Pink alignments whereby the carriageway extends south from the Merrie Harrier junction to the east of Dinas Powys. At a point near its interface with Cross Common Road, the Blue alignment then deviates southwards before interconnecting with the extant B4267 Sully

Moors Road/ Hayes Road roundabout. The alignments as shown in Appendix E are subsequently based on the following assumptions:

- The alignment is designed to the DMRB TD 9/93 for a 60mph speed limit (100kph design speed) single carriageway. A high-level review of the alignment identified departures from standards at Cog Moors where the horizontal curvature falls two steps below desirable combined with departures for the stopping sight distance. Widening of the verges has not been considered at this time with further detailed design work required at a later stage. Achieving a fully standard 60mph alignment would require substantially more properties and thus the alignment seeks to minimise these impacts.
- Carriageway width of 3.65m per lane plus 1m hardstrips (total carriageway width of 9.3m) plus verge width of 2.5m either side of the carriageway.
- A 3.5m wide cycleway has been included to one side of the bypass.
- Total cross section width of 17.8m plus earthworks slopes where required.
- The alignment has been developed to fit into the landscape and where possible avoid constraints as provided by Vale of Glamorgan Council.
- The vertical alignment is based on 5m OS Contours which have an accuracy to +/- 2m.
- Earthworks are assumed to be 1 in 3 embankment and cutting slopes – to be confirmed at a later stage subject to ground investigation and the materials present.
- Outfall points for drainage are not known at this stage and therefore costs have been estimated.

On-line enhancements interconnecting from the B4267 Sully Moors Road/ Hayes Road roundabout along Hayes Road and onwards to the Wimborne Road/ Ffordd Y Mileniwm junction in Barry have also been shown on the outline drawings as potential future strategic enhancements to facilitate further interconnectivity within the South East Vale.

Whilst this potential enhancement has been shown for information, its' implementation has not been considered as part of this WelTAG Stage Two assessment to ensure a viable comparison with the Green and Pink bypass alignments can be made accordingly.

It should be noted that this is a feasibility option study and in order to confirm its accuracy further surveys, investigations and design will be required. Such as a topographical survey, environmental surveys, ground investigation and stakeholder consultation.

Standards Used

The alignments considered are compliant with DMRB and in accordance with TD 9, TD 27 and TA 90.

Junctions

The Blue alignment includes for junctions at locations highlighted on drawing numbers 10015022-ARC-XX-XX-DR-HE-0023 and 0024. However, the junctions shown have not been designed in the current proposals. Traffic modelling and survey work would be required in order to inform the design of each specific junction.

Merrie Harrier Junction

The junction arrangements are as per the design development that has been completed for the Pink and Green alignments. The junction arrangement has not been individually priced within the construction cost estimate due to available data to make an informed assessment. However, it is considered that given the amount of optimism bias allowed for within the estimate, there is sufficient allowance to include for the junction improvement (please refer to drawing numbers).

Public Rights of Way

There are a number of PRoW affected by both of the considered options. It is anticipated that crossings will be rationalised by PRoW re-alignment and provision of crossing points under/ over the bypass alignment to maintain existing PRoW. Where PRoW cross the bypass alignment in-fill, culverts have been considered and where it crosses in-cut, 3m wide bridges have been used.

Constraints

Table 16 outlines the potential constraints associated with the route alignments.

Table 16 Constraints – Blue Alignment

Constraint	Description
Sully Brook	Sully Brook is crossed by the Blue alignment at a number of locations. NRW will need to be consulted.
Development Site	Blue alignment has been designed to avoid impacting on the committed St Cyres development site.
Ancient Woodland	The study area contains areas of ancient woodland. The Blue alignment has been optimised to minimise impact however in some locations minor impacts are possible, although would be limited to the outer areas.
Dinas Powys	Blue alignment bypasses the village of Dinas Powys to the east.
Sully	Blue alignment bypasses the village of Sully to the west.
Archaeology	Similar to the ancient woodland, the area currently under consideration is also scattered with archaeology. It could be expected that there is unknown archaeology within the area, of which cannot be shown on the constraints plans. The Blue alignment has been developed to avoid archaeology within the area and based on their existing alignments, the options do not affect any known archaeology shown on the plans provided by Vale of Glamorgan Council.
Merrie Harrier Junction	The Merrie Harrier junction is seen as one of the key constraints. To accurately inform a new junction proposal, survey data and traffic modelling information is required to assess updated junction capacity forecasts. Junction and network modelling using LinSig and Vissim programs has been undertaken alongside the WelTAG Stage Two study and the results are reported in a Technical Note contained in Appendix C.
Other Junctions	Additional survey data and traffic modelling information would be required to accurately inform any junction proposals to be designed and/ or upgraded as part of the Blue alignment.
Railway Tunnel	The railway tunnel south of the Merrie Harrier junction is considered a major risk to the proposal as the depth to soffit below existing ground level, condition and strength of the tunnel are all unknown.

Risks

Table 17 outlines the potential risks associated with the route alignment.

Table 17 Risks – Blue Alignment

Risk	Description
Topographic Survey Data	Topographic survey data is OS contours at 5m intervals and is accurate to +/- 2m which could affect earthworks and accuracy of design.
Unknown Archaeology	Unknown archaeology could be encountered during construction.

Risk	Description
Railway Tunnel	The railway tunnel may require strengthening and further works to be suitable for possible future traffic loadings. This will need a condition survey and assessment as part of any detailed design development.
Excavated Material	Excavated material to be used as suitable fill material may be classed as unsuitable, therefore requiring import or additional import of suitable fill material and export of unsuitable.
Health and Safety	All considered health and safety hazards have been highlighted on drawings numbers.

Assumptions

As shown on drawing numbers 10015022-ARC-XX-XX-DR-HE-0023 and 0024, access along Cross Common Road will be terminated and no direct through route will be allowed. A full compliant design has not been undertaken on the junctions, but it is considered costs for the construction of the possible accesses are allowed for within the optimism bias and risk allowance.

Environmental Constraints

Environmental constraints provided by Vale of Glamorgan Council have been used to help inform the design. Alignments have been developed and where possible have been designed to avoid environmentally sensitive areas.

2.7 Appraisal of Options

The shortlisted options have been assessed in terms of how each would tackle the identified problems, to what extent it meets the objectives (including contributing to local, regional, and national well-being objectives) as well as key risks, adverse impacts, constraints and dependencies. The extent to which the option meets the objectives is described using the WelTAG seven-point assessment scale as set out in Table 1.

For the Strategic Case, the impacts of the 'do-minimum' are also set out compared to the base year situation. This enables an understanding of what will happen if only limited investment is made in the transport connections and provides a basis for comparing the performance of the 'do-something' options.

Table 18 Option Appraisal: Do-Minimum

Do-Minimum	
Description	Assume continued delivery of transport enhancements via the LTP and utilising existing sources of funding but assumes no step change in the level of funding or delivery of any major transport enhancements within the study area (assumes current levels of investment). Assumes the continuation of rail services, local bus services and community transport at a similar level as present utilising funding at similar levels to existing. Assumes continued work by local authorities and stakeholders to deliver improvements to the transport network, with the overall aim of addressing the identified problems and the outcomes of the relevant transport polices. It is recognised that the enhancement of services and infrastructure as part of the new rail franchise and the South Wales Metro are committed improvements. However, in this appraisal, these are included in the multi-modal option given that the details are currently emerging.
How it tackles the problems	Limited available funding (both capital and revenue) and resources are unlikely to make a step difference in overcoming the identified problems.

Do-Minimum			
Objectives	**Overall**	Overall, the do-minimum option is considered to have an adverse effect at meeting the objectives, due to the modest levels of funding currently able to be invested in transport infrastructure and public transport services. It subsequently assumes that background increases in population and traffic growth exceed investment provision to mitigate increasing impacts and pressure on the existing transport network. It should be noted that policies and programmes are in place to facilitate improved transport services but limited funding means that beneficial enhancements are currently difficult to achieve. A negative impact on the environment is forecast as the traffic levels through Dinas Powys would continue to increase, whilst the limited funding means that there is currently poor to moderate accessibility to services and a moderate road safety record, as well as a limited promotion and delivery of transport schemes to promote health and well-being. The increased traffic at the key junctions of the Merrie Harrier, Barons Court and Murch Road is anticipated to lead to increased delay on the corridor, with all junctions operating over capacity in the do-minimum scenario. The additional delay and congestion may lead to an impact on economic growth in the south east Vale. These problems cannot be addressed without sufficient committed funding and sources to have a beneficial impact.	
	1	Support Sustainable Connectivity in Cardiff City Region	--
	2	Facilitate Economic Growth	--
	3	Improving Health and Well-being	-
	4	Improved Safety and Security	-
	5	Benefits and Minimised Impacts on the Environment	-
Key Risks		Potential reductions in available funding and resources leading to poor investment in public transport and local highway infrastructure. Do-minimum option may not be publicly acceptable, and not being seen to tackle existing issues.	
Adverse Impacts		The anticipated increase in annual traffic volumes (general background traffic growth plus local LDP development) is anticipated to have an adverse impact on the environment compared to the existing situation. Potential for a deterioration in highway safety, especially along the A4055 and at key junctions. Potential for adverse socio-economic opportunities with reducing accessibility to sustainable travel opportunities. Continued overcrowding on public transport services impacting on accessibility to jobs and services. Deterioration of the Cardiff Road corridor encompassing environmental issues, increase journey time delay and anticipated worsening of highway junction capacity. Potential that increased traffic re-routes to avoid congested corridor and has impacts on other areas of the south east Vale.	
Constraints		The option is considered to be relatively unconstrained although any restriction with regard to the availability of funding and resources could jeopardise standard maintenance/ enhancement proposals.	
Dependencies		Continued development of centralised services and socio-economic opportunities within key urban settlements surrounding Dinas Powys adding increasing pressure on the existing transport infrastructure and services, as well as an increased need to travel to access these services.	

Table 19 Option Appraisal: Bypass / Green Alignment (east of Dinas Powys interconnecting with the A4055 at Cardiff Road and the Merrie Harrier Junction)

Bypass / Green Alignment (east of Dinas Powys interconnecting with the A4055 at Cardiff Road and the Merrie Harrier Junction)		
Description		Construction of a new 60mph single carriageway bypass to the east of Dinas Powys interconnecting with the A4055 approximately 0.9km south of the A4055 Cardiff Road/ Cross Common Road priority junction, extending northwards to the east of Dinas Powys through primarily green wedge, and interconnecting with the A4055 at its junction with the B4267 at Merrie Harrier. The WelTAG Stage Two design has been developed with the potential to provide integral public transport infrastructure and suitable crossings to retain east/ west connectivity for walking and cycling. Implementation of the Green alignment would require changes to the Merrie Harrier junction to help facilitate wider benefits of route journey time improvements. The junction arrangement developed to support the WelTAG Stage Two assessment encompasses a standard roundabout to the south west of Merrie Harrier, with connection to Cardiff Road, Redlands Road and a new bypass as shown on drawing 10015022-ARC-XX-XX-DR-HE-0004. In addition, a new 3-arm roundabout at the southern end of the bypass would facilitate connectivity to the A4055 Cardiff Road for access northbound towards Dinas Powys and southbound towards Barry.
How it tackles the problems		The implementation of a new bypass at this location has the potential to tackle the following problems – P06 / P07 / P09 / P10. If a bypass is delivered, the existing adverse impact of road traffic specifically through Dinas Powys could be reduced. The forecast reduction in traffic is anticipated to: • Alleviate congestion and capacity issues at sensitive junctions within Dinas Powys with potential for improved local journey times and reliability (notably reducing delay at the Murch Road junction). • Reduce local issues associated with air quality and noise pollution. • Mitigate road safety concerns with the potential for a reduction in the number of accidents on the existing corridor. • Reduce severance within the community with improved crossing opportunity for pedestrians and cyclists. • Allow greater assimilation of new vehicle trips associated with future residential development within Dinas Powys. However, improving capacity of the local highway network is likely to strengthen dependence on the private car by making local journeys by private vehicles more attractive and reliable. Some of the improvements noted, including environmental and congestion, have the potential to be displaced onto the new road. Moreover, improved journey times through Dinas Powys may result in traffic continuing to use Cardiff Road but at increased speed that would potentially require mitigation measures.
Objectives	**Overall**	A new bypass has the potential to support sustainable connectivity in the Cardiff City Region by improving local journey times for bus trips through Dinas Powys allowing for greater reliability and the potential to attract increased patronage. Improved journey times could however make travel by car more attractive and therefore reduce the desirability of public transport locally and regionally. Moreover, connectivity within the village could be improved. A slight beneficial impact is therefore considered appropriate. Traffic modelling completed to support assessment of the bypass has demonstrated a measurable improvement in journey times between the Biglis roundabout and the Merrie Harrier junction. A minor beneficial impact could subsequently be achieved with regard to facilitating economic growth as accessibility is improved within and through the area.

Bypass / Green Alignment (east of Dinas Powys interconnecting with the A4055 at Cardiff Road and the Merrie Harrier Junction)			
		A neutral impact is also considered for improvements to health and well-being with the potential for improvements to air quality and noise pollution on the A4055 through Dinas Powys being displaced onto a new bypass impacting on local residents. A slight beneficial impact is assigned to safety and security as forecast reductions in traffic flow through Dinas Powys could be achieved together with implementation of a new highway/ bypass designed to current DMRB standards. A social and economic review of accidents has identified the potential for considerable cost savings and reductions in slight and serious road traffic accidents, although this is somewhat mitigated by a forecast increase in fatalities given the increased design speed of the new bypass. The option could establish a moderate adverse impact with regard to the environment as a bypass would (1) be implemented predominantly on existing green wedge, (2) have the potential increase in road traffic/ car use as more people could choose to drive due to time savings and greater journey time reliability, and (3) establish the displacement of existing air quality and noise pollution from the A4055 Cardiff Road to the new road. This could be considered a large adverse impact but needs to be considered against the likely environmental benefits for the village centre along Cardiff Road.	
	O1	Support Sustainable Connectivity in Cardiff City Region	+
	O2	Facilitate Economic Growth	++
	O3	Improving Health and Well-being	0
	O4	Improved Safety and Security	+
	O5	Benefits and Minimised Impacts on the Environment	--
Key Risks		Requires a high level of capital investment. At present the route is not included in the LDP thus there are planning risks in taking it forward. The route would be through the green wedge policy area between Dinas Powys and Penarth. Moreover, there are significant funding constraints in short to medium term programmes and design and development work required to take the proposal forward. There are already a number of large scale transport schemes currently in the Welsh Government's infrastructure delivery programmes (such as the M4 motorway and Five-Mile Lane, for example) which require significant capital funding and resources. A Bypass is not included in Welsh Government's National Transport Finance Plan 2017 Update and thus there is currently no indication that funding might be available from Welsh Government. It is anticipated that any proposal would need to demonstrate regional/ national value against these other large scale transport schemes. Impacts on properties in the vicinity of the route and the subsequent land acquisitions (time and cost). Environmental considerations, including the potential for protected species to be located along the route, archaeology, flooding and ancient woodland issues to address. Reduced traffic flows within Dinas Powys could lead to increased traffic speeds. Improved road conditions within Dinas Powys has the potential to retain and possible attract increased development pressure and traffic growth, alleviating the benefits of traffic reduction sought through the implementation of a bypass. Route uncertainties make it difficult to fully understand the engineering constraints and potential costs, and associated impacts. In particular, the uncertainties of the feasibility of	

Bypass / Green Alignment (east of Dinas Powys interconnecting with the A4055 at Cardiff Road and the Merrie Harrier Junction)	
	taking the route across the railway tunnel south of the Merrie Harrier junction poses a significant risk. The inability for the bypass to establish effective improvements to junctions and journey time reliability, particularly to the north of the new route, with the Merrie Harrier and Barons Court junctions remaining significant constraints to journey time.
Adverse Impacts	Potential adverse impact on the environment and biodiversity. Potential to encourage more journeys to be undertaken by car or Heavy Goods Vehicles (HGVs). Impact on residents situated adjacent or in close proximity to the bypass alignment. Impact on local communities during construction. Delay to road users (car, HGVs and public and community transport) during construction of new junctions. Would require a high level of capital investment, which may have implications on the delivery of other capital schemes in the region for a number of years, including the delivery of more sustainably driven measures.
Constraints	Availability of funding and resources. Environmental considerations including the potential for protected species along the bypass alignment. Land ownership constraints. Route uncertainties, in particular with the tunnel, make it difficult to fully understand the engineering constraints and potential costs.
Dependencies	Need to address more strategic corridor issues associated with Merrie Harrier and Barons Court junctions in particular, in order to maximise journey time benefits Impacts on available revenue/ maintenance budgets. Ability to acquire all land required to facilitate the proposal.

Table 20 Option Appraisal: Bypass / Pink Alignment (east of Dinas Powys interconnecting with the A4055 at Cardiff Road and the Merrie Harrier Junction, including roundabout for connectivity to Murch Road)

Bypass / Pink Alignment (east of Dinas Powys interconnecting with the A4055 at Cardiff Road and the Merrie Harrier Junction, including roundabout for connectivity to Murch Road)	
Note: The option appraisal is as described for the Green alignment with the following amendments confirmed.	
Description	As described for the Green alignment in Table 19, with the addition of a roundabout to be incorporated into the scheme. The roundabout has been based on a normal roundabout with an ICD of 45.2m to accommodate a potential new access onto it from Murch Road. It is assumed that a compliant access from Murch Road to the roundabout can be achieved although costs for developing this access have not been included within the estimates provided. The roundabout is shown for illustrative purposes to demonstrate it would be feasible to allow an access onto the roundabout. It would be anticipated that provision of a roundabout would lead to changes in traffic patterns on Murch Road, as a new connection is formed between the centre of Dinas Powys and the bypass. This would require further detailed analysis during design and development of a bypass, to determine the local traffic impacts.

Table 21 Option Appraisal: Multi-Modal Option

Multi-Modal Option			
Description		The multi-modal option considers the delivery of short (up to five years), medium (up to ten years) and long (more than 10 years) term improvements within the study area across a range of sustainable modes. The option includes a range of enhancements to the existing public transport network including enhancements to bus and rail services and associated infrastructure/ interchanges. In the short term, this could encompass relatively 'quick win' deliverables (subject to funding) including robust enhancements to passenger facilities which have the potential to have a measurable impact on transport provision within the study area, alongside a programme of active travel improvements. Full details of the multi-modal package have been included in section 2.6.2.	
How it tackles the problems		The option has the potential to tackle the following problems – P1 / P2 / P3 / P4 / P5 / P6 / P7 / P8 / P9 / P10. Through delivering enhancements to both services and infrastructure, the multi-modal package has the potential to make public transport services more attractive and less complex with greater integration, thus reducing the dependency on the private car and enabling those without a car to more readily access key services and employment. Greater regional assimilation to the Cardiff City Region could help improve access to employment and services, and enable a greater number of people access key centres containing key services. The extent to which improvements bring benefits however, is dependent on the wider context of Metro improvements and journey times for buses on the wider network. Moreover, without improvements to the local road network to improve journey times, ongoing congestion issues are anticipated to continue to impact on buses, walkers and cyclists. The delivery of a new bus lane between the Merrie Harrier and Barons Court junctions has the potential improve both journey times and journey time reliability for bus services through the study area.	
Objectives	**Overall**	The delivery of an enhanced public transport services and infrastructure would promote an improved level of accessibility to key destinations, employment and services. The low number of existing users of sustainable modes does however present a challenge to deriving significant mode transfer from car to sustainable travel. The delivery of walking and cycling improvements would have a moderate beneficial impact on health and well-being. Improving journey time reliability and providing enhanced public transport provision has the potential to have a beneficial impact on the environment by encouraging some to use more sustainable modes of travel.	
	O1	Support Sustainable Connectivity in Cardiff City Region	++
	O2	Facilitate Economic Growth	+
	O3	Improving Health and Well-being	+
	O4	Improved Safety and Security	+
	O5	Benefits and Minimised Impacts on the Environment	+
Key Risks		The package of measures would involve a moderate to high level of cost, depending on the level of public transport improvements included. Availability of funding to support the package of measures. Land acquisitions (time and cost).	

Multi-Modal Option	
	Environmental considerations (time and cost) associated with a park and ride site and rail station enhancements. Is there sufficient demand for additional services and routes to justify the investment when availability of funding is diminishing? Increasing pressure on available funding and resources to support public transport, both initial investment and ongoing support.
Adverse Impacts	Development of park and ride site and bus lane improvements could result in adverse environmental impacts. Impact on local communities during construction of improvements to highways, walking and cycling and rail interchange enhancements. Delay to road users (car, HGVs and public and community transport) during construction.
Constraints	Availability of funding and resources. Environmental considerations. Land ownership. Requires integration with local and community transport services, which are reliant on other funding sources and private operators and such integration is therefore not guaranteed. Journey times dependent on the existing road network and its existing limitations. Improvements to journey time and journey quality are dependent on significant highway improvements and hence investment. Requires local bus services and community transport to be of a sufficient frequency and coverage to enable a large number of people to be able to readily access the regional services.
Dependencies	Impacts on available revenue/ maintenance budgets. All of the individual identified schemes along the corridor would need to be delivered to enable the full scheme benefits to be achieved. Welsh Government priorities and committed expenditure.

Table 22 Option Appraisal: Bypass / Green Alignment (east of Dinas Powys interconnecting with the A4055 at Cardiff Road and the Merrie Harrier Junction) and Multi-Modal Option

Bypass / Green Alignment (east of Dinas Powys interconnecting with the A4055 at Cardiff Road and the Merrie Harrier Junction) and Multi-Modal Option		
Description		Combination of Green alignment and multi-modal option as described in Table 19 and Table 21.
How it tackles the problems		The option has the potential to tackle the following problems – P1 / P2 / P3 / P4 / P5 / P6 / P7 / P8 / P9 / P10.
Objectives	**Overall**	A combined bypass and multi-modal option has the potential to establish a comprehensive transport scheme for Dinas Powys with wider benefit to the immediate surrounding areas. The combining of sustainable measures throughout the two options could support robust sustainable connectivity in the Cardiff City Region. A moderate beneficial score is

Bypass / Green Alignment (east of Dinas Powys interconnecting with the A4055 at Cardiff Road and the Merrie Harrier Junction) and Multi-Modal Option			
		however retained as improved highway connectivity could make travel by car more attractive and therefore reduce the desirability of public transport locally and regionally. The journey time and capacity improvements from the bypass would assist public transport and walking and cycling movements through and within Dinas Powys by reducing general traffic volumes. The benefits identified for the economic appraisal have been noted. A moderate score is retained as benefits are not considered to establish a wider strategic impact throughout the south east Wales region with benefits more applicable to Dinas Powys and the immediate surrounding urban areas, most notably Barry. In light of the neutral impact recognised for the bypass option in isolation, the extensive health and well-being benefits realised as part of the multi-modal option have subsequently been carried forward to the combined option. A socio-economic review of accidents for a new bypass identified the potential for considerable cost savings and reductions in slight and serious road traffic accidents, although this is mitigated by a forecast increase in fatalities. The added benefits recognised as part of a multi-modal option have however also been considered to establish an overall moderate beneficial score. Whilst a neutral impact on the environment was considered applicable for the multi-modal option, the adverse impacts resulting from a new bypass, both in the short (construction) and long (operational) term have been applied to the combined option.	
	O1	Support Sustainable Connectivity in Cardiff City Region	++
	O2	Facilitate Economic Growth	++
	O3	Improving Health and Well-being	+++
	O4	Improved Safety and Security	++
	O5	Benefits and Minimised Impacts on the Environment	--
Key Risks		See Table 19 and Table 21 for summary of two options.	
Adverse Impacts		See Table 19 and Table 21 for summary of two options.	
Constraints		See Table 19 and Table 21 for summary of two options.	
Dependencies		See Table 19 and Table 21 for summary of two options.	

Table 23 Option Appraisal: Bypass – Blue Alignment (east and south of Dinas Powys, interconnecting between the A4055 at Merrie Harrier and the B4267 Sully Moors Road/ Hayes Road roundabout)

Bypass – Blue Alignment (east and south of Dinas Powys, interconnecting between the A4055 at Merrie Harrier and the B4267 Sully Moors Road/ Hayes Road roundabout)	
Description	Construction of a new 60mph single carriageway bypass interconnecting between the A4055/ B4267 Merrie Harrier junction and the B4267 Sully Moors Road/ Hayes Road roundabout south of Dinas Powys. The WelTAG Stage Two design has been developed with the potential to provide integral public transport infrastructure and suitable crossings to retain east/ west connectivity for walking and cycling.

Bypass – Blue Alignment (east and south of Dinas Powys, interconnecting between the A4055 at Merrie Harrier and the B4267 Sully Moors Road/ Hayes Road roundabout)			
		Implementation of the Blue alignment would require changes to the Merrie Harrier junction to help facilitate wider benefits of route journey time improvements. The junction arrangement developed to support the WelTAG Stage Two assessment encompasses a standard roundabout to the south west of Merrie Harrier, with connection to Cardiff Road, Redlands Road and a new bypass as shown on drawing 10015022-ARC-XX-XX-DR-HE-0004. In addition, a new 4-arm roundabout at the southern end of the bypass would facilitate connectivity to the B4267 Sully Moors Road for onward access to Barry and Sully. There is future potential for subsequent on-line enhancements extending along Hayes Road and Wimborne Road to Ffordd y Mileniwm to facilitate improved strategic accessibility and potentially enable development and regeneration (as shown on plan 10015022-ARC-XX-XX-DR-HE-0024 for illustrative purposes only) however this additional enhancement has not been specifically assessed for comparison as it addresses different problems and objectives than this Stage Two study.	
How it tackles the problems		The implementation of a new bypass at this location has the potential to tackle the following problems – P06 / P07 / P09 / P10. If a bypass is delivered, the existing adverse impact of road traffic specifically through Dinas Powys could be reduced. However, the increased length of route compared to the Green alignment and potentially marginal journey time benefits compared to the existing corridor, means that reductions in traffic are anticipated to be low. The reductions in traffic would be associated with those journeys currently made between the Merrie Harrier junction and Sully Moors Road area, which constitutes some 11% of total traffic through Dinas Powys. There may be benefits in traffic currently travelling through Sully and Penarth being transferred onto the new road, but this does not address the Dinas Powys transport network issues. Moreover, improving capacity of the local highway network is likely to strengthen dependence on the private car by making local journeys by private vehicles more attractive and reliable.	
Objectives	**Overall**	A new bypass has the potential to support sustainable connectivity in the Cardiff City Region by improving local journey times for bus trips through Dinas Powys allowing for greater reliability and the potential to attract increased patronage. However, initial traffic assessment suggests that the benefits would be substantially less than for the Green alignment, with a relatively minor reduction in traffic through Dinas Powys. A neutral impact is therefore considered appropriate. Whilst there are likely to be limited benefits through Dinas Powys from this option, there may be wider economic growth benefits through enabling development and regeneration in the vicinity of and west of the route. As such a moderate beneficial impact could subsequently be achieved with regard to facilitating economic growth. A minor adverse impact is considered for improvements to health and well-being with limited potential for improvements to air quality and noise pollution on the A4055 through Dinas Powys, alongside the new bypass impacting on local residents. A neutral impact is assigned to safety and security as relatively low reductions in traffic flow through Dinas Powys would be achieved. The option could establish a moderate adverse impact with regard to the environment as a bypass would (1) be implemented predominantly on existing green wedge and (2) have the potential increase in road traffic/ car use as more people could choose to drive due to time savings and greater journey time reliability.	
	O1	Support Sustainable Connectivity in Cardiff City Region	0

Bypass – Blue Alignment (east and south of Dinas Powys, interconnecting between the A4055 at Merrie Harrier and the B4267 Sully Moors Road/ Hayes Road roundabout)			
	O2	Facilitate Economic Growth	++
	O3	Improving Health and Well-being	-
	O4	Improved Safety and Security	0
	O5	Benefits and Minimised Impacts on the Environment	--
Key Risks		Requires a high level of capital investment. At present the route is not included in the LDP thus there are planning risks in taking it forward. The route would be through the green wedge policy area between Dinas Powys, Penarth and Sully. Moreover, there are significant funding constraints in short to medium term programmes and design and development work required to take the proposal forward. There are already a number of large scale transport schemes currently in the Welsh Government's infrastructure delivery programmes (such as the M4 motorway and Five-Mile Lane, for example) which require significant capital funding and resources. A Bypass is not included in Welsh Government's National Transport Finance Plan 2017 Update and thus there is currently no indication that funding might be available from Welsh Government. It is anticipated that any proposal would need to demonstrate regional/ national value against these other large-scale transport schemes. Impacts on properties in the vicinity of the route and the subsequent land acquisitions (time and cost). Uncertainties regarding the development and regeneration benefits and the dependency on land owners. Environmental considerations, including the potential for protected species to be located along the route, archaeology, flooding and ancient woodland issues to address. Route uncertainties make it difficult to fully understand the engineering constraints and potential costs, and associated impacts. In particular, the uncertainties of the feasibility of taking the route across the railway tunnel south of the Merrie Harrier junction poses a significant risk. The inability for the bypass to establish effective improvements to junctions and journey time reliability, particularly to the north of the new route, with the Merrie Harrier and Barons Court junctions remaining significant constraints to journey time.	
Adverse Impacts		Potential adverse impact on the environment and biodiversity. Potential to encourage more journeys to be undertaken by car or Heavy Goods Vehicles (HGVs). Impact on residents situated adjacent or in close proximity to the bypass alignment. Impact on local communities during construction. Delay to road users (car, HGVs and public and community transport) during construction of new junctions. Would require a high level of capital investment, which may have implications on the delivery of other capital schemes in the region for a number of years, including the delivery of more sustainably driven measures. Funding may be available through private investment but this may lead to increased development traffic through the corridor.	
Constraints		Availability of funding and resources.	

Bypass – Blue Alignment (east and south of Dinas Powys, interconnecting between the A4055 at Merrie Harrier and the B4267 Sully Moors Road/ Hayes Road roundabout)	
	Environmental considerations including the potential for protected species along the bypass alignment. Land ownership constraints. Route uncertainties make it difficult to fully understand the engineering constraints and potential costs.
Dependencies	Impacts on available revenue/ maintenance budgets. Ability to acquire all land required to facilitate the proposal. Relationship to development and regeneration proposals, which gives rise to a justification for the route.

3 Transport Case

3.1 Overview

The aim of the Transport Case is to explain the expected impacts of the project, how the project will contribute to the well-being goals and whether the project will provide value for public money. The social, cultural, environmental and economic costs and benefits of each option are considered.

The transport case presents the approach and assessment of impacts of each option under the headings of social, cultural, environmental and economic impacts and an evidence-based assessment of the following:

- What the impacts will be;
- The scale of those impacts;
- Where will they occur; and
- Who/ what will experience them.

All Stage Two options have been tested, namely:

- Do-minimum
- Bypass – Green Alignment
- Bypass – Pink Alignment
- Multi-Modal Option
- Bypass – Green Alignment and Multi-Modal Option
- Bypass – Blue Alignment

The do-minimum impacts are assessed against the base year, whereas each of the do-something options is compared to the do-minimum.

3.2 Approach to Impact Assessment

Background Information

The anticipated impact of the bypass on traffic and the subsequent economic, social and environmental impacts has been quantified through use of a spreadsheet model constructed using Manual Classified Counts (MCC) and ANPR survey data to derive forecast reference case and option traffic flows throughout the study area. Model flows, journey times and user benefits have been obtained for the Base Year 2017 and for the With and Without Scheme in 2036. This has enabled Arcadis to undertake a Cost Benefit Analysis, including accident benefits and prepare a Transport Economic Efficiency (TEE) table for each option. The Green alignment has been used for the purposes of the assessment as this represents the greatest potential for improved journey times in comparison to the Pink alignment, which is inclusive of an additional roundabout interconnecting with Murch Road. A technical note setting out the methodology for the economic appraisal is included as Appendix F.

In addition, a Vissim model has been developed using MCC (plus queue length surveys) and ANPR data to assess the capacity and delay at the three key signalised junctions in Dinas Powys namely Barons Court, Merrie Harrier and Cardiff Road/ Murch Road. A 2017 base year model plus 2036 with and without scheme scenario has been established to allow the development of options/ scenarios, assuming that options will include improved walking and cycling and bus priority as possibilities, as well as reconfiguration of the Merrie Harrier junction with a new road link. A technical note setting out the base situation, options and the results has been included as Appendix C.

Where possible, other impacts have been quantified. At this stage social, cultural and environmental impacts have been assessed through measurement of receptors likely to be affected, but this is prior to environmental and technical surveys being undertaken, and a full Environmental Impact Assessment, which will be needed to progress an option in Stage Three.

The impacts considered and the means of assessment for social, cultural, environmental and economic impacts is summarised below.

Social Impacts

The social impacts have been assessed where applicable with reference to the guidance in WebTAG Unit A4[5].The assessment is qualitative with the exception of accidents, for which a quantified analysis has been undertaken using COBALT from the traffic modelling results (and is reported under the economic impacts appraisal). The topics covered are physical activity, security, severance, journey quality, option and non-use values, accessibility and personal affordability.

Cultural Impacts

The Well-being of Future Generations (Wales) Act 2015 has a well-being goal of ‘A Wales of vibrant culture and thriving Welsh language’. It is noted that this well-being goal will be achieved through ‘a society that promotes and protects culture, heritage and the Welsh language, and which encourages people to participate in the arts, and sports and recreation’. For this assessment, the cultural assessment is a qualitative commentary on any impacts on cultural assets and the Welsh language. Cultural assets considered include arts and cultural centres, visitor attractions, sports facilities and cultural heritage.

Environmental Impacts

The environmental impacts appraisal for this Stage Two assessment is based on WebTAG Unit A3[6]. The topics covered are noise, air quality, Greenhouse gases, landscape, townscape, historic environment, biodiversity and water environment. At this stage, surveys have not been undertaken and the appraisal has been undertaken using desk top analysis. For landscape and visual impacts and biodiversity, site visits by professionals to identify key issues and constraints have been completed. The Impacts Assessment Report sets out the environmental data utilised to inform the appraisal and the worksheets are provided in Appendix G.

Economic Impacts

The economic impacts appraisal considers the changes in journey time, reliability and accidents as derived from the traffic modelling completed. Arcadis has used the outputs to subsequently undertake the economic assessment. The WebTAG guidance highlights that wider economic impacts can also be appraised. The wider economic appraisal is a short qualitative statement at present, pending further analysis in a Stage Three assessment. The Department for Transport (DfT) has recently revised the WebTAG guidance on the induced investment, employment effects and productivity impacts, with new guidance made available in December 2017. As noted above, the economic appraisal methodology as well as results are included as Appendix F.

3.3 Option Assessment

3.3.1 Summary of Impact Assessment

A summary of results is outlined within Table 24 with each of the detailed option assessments contained herewith in Table 25 to Table 30. Each assessment is in comparison to the do-minimum in 2036. The WelTAG seven-point assessment scale, as set out in Table 1, has been used to present the scale of the impact. Appendix G contains the WebTAG worksheets that support analysis of the impacts (where applicable) as undertaken for the Stage Two assessment.

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[5] https://www.gov.uk/government/publications/webtag-tag-unit-a4-1-social-impact-appraisal-december-2017

[6] https://www.gov.uk/government

Table 24 Impact Assessment Summary

Impact	Do-minimum	Bypass Green Alignment	Bypass Pink Alignment	Multi-Modal	Bypass[7] + Multi-Modal	Bypass Blue Alignment
Social						
Physical Activity	-	+	+	++	++	+
Journey Quality	--	+++	+++	++	+++	++
Accidents	-	+	+	+	++	0
Security	-	+	+	++	++	+
Access to Employment	--	++	++	++	++	+
Access to Services	--	++	++	++	++	+
Affordability	0	0	0	+	+	0
Severance	-	++	++	+	++	0
Option and Non-Use Values	-	+	+	++	++	+
Cultural						
Cultural Facilities	0	0	0	0	0	-
Welsh Language	0	0	0	0	0	0
Environmental						
Noise	-	--	--	0	--	--
Air Quality	0	-	-	+	0	--
Greenhouse Gases	0	-	-	+	0	-
Landscape	0	--	--	-	--	--
Townscape	-	0	0	0	0	0
Historic Environment	0	-	-	0	-	-
Bio-Diversity	0	--	--	-	--	---
Water Environment	0	-	-	-	-	-
Residential Amenity	-	--	--	-	--	--

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[7] Bypass – Green Alignment

Impact	Do-minimum	Bypass Green Alignment	Bypass Pink Alignment	Multi-Modal	Bypass[7] + Multi-Modal	Bypass Blue Alignment
Economic						
Journey Time Changes	-	++	+	+	++	+
Journey Time Reliability Changes	-	++	++	+	++	+
Transport Costs	-	0	0	+	+	0
Accidents	-	+	+	+	++	0
Wider Economic Impacts	0	0	0	+	+	++
Land and Property	0	--	--	-	--	--
Capital Costs	0	---	---	--	---	---
Revenue Costs	0	--	--	-	--	--

Table 25 Impact Assessment: Do-Minimum

Do-Minimum		
	Impacts	**Scale**
Social		
Physical Activity	A slight adverse impact on physical activity, due to low levels of funding currently being invested in the infrastructure.	-
Journey Quality	The highway network forms the backbone of the transport network however the volume of traffic would increase in the do-minimum by approximately 12% in the peak hours (using TEMPro growth as set out in the Economic Appraisal Appendix F). This will exacerbate existing traffic issues using the highway through the study area. The junction capacity modelling work as part of the Vissim model identifies that delay at the Barons Court, Merrie Harrier and Murch Road junctions will increase in the do-minimum with traffic growth. All junctions are anticipated to be significantly over capacity in the 2036 do-minimum. A step change in the level of investment in the infrastructure is required to deliver journey quality improvements.	--
Accidents	A number of accidents have been identified within the study area, particularly through the A4055 Cardiff Road link through Dinas Powys. This is anticipated to increase with future traffic growth on the congested corridor. A step change in the level of investment in the infrastructure is required to deliver road safety improvements.	-

Do-Minimum		
Security	A slight adverse impact on security due to low levels of funding currently being invested in the infrastructure and associated security measures.	-
Access to Employment	Dinas Powys is situated near to key employment settlements most notably Cardiff and Barry, however existing public transport services and infrastructure provision would require an increased level of funding to deliver improved accessibility to employment. The car (or van) is the dominant mode of travel to work across Dinas Powys, as with the Vale of Glamorgan and South East Wales as a whole. 79% of those from Dinas Powys drive to work (including passengers) compared with 76% of South East Wales as a whole. Journey times by car or van to employment would be expected to deteriorate in the do-minimum due to traffic growth on the corridor.	--
Access to Services	The Welsh Index of Multiple Deprivation (WIMD) 2014 for access to services deprivation identifies that large parts of the study area are ranked in the least deprived lower super output areas. Some areas retain a moderate ranking in terms of access to services. A large proportion of retired people live within the study area, who tend to be more reliant on public and community transport to participate fully in the community and get access to essential social and healthcare facilities. Increasing pressures on available budgets are subsequently putting increased pressure on the provision of bus services. An increased level of funding is however required to deliver improved access to services, particularly for younger and retired people who are more reliant on public transport. Moreover, journey times by car or van to services would be expected to deteriorate in the do-minimum due to traffic growth on the corridor.	--
Affordability	Problems many people in the region encounter in accessing work, education and healthcare because of lack of available, affordable transport (Cardiff Capital Region Metro Study; 2013). This is not anticipated to change in the do-minimum compared to the existing situation.	0
Severance	The A4055 Cardiff Road passes through the centre of Dinas Powys. High traffic volumes including HGVs passing through the settlement have an impact on communities with a limited number of viable crossing points available. This would increase in the future year with traffic growth (anticipated to be in the region of 12% in the peak hours as set out in the Economic Appraisal).	-
Option and Non-Use Values	There is high use of the private car within and through Dinas Powys, especially for access to employment. Services and employment are relatively centralised within Dinas Powys and nearby urban centres however the available alternate mode options are not always considered viable to accommodate many journey needs (including the available frequency of services and capacity). An increased level of funding is required to deliver realistic and attractive alternatives to the private car.	-
Cultural		
Cultural Facilities	No impact identified.	0
Welsh Language	No impact identified.	0

Do-Minimum		
Environmental		
Noise	Road transport is the dominant mode of transport for journeys in the region (2011 Census) and thus contributes to noise pollution. No quantitative data on noise levels is available at this stage but it would be anticipated that traffic noise would increase with anticipated increases in traffic levels in the do-minimum	-
Air Quality	Road transport is the dominant mode of transport for journeys in the region (2011 Census) and thus contributes to air pollution. There are no Air Quality Management Areas (AQMA) within the study area. According to the 2016 Air Quality Progress Report for Vale of Glamorgan, the overall air quality across the Vale of Glamorgan complies with regulations to protect human health. Data for 2012 however has highlighted that at some locations road traffic emissions of nitrogen dioxide (NO2) are at, or close to, the relevant annual average concentration of 40ug/m3. These locations include Cogan Roundabout and Cardiff Road, Dinas Powys. Increasing traffic levels would be anticipated to exacerbate air quality issues, however the air quality monitoring shows reducing emissions and with changes in the composition of fuels in vehicles over time, air quality changes in the do-minimum are considered likely to be neutral.	0
Greenhouse Gases	See note for Air Quality. Road transport is the dominant mode of transport for journeys in the region (2011 Census) and thus contributes to Greenhouse gas emissions. In the do-minimum, traffic levels will increase which may affect emissions, although the changes in the composition of fuels in vehicles over time, greenhouse gas emissions are considered likely to be neutral.	0
Landscape	No impact identified.	0
Townscape	The strategic road network passes through the centre of Dinas Powys. The high levels of traffic flow is subsequently considered to have an adverse impact on the community and this will worsen with increased traffic levels in the future year.	-
Historic Environment	No impact identified.	0
Bio-Diversity	No impact identified.	0
Water Environment	No impact identified.	0
Residential Amenity	The impact on residential amenity considers the cumulative impact of air quality, noise and visual intrusion on residential properties. A slight adverse impact on residential amenity has subsequently been identified as adverse impacts on noise and air pollution, accidents and severance due to increasing traffic levels increasingly affect those living especially close to the A4055 Cardiff Road through Dinas Powys.	-
Economic		
Journey Time Changes	The increasing levels of traffic are anticipated to lead to reduced journey times in the do-minimum, with congestion through the Dinas Powys corridor and delay at the key junctions. A step change in the level of investment in the infrastructure is required to deliver journey time improvements.	-

Do-Minimum		
Journey Time Reliability Changes	The increasing levels of traffic are anticipated to lead to further impacts on the reliability of journey times in the do-minimum, with congestion through the Dinas Powys corridor and resilience of the key junctions. A step change in the level of investment in the infrastructure is required to deliver journey time reliability improvements.	-
Transport Costs	The rising cost of transport including high fuel prices is making owning and running a car an increasing obstacle, whilst the availability of public transport and other modes of transport is not always a viable alternative. A step change in the level of investment in services and infrastructure is required to deliver viable alternatives the car at an affordable cost, or to reduce journey costs by car or van.	-
Accidents	A number of accidents have been identified within the study area, particularly through the A4055 Cardiff Road link through Dinas Powys. This is anticipated to increase with future traffic growth on the congested corridor. A step change in the level of investment in the infrastructure is required to deliver road safety improvements.	-
Wider Economic Impacts	No impact identified.	0
Land	No impact identified.	0
Capital Costs	The delivery of the local and regional transport programmes requires continued financial support from the public sector.	0
Revenue Costs	Bus services require continued subsidy from the public sector. Rising cost of transport is resulting in many households struggling to afford to own and run a car, whilst public transport alternatives are often not a viable alternative.	0

Table 26 Impact Assessment: Bypass / Green Alignment (east of Dinas Powys interconnecting with the A4055 at Cardiff Road and the Merrie Harrier Junction)

Bypass / Green Alignment (east of Dinas Powys interconnecting with A4055 at Cardiff Road and the Merrie Harrier Junction)		
	Impacts	**Scale**
Social		
Physical Activity	It is expected that a new bypass would have a slight beneficial impact on physical activity with the integral provision of segregated walking and cycling infrastructure. It could also improve conditions for walkers and cyclists along the A4055 existing transport corridor through Dinas Powys as reduction in traffic flow are experienced.	+
Journey Quality	The broadly qualitative assessment completed using DMRB 11.3.9.2 (travellers' views) and 11.3.9.3/4 (traveller stress) has been considered alongside traveller care elements noted within TAG Unit A4.1.6 (Journey Quality Impacts). It is anticipated that the implementation of a new off-line bypass would establish moderate beneficial improvements in journey quality in	+++

Bypass / Green Alignment (east of Dinas Powys interconnecting with A4055 at Cardiff Road and the Merrie Harrier Junction)		
	comparison to the do-minimum scenario, with specific enhancements to traveller views and stress anticipated. The existing highway route interconnecting through Dinas Powys is urbanised, predominantly bounded by existing residential properties. In contrast, a new bypass would be situated east of Dinas Powys and west of Penarth within an extant Green belt with the potential to slightly enhance a traveller's view of the surrounding area. It would however be noted that whilst slight betterment would be envisaged, the outer fringes of the surrounding urban areas would remain within view from the bypass alignment with the subsequent potential for landscaping to mitigate what might be considered adverse scenery. In line with DMRB 11.3.9.3/4, a range of factors can affect a traveller's exposure to driver stress primarily encompassing frustration, fear of potential accidents, and uncertainty relating to the route being followed. Whilst there is unlikely to be a notable improvement regarding route uncertainty, it is anticipated that there would be a slight improvement with regard to general traveller stress following implementation of a new road. Using thresholds outlined within the DMRB guidance for urban areas, observed maximum traffic flows along the A4055 Cardiff Road through Dinas Powys are at 813 vehicles (northbound one-way) during the AM peak and 896 vehicles (southbound one-way) during the PM peak (for average journey speeds less than 50 km/hr) indicating high levels of stress are currently being experienced. Implementation of a new bypass is estimated to reduce maximum one-way vehicle flows through Dinas Powys to less than 600 vehicles during the peak hours indicating a reduction in stress levels from high to moderate. The DMRB assessment also considers the impact of traffic volume on driver stress for a 60mph single-carriageway categorising forecast stress for one-way traffic flows as low (<600 vehicles), moderate (600-800 vehicles) and high (over 800 vehicles). Implementation of the bypass designed to current DMRB standards could subsequently establish low levels of driver stress during the peak hours with maximum forecast peak hourly flows per lane of <600 vehicles (Do-something TEMPro 2036 traffic flows assuming a core scenario average speed >70 km/hr). The guidance on driver stress does note that the advised thresholds are provided for guidance only and that the assessment of specific routes can only be made in the light of full knowledge of local conditions. The potential to reduce the fear of accidents associated with a new bypass is subsequently also considered applicable as a driver's interface with junctions/ driveways, formal/ informal road crossings and sensitive land-uses (including Dinas Powys Primary School, for example) is reduced or removed. A new link has also demonstrated an improvement to journey times along a bypass with the potential to reduce frustration associated with extant congestion and delay experienced along the existing A4055 Cardiff Road link through Dinas Powys. This benefit is however lessened by the retention of driver delay at the interconnecting Merrie Harrier junction and Barons Court junction. Traveller care is considered less influential with regard to the bypass with cleanliness, facilities and information factors considered to retain a neutral impact against the do-minimum scenario. Improvements would however be identified with regard to the traveller's environment with enhanced driver capability anticipated as a result of a new and improved	

Bypass / Green Alignment (east of Dinas Powys interconnecting with A4055 at Cardiff Road and the Merrie Harrier Junction)		
	route, as well as potential to establish an improved condition and smoothness of ride. The implementation of a bypass would provide further benefits to walkers and cyclists through enhanced infrastructure provision and interconnectivity. Implementation of an integral shared walking/ cycling route would provide improved traveller care (information, environment), views (similar benefits to those noted for the highways review), and stress with perceived reductions in frustration and fear of potential accidents. Whilst no new public transport infrastructure or services are specifically included as part of this option, the new road would facilitate more attractive journeys for buses with similar highway benefits as noted herewith. In line with TAG Unit A4.1.6, a high impact rating has subsequently been applied to the scoring as the number of travellers affected is estimated to be in excess of 10,000 users per day based on the reassignment of traffic from the existing A4055 Cardiff Road link to a new bypass.	
Accidents	The DfT's program COBALT (COst and Benefit to Accidents Light Touch) has been used to undertake the analysis of the impacts on accidents as part of the economic appraisal of the road scheme. The accident impact assessment has been performed using the method set out in the COBALT Manual. It is used to forecast changes in the number of accidents and casualties and estimate the monetary value of these impacts. The accident rates used for the assessment are the default accident rates (national average) provided in the Tag Datebook. Full details of the analysis including supporting information and methodologies have been included within Appendix F. The analysis indicates that following the implementation of a new bypass there could be a reduction in accidents from 876 to 716 against the do-minimum scenario, a total of 169 less accidents occurring within the study area over a 60-year assessment period (2023 – 2082). Whilst the results forecast a reduction of 161 slight and 10 serious accidents, the results do forecast an increase of two fatal accidents. This would be due to having a higher speed road. The overall monetary value of accident savings is calculated as £3.66m. The benefits of a reduction in accidents is therefore considered to be minor, with some benefits but the lower slight and serious accidents offset by the forecast increase in fatalities.	+
Security	A review of security has been completed in line with TAG Unit A4.1.4 (Security Impacts) to assess the implementation of the route alignment. The guidance notes that there are no formal guidelines for road users. However, the guidelines set out readily apply to road users whilst considering the security indicators in relation to road users as: • Road users are more vulnerable to crime in circumstances where they are required to stop their vehicles or travel at slow speeds, such as at the approaches to signals or in congested conditions; • Road users are more vulnerable to crime at locations where they are required to leave their vehicles, such as at service stations and car parks; and • The importance of each indicator is likely to vary according to the location and nature of the road; for example: emergency call facilities	+

Bypass / Green Alignment (east of Dinas Powys interconnecting with A4055 at Cardiff Road and the Merrie Harrier Junction)		
	are likely to be more important than surveillance when considering a rural road. Whilst existing site perimeters, entrances and exits are anticipated to provide moderate benefit to the existing route, it would be anticipated that a new bypass designed to current DMRB standards would present the opportunity for robust, high quality demarcation to support enhanced security for users. In the absence of a baseline assessment, it would be proposed that a new bypass constructed in line with current DMRB standards would improve formal surveillance through the transport corridor. The specific requirements for CCTV monitoring systems and emergency call points would be clarified during detailed design, however at this stage of the assessment a slight betterment is considered a reasonable assumption. No improvement to informal surveillance has been considered applicable with a new bypass in place. The existing route through an urban area already establishes moderate levels of informal surveillance against a new route through a less urbanised area, albeit with a design implemented that would likely support open visibility of the alignment. Implementation of robust landscaping along the bypass route is anticipated (design/ planting) as part of detailed design development to positively contribute towards good visibility. In the long term the establishment of hedgerow would be anticipated although this is likely to be managed so as to maintain suitable safety and security for users of the bypass including pedestrians and cyclists. Highway lighting for the benefit of vehicles has only been considered at new junctions. This will be implemented to current standards to enhance upon existing provision. In addition, and in accordance with Sustrans guidance, 5m high lighting columns have been chosen for the length of the cycleway at 35m intervals and included within the cost makeup for the option. It is however recommended that due to the close proximity to the bypass alignment that a risk assessment be carried out during the next stage to ensure that the lighting does not adversely affect traffic using the bypass.	
Access to Employment	The transport user benefits assessment completed to assess the route option has quantified user and provider benefits (£M PVB 2010 prices discounted to 2010) for the new link are forecast to be: • £23.43M for commuters; and • £24.07M for business. This indicates that the bypass could afford benefits for access to work and for businesses in the local area. This would include accessibility to strategic sites by providing a new link with reduced journey times and improved journey time reliability.	++
Access to Services	The transport user benefits assessment completed to assess the route option has quantified user and provider benefits (£M PVB 2010 prices discounted to 2010) for the new link are forecast to be: • £28.08M for other consumers. This indicates that the bypass could afford benefits for access to services in the area by providing a new link with reduced journey times and improved journey time reliability.	++

Bypass / Green Alignment (east of Dinas Powys interconnecting with A4055 at Cardiff Road and the Merrie Harrier Junction)		
Affordability	The potential to divert trips from the car to public transport as a result of likely improved journey time and journey time reliability for buses is mitigated by the potential for the option to retain the car as the dominant mode of travel in the region.	0
Severance	An assessment has been completed to consider the impact that a new bypass would have on severance through the transport corridor, both for the new route alignment and existing A4055 Cardiff Road. The assessment has been completed in line with TAG Unit A4.1.5 (Severance Impacts). A new route bypassing Dinas Powys is forecast to reduce daily traffic flows through Dinas Powys with up to 75% reductions in traffic flow during the peak hours of travel as a result of vehicle trips transferring to a new bypass. The greatest impact is likely to be applicable to pedestrians as opposed to cyclists, however reduced traffic flow through Dinas Powys is anticipated to retain a moderate beneficial impact for both modes of travel. In addition, DMRB 11.3.8 provides guidance on the relief of severance using proportional improvement to traffic flows. The guidance is only applicable to roads with an existing AADT flow of more than 8,000 as in the A4055 Cardiff Road through Dinas Powys. A moderate level of traffic relief is subsequently forecast with up to 75% reductions in traffic flow estimated. The guidance also acknowledges that a review of any severance relief that can be gained should be seen in the context of the size of the community affected noting low to moderate decreases in traffic flow are likely to be more significant for smaller communities in comparison to larger urban areas. In contrast, the current alignment is shown to sever Cross Common Road and Green Lane. It would be proposed that a new junction is provided to retain accessibility to Green Lane which is currently utilised to access the Cog Moors Waste Water Treatment works. Further consideration will need to be given to Cross Common Road to identify the mitigation required to retain accessibility to properties/ buildings from north and south of the bypass alignment. The bypass alignment affects a number of PRoW. It is anticipated that crossings will however be rationalised by public right of way re-alignment and/ or provision of crossing points under/ over the bypass alignment to maintain existing connectivity and to effectively establish a neutral impact. Culverts have been assumed where PRoW cross the bypass alignment at in-fill sections, and where it crosses through cut sections 3m wide bridges have been assumed.	++
Option and Non-Use Values	The implementation of a new bypass has the potential to encourage trips made by bus as journey times and reliability improve, as well as potentially increasing the resilience of the road network by alleviating high traffic flows along key sections of the existing highway, most notably the A4055 Cardiff Road through Dinas Powys.	+
Cultural		
Cultural Facilities	No impact identified.	0
Welsh Language	No impact identified.	0

Bypass / Green Alignment (east of Dinas Powys interconnecting with A4055 at Cardiff Road and the Merrie Harrier Junction)		
Environmental		
Noise	Road transport is the dominant mode of transport for journeys in the study area (2011 Census) and thus contributes to noise pollution. This review is not yet quantifiable in the absence of quantitative data, but a moderate adverse impact is considered reasonable to assume whilst also noting the impacts from short-term construction noise associated with the new route. The results acquired from the traffic assessment suggest as much as 75% of existing A4055 Cardiff Road vehicles could transfer to a bypass suggesting a significant reduction in noise pollution could be experienced through central Dinas Powys. However, this transference of trips also establishes a new noise pollution source along the bypass alignment with the potential to adversely impact dwellings situated to the east of Dinas Powys and west of Penarth. In most cases mitigation measures should be available to help alleviate any associated short and long-term noise pollution but this would need to be considered against the potential to establish adverse landscape impacts (e.g. implementation of noise bunds). The traffic noise impacts would however need to be modelled in accordance with DMRB to quantify the noise impacts and consider the detailed propagation path for the alignment. This would allow for a detailed comparison of all bypass alignments against the do-minimum scenario and quantify the number of properties that would be adversely affected as well as the number of properties that would benefit from a new bypass proposal.	--
Air Quality	Road transport is the dominant mode for journeys in the region (2011 Census) and thus contributes to air pollution. There are no AQMA within the study area. Based upon the 2016 Air Quality Progress Report for the Vale of Glamorgan, the overall air quality across the county complies with regulations to protect human health. Data from the 2012 Air Quality Progress Report highlighted that at some locations road traffic emissions of Nitrogen Dioxide (NO2) were at, or close to, the relevant annual average concentration of 40 ug/m3. These were recorded away from the project's study area at Culverhouse Cross (Vale of Glamorgan, 2013). Implementation of a new highway alignment has the potential to improve local air quality through Dinas Powys with a reduction in local traffic flows forecast, especially for those currently situated adjacent to the existing A4055 Cardiff Road. In contrast, the implementation of new highway infrastructure is likely to establish a deterioration in local air quality along a new bypass alignment with the potential to adversely affect those living within proximity of a bypass. Additionally, the construction of a new road has the potential to encourage increased travel by private car as traffic conditions through Dinas Powys are improved. Whilst provision of an integral walking/ cycling route would help mitigate this impact it is unlikely to fully alleviate the adverse impacts identified herewith. The impact is not yet quantifiable in the absence of quantitative data, but a slight adverse impact is considered reasonable to assume at this stage of the analysis given the possible impacts noted. The impact of construction on managing air quality/ dust as well as vibration impacts would also need to be considered.	-

Bypass / Green Alignment (east of Dinas Powys interconnecting with A4055 at Cardiff Road and the Merrie Harrier Junction)		
Greenhouse Gases	The traffic modelling completed has assumed that existing A4055 Cardiff Road vehicle trips will divert onto a new bypass as opposed to the establishment of new vehicle trips on the highway network. On this assumption no increase in Greenhouse gas emissions would be assumed over and above forecast traffic growth/ committed development trips included as part of the traffic modelling assessment. In contrast, it is considered that the implementation of a new highway bypass will have the potential to encourage increased travel by private car as traffic conditions through Dinas Powys are improved. Whilst provision of an integral walking/ cycling route would help mitigate this impact it is unlikely to fully alleviate the adverse impacts identified herewith. The impact is not yet quantifiable in the absence of quantitative data, but a slight adverse impact is considered reasonable to assume at this stage of the analysis given the perceived impacts noted.	-
Landscape	A range of factors have been assessed as part of the WebTAG analysis for landscape, including pattern, tranquillity, cultural and landcover, together with an overarching summary of character. It is subsequently considered that a bypass will reduce tranquillity, farmland will be lost and previously unlit landscape will be lit, field patterns and open spaces disrupted, and long-distance views will be interrupted including an adverse impact on the night time setting. Impacts can be mitigated through landscape design along route, retention or planting of new hedges and design of elevated road sympathetic to local landscape character. Moreover, good landscape design is needed to mitigate lighting impacts at night. Overall the impact is assessed as moderate adverse.	--
Townscape	The area of townscape is characterised around the large village of Dinas Powys with low density residential areas predominantly consisting of cul-de-sac roads. There are isolated individual properties located within the surrounding agricultural landscape to the south and east of Dinas Powys. The Dinas Powys Conservation Area is notable for its architecture from three phases of developing which reflects the expansion of the village (pre-1880s, 1880s to 1930s, late 20th Century). As the road alignment is both linear and bypass Dinas Powys, it is considered that the alignment would not result in a significant change in the layout, density and mix, scale, appearance, or land-use of the townscape establishing neutral impacts for these variables. A slight adverse impact is however noted with regard to human interaction as access to and quantity of open space between Dinas Powys (Murch) and Lower Penarth would likely be negatively impacted by the development of a bypass. In contrast, and whilst the alignment would not result in a significant change in the cultural aspect of the townscape, with the alignment bypassing Dinas Powys this would divert traffic away from the village which could enhance its overall heritage character. Central Dinas Powys could also be adversely affected by increased traffic speeds (unless mitigated) in light of any reduced traffic flows experienced.	0

Bypass / Green Alignment (east of Dinas Powys interconnecting with A4055 at Cardiff Road and the Merrie Harrier Junction)		
Historic Environment	The baseline assessment has completed a thorough analysis of known environmental and land-use characteristics for the study area and identified an overall slight adverse impact on the historic environment. The historic resource of the study area is characterised predominately by agricultural land comprising both arable and pasture to the east, south east of Dinas Powys and west of Penarth. Surrounding this agricultural land are the built-up urban settlements of Dinas Powys and Lower Penarth. The following have been identified within 500m of the bypass alignment: • One area of Registered Common Land; • One Scheduled Monument (Cogan Deserted Medieval Village) separated in to three pockets; • Eight Listed Buildings (seven Grade II and one Grade II*) and • Multiple 'known' archaeological sites (Roman, Medieval and Post-Medieval features). There is potential for as yet unidentified buried archaeological assets to be present within the bypass alignment footprint. There are no Registered Parks and Gardens, Conservation Areas, World Heritage Sites, Historical Landscapes or Registered Battlefields located within 500m of the bypass alignment. The designated heritage assets are mainly associated with domestic buildings. Eight of the listed buildings within 500m of the bypass alignments are located within the Green wedge between Dinas Powys and Lower Penarth. The remaining designated assets are not overly complex and represent medieval ruins to the west of Lower Penarth. The Dinas Powys Conservation Area is located approximately 1km west of the alignments. The bypass alignment has the potential to have a slight adverse impact on 'unknown' non-designated heritage assets, as well as the potential to directly impact on buried archaeological remains which could result in the permanent and irreversible loss of assets. A neutral impact has been determined on the settings of the Listed Buildings and Scheduled Monument with a slight beneficial impact identified on the Conservation Area as it is anticipated this would divert traffic from the centre of Dinas Powys.	-
Bio-Diversity	Pop Hill Site of Special Scientific Interest (SSSI) is within 100m of the western end of the route and the edge of one Site of Importance for Nature Conservation (SINC). The edge of two areas of ancient woodland are likely to be impacted. Priority habitats are present along the bypass alignment and there is potential for a variety of protected and priority species to be present and therefore could be affected by both route proposals. It is anticipated at this stage that the majority of impacts can be mitigated for through standard techniques in accordance with the relevant best practice guidelines. The scheme is considered to have up to a moderate adverse impact on biodiversity due to the potential loss and damage of ancient woodland and Pop Hill SINC. The Pink alignment, as it comprises three roundabouts, is likely to lead to the loss of more habitat than the Green alignment (one roundabout) but	--

Bypass / Green Alignment (east of Dinas Powys interconnecting with A4055 at Cardiff Road and the Merrie Harrier Junction)		
	otherwise there is little to differentiate the routes, from an ecological perspective, until further surveys are completed. It should also be noted that the current route alignment will adversely impact on land being purchased by Dŵr Cymru Welsh Water to provide replacement woodland habitat as compensation for loss of woodland resulting from extending the Cog Moors Waste Water Treatment Works. The woodland is being planted specifically for dormice and will be covered by a 10-year management plan which forms part of the licence application, and if approved will form part of a legally binding document. As a minimum it would be assumed that replacement habitat would need to be provided to compensate for any woodland lost (regardless of whether any dormice are present or not). There would be a need to provide more woodland (most likely at cost) than being lost (usually an additional 10-15%) and this would likely need to be connected to the Dŵr Cymru Welsh Water Cog Moors site to allow dormouse dispersal. The full impacts and potential for route alignment at this location would need to be confirmed as part of a Stage Three WelTAG assessment.	
Water Environment	The potential impacts to the 'main rivers' and ordinary water courses concerns a possible accidental spillage, construction activities and routine run-off. This potential impact requires further investigation at Stage Three as the River Cadoxton has achieved a moderate Water Framework Directive score. Following further investigations, mitigation measures may be required as part of the design. A construction environmental management plan should be put in place during the construction of the alignment which will minimise the risk of pollution to watercourses during construction. Three ordinary watercourses are crossed as part of both the bypass alignment. Sections of the route cross the floodplain to the south west of the alignments in a Flood Zone C2/B. The floodplain is associated with the Cadoxton River for which the NRW flood maps confirms that flood risk is moderate to high in the areas where the alignment interacts with the floodplain. Potential effects include for the loss of floodplain storage volume and impediment of floodplain flow paths. To mitigate, there may be a need to provide compensation storage and culverts through embankments to maintain continuity of flow conveyance. Any new crossings of smaller watercourses also have the potential to impact flood risk, careful design of crossings should avoid impacts/ mitigate risks.	-
Residential Amenity	The impact on residential amenity considers the cumulative impact of air quality, noise and visual intrusion on residential properties. The combined assessment from the above indicates that the properties in Dinas Powys will largely benefit from reductions in traffic through the village. A large number of properties to the east of Dinas Powys and west of Penarth will however experience adverse impacts due to proximity of the alignment, anticipated to give a moderate adverse impact. There is potential for these impacts to be mitigated as part of design development of the bypass however there may also be impacts of visual intrusion based on longer distance views.	--
Economic		
Journey Time Changes	The implementation of a bypass designed to current DMRB standards is anticipated to result in measurable improvements in journey times. As a result of increased average speeds between Biglis roundabout and the	++

Bypass / Green Alignment (east of Dinas Powys interconnecting with A4055 at Cardiff Road and the Merrie Harrier Junction)		
	Merrie Harrier junction, a nine minutes time saving for northbound journeys has been forecast during the AM peak and a three minute saving in the PM peak. For southbound journeys, time savings of 3 minutes in the AM peak and 13 minutes in the PM peak have been calculated. The scheme user and provider benefits are subsequently estimated to have a total discounted value in 2010 prices and values appraised over 60 years, of £76M which represents a significant beneficial improvement. There is also the potential, if active travel measures are delivered, that additional benefits to walkers and cyclists could be realised through enhanced infrastructure provision.	
Journey Time Reliability Changes	It is anticipated that the implementation of a bypass designed to current DMRB standards could establish measurable improvements in journey time reliability between Biglis roundabout and the Merrie Harrier junction. Analysis completed suggests journey time improvements of up to 10 minutes for northbound trips and 13 minutes for southbound trips.	++
Transport Costs	Transport costs for road users are anticipated to reduce compared to the do-minimum reflecting the journey time savings. With regards to public transport operating costs, existing bus services would be anticipated to benefit from reduced traffic through Dinas Powys and the opportunity to use the new route of good standard. It is therefore anticipated that delivery of a new road link and associated junction improvements would have a negligible impact on transport costs compared to the do-minimum option as the benefits recognised are likely to be offset by the scheme encouraging trips to be made car.	0
Accidents	The DfT's program COBALT (COst and Benefit to Accidents Light Touch) has been used to undertake the analysis of the impacts on accidents as part of the economic appraisal of the road scheme. The accident impact assessment has been performed using the method set out in the COBALT Manual. It is used to forecast changes in the number of accidents and casualties and estimate the monetary value of these impacts. The accident rates used for the assessment are the default accident rates (national average) provided in the Tag Datebook. Full details of the analysis including supporting information and methodologies have been included within Appendix F. The analysis indicates that following the implementation of a new bypass there would be a reduction in accidents from 876 to 716 against the do-minimum scenario, a total of 169 less accidents occurring within the study area over a 60-year assessment period (2023 – 2082). Whilst the results forecast a reduction of 161 slight and 10 serious accidents, the results do forecast an increase of two fatal accidents. This would be due to having a higher speed road. In terms of the economic assessment as a consequence of overall reduced road traffic accidents, the analysis indicates a total cost saving of £3.66M against the do-minimum scenario (with costs discounted to 2010 prices). These are for the 60-year assessment period (2023 – 2082).	+
Wider Economic Impacts	It is anticipated that some additional wider economic impacts associated with the option could be realised. This may include induced investment through additional strategic development arising as a result of improved connectivity between the local urban centres of Barry and Cardiff. However, the bypass option predominantly focusses on addressing a	0

Bypass / Green Alignment (east of Dinas Powys interconnecting with A4055 at Cardiff Road and the Merrie Harrier Junction)		
	local connectivity issue through an extant transport corridor and therefore significant benefits to medium/ large commercial businesses are arguably less likely to be significantly realised in areas beyond the study area.	
Land and Property	Implementation of a bypass will require significant areas of land, in addition to land adjacent to existing routes to facilitate the on-line highway improvements. The exact extent and potential costs are unknown at this stage and would require further exploration, however a cost allowance has been included, as identified in the Financial Case. The option is anticipated to have the following impacts on residential and business properties: • Number of buildings directly impacted by alignment = 0 • Number of buildings with potential for some land take = 0 • Number of residential properties with potential impacts by virtue of close proximity = 3 (house off Cross Common Road, property west of Sully Road, property accessed off Murch Road and Sully Road) In addition, the bypass would cross over the tunnel for the railway line, to the south of the Merrie Harrier junction, which is anticipated to require property agreements with Network Rail. It should be noted that at this stage information on land holdings impacted is not known. Impacts are assessed as moderate given the relatively low number of properties impacted for a scheme of this length.	--
Capital Costs	The delivery of a bypass would require a high capital investment from the public sector. The cost estimate, in undiscounted 2017 market prices, is £39.463M.	---
Revenue Costs	The highway would require maintenance support from the public sector in addition to that for the existing route, and it is envisaged that the scheme would result in additional pressure on increasingly stretched highway maintenance budgets. Given the anticipated requirement for flood alleviation measures, the ongoing costs of the option may be moderate.	--

Table 27 Impact Assessment: Bypass / Pink Alignment (east of Dinas Powys interconnecting with the A4055 at Cardiff Road and the Merrie Harrier Junction, including roundabout for connectivity to Murch Road)

Bypass / Pink Alignment (east of Dinas Powys interconnecting with the A4055 at Cardiff Road and the Merrie Harrier Junction)		
Note: The impact assessment scoring is as identified for the Green alignment with the following amendments confirmed.		
	Impacts	**Scale**
Economic		
Journey Time Changes	The implementation of a bypass designed to current DMRB standards is anticipated to result in measurable improvements in journey times. As a result of increased average speeds between Biglis roundabout and the Merrie Harrier junction, the Green alignment is forecast to establish a nine minute time saving for northbound journeys during the AM peak, and	+

Bypass / Pink Alignment (east of Dinas Powys interconnecting with the A4055 at Cardiff Road and the Merrie Harrier Junction)		
	a three minute saving in the PM peak. For southbound journeys, time savings of 3 minutes in the AM peak and 13 minutes in the PM peak have been calculated. The implementation of a new roundabout mid-way through the bypass alignment (to facilitate access to Murch Road) is subsequently likely to establish a slightly reduced journey time benefit to that identified for the Green alignment. The extent of any delay would be subject to the completion of traffic capacity assessment. It will also alter traffic patterns using the bypass and Murch Road. In the interim it is considered appropriate to assign a reduced slight benefit for the bypass alignment.	

Table 28 Impact Assessment: Multi-Modal Option

Multi-Modal Option		
	Impacts	**Scale**
Social		
Physical Activity	It is expected that implementation of the multi-modal option would have a moderate beneficial impact on physical activity with the potential to encourage sustainable travel throughout the study area.	++
Journey Quality	The broadly qualitative assessment has been completed using the journey quality elements noted within TAG Unit A4.1.6 (Journey Quality Impacts). With regards to traveller care, it is considered that improvements to cleanliness, facilities, information provision and environment would all be recognised following implementation of the multi-modal option. There is also potential betterment with regard to traveller stress with improvements to fear of potential accidents and route uncertainty. Enhancements made to the public transport network and walking/ cycling routes can reassure travellers, reduce safety concerns and actively promote travel by sustainable means for a broad spectrum of society. This would perhaps be especially applicable for disabled, elderly and younger passengers. In addition, the provision of enhanced timetables, network maps and way-finding can lead to improved route certainty, an additional contributory factor when seeking to enhance the perception of safety and security for passengers. A neutral impact for traveller frustration has been applied subject to road robust layout/ geometry and condition improvements being provided especially at key junctions to maximise the potential for bus users, walkers and cyclists to make good progress along a route. A neutral impact has subsequently also been applied to traveller's views with negligible improvements recognised as a result of the multi-modal option.	++
Accidents	Through the delivery of improved walking and cycling infrastructure, and enhanced public transport services and interchange facilities there is the potential to improve road safety through the removal of pinch points, severance, improving the standard of the highway network, and encouraging people to travel by more sustainable means.	+

Multi-Modal Option		
Security	The broadly qualitative assessment completed using the journey quality elements noted within TAG Unit A4.1.6 (Security Impacts). The implementation of multi-modal design features could establish a moderate beneficial impact for travellers using sustainable modes of travel with the potential to attract users away from the dominant use of the car. It is assumed that a range of design features would be applied to current standards as part of detailed development to establish robust improvements to security including for example the provision of CCTV systems designed to encourage staff and passenger/ user surveillance; landscaping designed to maximise the potential for informal surveillance; appropriate fencing to clearly demarcate exits, entrances and site perimeters; good lighting design to maximise natural light as well as attention to lighting at signing, information, waiting/ shelter and help points; and good provision of emergency phones, public telephones/ wi-fi and information on emergency help procedures.	++
Access to Employment	Rail services within the study area accessed from Dinas Powys and Eastbrook railway stations already interconnect with the key urban settlements throughout the region, however the option for enhanced rail services and interchange facilities together with bus service/ infrastructure enhancements would further improve accessibility to employment, notably in Cardiff, Barry and Bridgend. The provision of walking and cycling and a new Park and Ride facility would further support improved interconnectivity to employment.	++
Access to Services	Rail services within the study area accessed from Dinas Powys and Eastbrook railway stations already interconnect with the key urban settlements throughout the region, however the option for enhanced rail services and interchange facilities together with bus service/ infrastructure enhancements could further improve accessibility to services. The provision of walking and cycling and a new Park and Ride facility would further support improved interconnectivity to services.	++
Affordability	Rising cost of transport is resulting in many households struggling to afford to own and run a car. The provision of enhanced public transport and walking and cycling options has the potential to make travel more affordable for some sections of society, most notable the young and the older sections of society.	+
Severance	With improvements to walking and cycling crossing points, most notably across the A4055 Cardiff Road and interconnectivity within the wider Dinas Powys community, severance is anticipated to be reduced. In addition, the traffic modelling has identified a measurable reduction in traffic flow through Dinas Powys affording the opportunity for improved connectivity. Traffic growth would be forecast to impact on any reduced traffic flows regardless and subsequently a moderate impact is estimated.	+
Option and Non-Use Values	In line with TAG Unit A4.1.7, ‘Option and non-use values should be assessed if the scheme being appraised includes measures that will substantially change the availability of transport services within the study area (e.g. the opening or closure of a rail service, or the introduction or withdrawal of buses serving a particular rural area).’ This option includes for a range of specific measures to enhance public transport. Moreover, the implementation of integral walking and cycling infrastructure also affords some opportunity for alternate modes of travel away from use of the private car. A score of moderate beneficial is	++

Multi-Modal Option		
	therefore considered reasonable given the range of additional opportunities from the proposed option.	
Cultural		
Cultural Facilities	No impact identified.	0
Welsh Language	No impact identified.	0
Environmental		
Noise	Road transport is the dominant mode of transport for journeys in the region (2011 Census) and thus contributes to noise pollution. The improvements in public transport has the potential to encourage a mode shift away from the private car to the bus thus has the potential to improve noise pollution. The proximity of the rail line and stations to residential properties in Dinas Powys and Eastbrook means that local noise pollution may increase in Dinas Powys with an increase in rail services. Overall and at this stage of the assessment, it is considered that the delivery of an integrated public transport system that benefits from highway works and improvements to public transport, walking and cycling would have a neutral impact on noise. No quantitative data is available at this stage.	0
Air Quality	Road transport is the dominant mode for journeys in the region (2011 Census) and thus contributes to air pollution. There are no AQMAs within the study area and based on the 2016 Air Quality Progress Report for the Vale of Glamorgan, the overall air quality across the county complies with regulations to protect human health. Data from the 2012 Air Quality Progress Report highlighted that at some locations road traffic emissions of Nitrogen Dioxide (NO2) were at, or close to, the relevant annual average concentration of 40 ug/m3. However, these were recorded away from the project's study area at Culverhouse Cross (Vale of Glamorgan, 2013). Implementation of an enhanced integrated public transport has the potential to improve local air quality through Dinas Powys with the opportunity to transfer transport user trips from the car to public transport. This would be particularly beneficial to those situated adjacent to the A4055 Cardiff Road where existing traffic flows are high. The impact is not yet quantifiable in the absence of quantitative data, but a slight beneficial impact is considered reasonable to assume at this stage of the analysis given the perceived impacts noted. The impact of construction (in relation to the Park and Ride facility especially) on managing air quality/ dust as well as vibration impacts would also need to be considered.	+
Greenhouse Gases	The increase in buses is not expected to have an adverse impact on Greenhouse gases compared to the do-minimum option. The improvements in public transport has the potential to encourage a mode shift away from the private car to the bus thus has the potential to mitigate adverse levels of Greenhouse gas emissions, whilst the improvements to the highway could encourage some to drive more frequently. It is considered that the delivery of an enhanced integrated public transport system that benefits from highway works and improvements to	+

Multi-Modal Option		
	public transport, walking and cycling would have a slight beneficial impact on Greenhouse gas emissions. No quantitative data is available at this stage.	
Landscape	A range of factors have been assessed as part of the WebTAG analysis for landscape, including pattern, tranquillity, cultural and landcover, together with an overarching summary of character. It is subsequently considered that a multi-modal option will reduce tranquillity and previously unlit landscape will be lit, field patterns and open spaces disrupted, and long-distance views will be interrupted including an adverse impact on the night time setting. This is particularly with reference to the Park and Ride proposal. Impacts can be mitigated through landscape design, retention or planting of new hedges and design sympathetic to local landscape character. Moreover, good landscape design is needed to mitigate lighting impacts at night.	-
Townscape	The area of townscape is characterised around the large village of Dinas Powys with low density residential areas predominantly consisting of cul-de-sac roads. There are isolated individual properties located within the surrounding agricultural landscape to the south and east of Dinas Powys. The Dinas Powys Conservation Area is notable for its architecture from three phases of developing which reflects the expansion of the village (pre-1880s, 1880s to 1930s, late 20th Century). To a large extent the multi-modal option utilises existing rail, bus, walking and cycling transport infrastructure within and surrounding Dinas Powys. For the majority of townscape features subsequently assessed including layout, density and mix, scale, appearance, cultural and land-use it is considered that the multi-modal option will have a neutral impact with no significant change in the townscape character of Dinas Powys and Lower Penarth. A slight beneficial impact is identified with regard to the cultural aspect of human interaction with the option potentially establishing an increase of individuals utilising the upgraded public transport and walking and cycling routes helping to mitigate existing high traffic flows through the village.	0
Historic Environment	The baseline assessment has completed a thorough analysis of known environmental and land-use characteristics for the study area and identified an overall neutral impact on the historic environment. The historic resource of the study area is characterised predominately by agricultural land comprising both arable and pasture to the east, south east of Dinas Powys and west of Penarth. Surrounding this agricultural land are the built-up urban settlements of Dinas Powys and lower Penarth. The following have been identified within 500m of the multi-modal option: • One area of Registered Common Land; • One Scheduled Monument (Cogan Deserted Medieval Village) separated in to three pockets; • Eight Listed Buildings (seven Grade II and one Grade II*) and multiple 'known' archaeological sites (Roman, Medieval and Post-Medieval features). There is potential for as yet unidentified buried archaeological assets to be present within the option's footprint. There are no Registered Parks and Gardens, Conservation Areas, World Heritage Sites, Historical Landscapes or Registered Battlefields located	0

Multi-Modal Option		
	within 500m of the multi-modal option. The designated heritage assets are mainly associated with domestic buildings. Eight of the listed buildings within 500m of the multi-modal option are located within the green wedge between Dinas Powys and lower Penarth. The remaining designated assets are not overly complex and represent medieval ruins to the west of lower Penarth. The Dinas Powys Conservation Area is located within close proximity. The multi-modal option is unlikely to have any impact on 'known' and 'unknown' designated heritage assets and non-designated heritage assets and is unlikely to have any potential direct impact on buried archaeological remains. In addition, the option would not have an effect on the survival of the designated assets, and the effect on the context of the Scheduled Monument and Listed Buildings are likely to be neutral. The impact on the context of the Dinas Powys Conservation Area has the potential to be slight beneficial due to the multi-modal option potentially reducing traffic through Dinas Powys due to the utilisation of the upgraded public transport routes.	🟨
Bio-Diversity	The Park and Ride site is situated to the west of a C2 Flood Zone and adjacent to the southern boundary of the facility is an existing SINC area. Whilst there is no proposal for the Park and Ride facility to encroach upon the SINC, this will need to be considered as part of any detailed design development. As the proposed site is an existing Green field, there is potential for a variety of protected and priority species to be present and therefore could be affected by the proposal. It is anticipated at this stage that the majority of impacts can be mitigated for through standard techniques in accordance with the relevant best practice guidelines. Although no quantitative data is available at this stage, the Park and Ride scheme would be considered to have a slight adverse impact on biodiversity. Further surveys would need to be completed during the detail design analysis to understand the potential adverse impact of the proposal. There is also potential for localised impacts on biodiversity as a result of the walking and cycling measures. The Dinas Powys to Penarth connections proposal as illustrated on plan 10015022-ARC-XX-XX-DR-HE-0014 follows the line of an extant PRoW which interconnects through an existing SINC and SSSI. Environmental constraints have been highlighted within the Barry to Dinas Powys Cycleway/ Footway Review with potential for tree clearance and hedgerow to be adversely impacted. The actual environmental impact will be subject to detailed design development of preferred options highlighted within the sustainable package. Cycleway/ footway enhancements between the Merrie Harrier junction and Barons Court junction and not anticipated to have an adverse impact on biodiversity given their urban context, however this will be subject to review during the development of the detailed design. The remaining elements of the multi-modal option encompassing bus and rail enhancements are anticipated to retain a neutral impact on biodiversity.	🟥 -
Water Environment	The potential impacts to the 'main rivers' and ordinary water courses concerns a possible accidental spillage, construction activities and routine run-off. This potential impact requires further investigation as the River Cadoxton has achieved a 'moderate' Water Framework Directive (WFD) score. Following further investigations, mitigation measures may be required as part of the design.	🟥 -

Multi-Modal Option		
	A construction environmental management plan should be put in place during the construction of the multi-modal option which will minimise the risk of pollution to watercourses during construction. Three ordinary watercourses are crossed as part of both the multi-modal options (however, these upgrades would utilise the existing infrastructure present). Sections of the multi-modal option (in the vicinity of the park and ride site) are located in floodplain to the south of Dinas Powys in Flood Zones C2/B. The floodplain is associated with the Cadoxton River. Potential effects include for the loss of floodplain storage volume and impediment of floodplain flow paths if significant works are to take place on the existing transport links. Any new crossings of smaller watercourses also has the potential to impact flood risk, careful design of crossings should avoid impacts/ mitigate risks. It would be recommended that detailed design of a new Park and Ride facility should avoid the flood zone where possible.	
Residential Amenity	The impact on residential amenity considers the cumulative impact of air quality, noise and visual intrusion on residential properties. The combined assessment from the above indicates that the properties in Dinas Powys may benefit from potential reductions in traffic as a result of enhanced multi-modal infrastructure and services. A small number of properties to the south of Dinas Powys will experience adverse impacts due to the proximity of the Park and Ride scheme, subsequently anticipated to give a minor adverse impact.	-
Economic		
Journey Time Changes	The proposed service enhancements to bus and rail through Dinas Powys has the potential to reduce overall journey times by reducing waiting times and reducing overcrowding (which leads to waiting for the next train/ bus). The provision of a section of bus lane between the Merrie Harrier and Barons Court junctions has the potential to reduce bus journey times by one to three minutes for each bus. There are a low number of buses at present and thus it is not anticipated that journey time would improve for a significant number of passengers. A minor beneficial impact is envisaged.	+
Journey Time Reliability Changes	The proposed service enhancements to bus and rail through Dinas has the potential to reduce overall journey time reliability by reducing waiting times and reducing overcrowding (which leads to waiting for the next train/ bus). The provision of a section of bus lane between the Merrie Harrier and Barons Court junctions has the potential to reduce bus journey times by one to three minutes for each bus and make service times more reliable for that short section. There are a low number of buses at present and thus it is not anticipated that journey time would improve for a significant number of passengers. A minor beneficial impact is envisaged.	+
Transport Costs	Rising cost of transport is resulting in many households struggling to afford to own and run a car. The provision of enhanced public transport and walking and cycling has the potential to make travel more affordable for some sections of society, most notable the young and the older sections. However, any car trips diverted to public transport as a result of service enhancements and improved highway journey times/ reliability could be offset by more prominent forecast increases in traffic growth as the same	+

Multi-Modal Option		
	benefits are experienced by car users. It is therefore anticipated that delivery of junction/ bus lane improvements would not reduce the transport costs compared to the do-minimum option. The opportunity for more affordable means of travel is therefore mitigated and a slight beneficial impact has been applied.	
Accidents	Through the delivery of improved walking and cycling infrastructure, and enhanced public transport services and interchange has the potential to improve road safety through encouraging people to travel by more sustainable means.	+
Wider Economic Impacts	There is potential to improve access to employment and enable some groups of society who take a fully active role within society, particularly the younger groups who may not be able to afford to own a car or do not drive. The linkages to strategic employment locations such as Cardiff and Barry would be improved through enhanced public transport services.	+
Land	It is expected that land would need to be purchased in order to deliver infrastructure improvements, the exact extent and potential costs of which are unknown at this stage and would require further exploration. The implementation of the walking and cycling connections and Park and Ride facility is therefore currently considered to establish a minor adverse impact on land requirements.	-
Capital Costs	The delivery of a new multi-modal package of measures would require a high capital investment from the public sector. The cost estimate for all elements of the scheme combined is £10.911M (excluding rail costs).	--
Revenue Costs	The highway would continue to require maintenance support from the public sector and it is expected that bus services would also require subsidy from the public sector.	-

Table 29 Impact Assessment: Bypass / Green Alignment (east of Dinas Powys interconnecting with the A4055 at Cardiff Road and the Merrie Harrier Junction) and Multi-Modal Option

Bypass – Green Alignment (east of Dinas Powys interconnecting with the A4055 at Cardiff Road and the Merrie Harrier Junction) and Multi-Modal Option		
	Impacts	**Scale**
Social		
Physical Activity	It is expected that implementation of a new bypass and multi-modal option would have a moderate beneficial impact on physical activity with the potential to encourage sustainable travel in the study area.	++
Journey Quality	The combination of options has the potential to establish a comprehensive transport scheme with benefits to traveller care, views and reduced stress all realised. In line with the WebTAG Unit A4.1.6 guidance (Journey Quality Impacts), a high beneficial score has been retained as the number of users affected is anticipated to be more than 10,000.	+++
Accidents	A moderate beneficial score has been assigned to recognise the improvements in highway safety that could be experienced following	++

Bypass – Green Alignment (east of Dinas Powys interconnecting with the A4055 at Cardiff Road and the Merrie Harrier Junction) and Multi-Modal Option		
	implementation of a new bypass (169 less accidents forecast within the study area over a 60-year assessment period), together with enhancements to sustainable transport infrastructure/ services.	
Security	The implementation of highway and sustainable infrastructure to current design standards could establish robust improvements in actual and perceived safety and security throughout the transport network.	++
Access to Employment	The transport user benefits for a new bypass have been quantified (£M PVB 2010 prices) at £23.43M for commuters and £24.07M for business indicating robust benefits could be realised. Combined with enhancements to sustainable transport opportunities (services and infrastructure) then a moderate beneficial impact for access to employment could be established.	++
Access to Services	The transport user benefits for a new bypass have been quantified (£M PVB 2010 prices) at £28,080M for other consumers (excluding commuters and business) indicating robust benefits could be realised. Combined with enhancements to sustainable transport opportunities (services and infrastructure) then a moderate beneficial impact for access to services could be established.	++
Affordability	The potential for a new bypass to divert trips from the car to public transport as a result of likely improved journey time and journey time reliability for buses is mitigated by the potential for a new road to retain the car as the dominant mode of travel in the region. Improving accessibility and experience of using sustainable transport could however mitigate the rising costs of owning a car making travel more affordable for some sections of society.	+
Severance	Both the bypass option and multi-modal option have identified potential improvements to severance as a result of their implementation. A new bypass could significantly reduce traffic flows through Dinas Powys with the likely requirement for mitigation to retain accessibility to properties/ buildings north and south of the bypass alignment. Improvements to sustainable modes of transport could also specifically reduce severance with improved crossing points and connectivity. The combination of options could subsequently establish large beneficial impacts.	++
Option and Non-Use Values	In line with TAG Unit A4.1.7, 'Option and non-use values should be assessed if the scheme being appraised includes measures that will substantially change the availability of transport services within the study area (e.g. the opening or closure of a rail service, or the introduction or withdrawal of buses serving a particular rural area).' This option includes for a range of specific measures to enhance public transport. Moreover, the implementation of integral walking and cycling infrastructure also affords some opportunity for alternate modes of travel away from use of the private car. The option also includes for an additional route option for highways. A score of moderate beneficial is therefore considered reasonable given the range of additional opportunities from the proposed option.	++
Cultural		
Cultural Facilities	No impact identified.	0

Bypass – Green Alignment (east of Dinas Powys interconnecting with the A4055 at Cardiff Road and the Merrie Harrier Junction) and Multi-Modal Option		
Welsh Language	No impact identified.	0
Environmental		
Noise	Whilst a neutral impact was identified for the multi-modal option, the moderate adverse impact applied to the bypass option has been carried over to the combined option. Potential for improvements in noise pollution were noted for central Dinas Powys with significant reductions in traffic flow forecast however the establishment of a new road is likely to establish a new noise source affecting a large number of dwellings to the east of Dinas Powys and west of Penarth.	--
Air Quality	The implementation of an enhanced sustainable transport network has the potential to improve local air quality through Dinas Powys, especially along the A4055 Cardiff Road as user trips are encouraged away for the car. In addition, a new bypass could significantly reduce traffic flow through Dinas Powys and help mitigate adverse air quality especially for those situated adjacent to Cardiff Road. These benefits are somewhat mitigated by the implementation of a new bypass establishing new air quality impacts within proximity of the new route.	0
Greenhouse Gases	The traffic modelling completed for a new bypass has assumed that existing A4055 Cardiff Road vehicle trips will divert onto a new bypass as opposed to the establishment of new vehicle trips being generated on the highway network. On this assumption no increase in Greenhouse gas emissions would be assumed against the do-minimum scenario, over and above forecast traffic growth/ committed development trips included as part of the traffic modelling assessment. In contrast, it is considered that the implementation of a new highway bypass will have the potential to encourage increased travel by private car as traffic conditions through Dinas Powys are improved. The slight benefits realised as part of sustainable transport improvements are therefore mitigated by proposals to promote travel by car through delivery of a new bypass.	0
Landscape	A range of factors have been assessed as part of the WebTAG analysis for landscape, including pattern, tranquillity, cultural and landcover, together with an overarching summary of character. It is subsequently considered that a bypass will reduce tranquillity, farmland will be lost and previously unlit landscape will be lit, field patterns and open spaces disrupted, and long-distance views will be interrupted including an adverse impact on the night time setting. Impacts can be mitigated through landscape design along route, retention or planting of new hedges and design of elevated road sympathetic to local landscape character. Moreover, good landscape design is needed to mitigate lighting impacts at night. Whilst additional adverse impacts have been identified for the multi-modal option, an overall of moderate adverse has been retained with the potential for effective design to mitigate impacts.	--
Townscape	Implementation of a new bypass identified a neutral impact following completion of a WebTAG assessment which considered elements such as layout, density and mix, scale, appearance and land-use. In addition, a neutral impact was also identified for the multi-modal option where only a slight beneficial impact was identified for the cultural aspect of human interaction with the option potentially establishing an increase of individuals utilising an upgraded transport network.	0

Bypass – Green Alignment (east of Dinas Powys interconnecting with the A4055 at Cardiff Road and the Merrie Harrier Junction) and Multi-Modal Option		
Historic Environment	Whilst a neutral impact was considered reasonable for the multi-modal option, the slight adverse impact resulting from a new bypass has been brought forward to the combined option. The WebTAG assessment identified the potential to have a slight adverse impact on 'unknown' non-designated heritage assets, as well as the potential to directly impact on buried archaeological remains which could result in the permanent and irreversible loss of assets.	-
Bio-Diversity	An impact assessment of biodiversity using WebTAG guidance was completed for a bypass indicating a moderate adverse impact could be realised, predominantly due to the potential loss and damage of ancient woodland and Pop Hill SINC. In addition, a slight adverse impact was also recognised for the multi-modal option given the impact the Park and Ride proposal and walking and cycling measures could have on biodiversity.	--
Water Environment	Both options were separately assessed and identified a slight adverse impact as a result of their implementation. The same impact score has subsequently been assigned for the combined option with impacts recognised to existing floodplains and the potential impacts to the main rivers and ordinary water courses as a result of accidental spillage, construction activities and routine run-off. A construction environmental management plan should be put in place during the construction of the multi-modal option which will minimise the risk of pollution to watercourses during construction.	-
Residential Amenity	The impact on residential amenity considers the cumulative impact of air quality, noise and visual intrusion on residential properties. The combined assessment from the above indicates that the properties in Dinas Powys will largely benefit from reductions in traffic through the village. A large number of properties to the east of Dinas Powys and west of Penarth will however experience adverse impacts due to proximity of the bypass alignment, anticipated to give a moderate adverse impact. There is potential for these impacts to be mitigated as part of design development of the bypass however there may also be impacts of visual intrusion based on longer distance views. The multi-modal impact is considered neutral.	--
Economic		
Journey Time Changes	The bypass scheme user and provider benefits (in isolation) as a result of improved journey time changes estimated to have a total discounted value in 2010 prices and values appraised over 60 years, is £76M which represents a significant beneficial improvement. There is also the potential that additional benefits to multi-modal trips could also be realised through enhanced infrastructure and service provision.	++
Journey Time Reliability Changes	It is anticipated that the implementation of a bypass designed to current DMRB standards could establish measurable improvements in journey time reliability between Biglis roundabout and the Merrie Harrier junction. Analysis completed suggests journey time improvements of up to 9 minutes for northbound trips and 11 minutes for southbound trips. There is also the potential that additional benefits to multi-modal trips could also be realised through enhanced infrastructure and service provision.	++

Bypass – Green Alignment (east of Dinas Powys interconnecting with the A4055 at Cardiff Road and the Merrie Harrier Junction) and Multi-Modal Option		
Transport Costs	Analysis of bypass transport costs identified a neutral impact as the benefits recognised are likely to be offset by the proposal encouraging trips to be made by car as opposed to more sustainable, affordable means. In contrast a slight beneficial impact has been applied as the provision of an enhanced multi-modal network has the potential to make travel more affordable for some sections of society, most notably the young and elderly.	+
Accidents	In terms of the economic assessment as a consequence of overall reduced road traffic accidents resulting from a new bypass, the analysis indicates a total cost saving of £3.66M against the do-minimum scenario (with costs discounted to 2010 prices). These are for the 60-year assessment period (2023 – 2082). Through the delivery of highway improvements, improved walking and cycling infrastructure, and enhanced public transport services and interchange also has the potential to improve road safety through the removal of pinch points, improving the standard of the carriageway, and encouraging people to travel by more sustainable means.	++
Wider Economic Impacts	It is anticipated that some additional wider economic impacts associated with a new bypass could be realised. This may include induced investment through additional strategic development arising as a result of improved connectivity between the local urban centres of Barry and Cardiff. However, the bypass option combined with the multi-modal options will predominantly focus on addressing a local connectivity issues through an extant transport corridor and therefore significant benefits to medium/ large commercial businesses are arguably less likely to be significantly realised in areas beyond the study area.	+
Land	The adverse impacts identified for each of the two options in isolation have been carried through to the combined option. The most significant land impacts are retained for a new bypass with three residential properties potentially affected by the proposal (no buildings are however directly impacted). In addition, adverse impacts were identified for the implementation of a new Park and Ride facility. The exact extent of land requirements and potential costs are unknown at this stage and would require further exploration.	--
Capital Costs	The delivery of a bypass would require a high capital investment from the public sector. The cost estimate, in undiscounted 2017 market prices, is £39.463M. The cost estimate for delivery of the multi-modal option (excluding rail enhancements), is £10.911M. The delivery of a bypass and multi-modal option would therefore require a high capital investment from the public sector.	---
Revenue Costs	The highway would continue to require maintenance support from the public sector and it is envisaged that the scheme would result in additional pressure on increasingly stretched highway maintenance budgets. Given the anticipated requirement for flood alleviation measures, the ongoing costs of the option may be moderate. In addition, the provision of new bus and rail services together with maintenance of walking and cycling routes and a new Park and Ride is also likely to require subsidy from the public sector.	--

Table 30 Impact Assessment: Bypass / Blue Alignment (east and south of Dinas Powys, interconnecting between the A4055 at Merrie Harrier and the B4267 Sully Moors Road/ Hayes Road roundabout)

Bypass / Blue Alignment (east and south of Dinas Powys, interconnecting between the A4055 at Merrie Harrier and the B4267 Sully Moors Road/ Hayes Road roundabout)		
Note: The impact assessment scoring is as identified for the Green alignment with the following amendments to impact analysis and scoring confirmed as follows.		
	Impacts	**Scale**
Social		
Physical Activity	It is expected that a new bypass would have a slight beneficial impact on physical activity with the integral provision of segregated walking and cycling infrastructure. However, the relatively low anticipated reduction to traffic movements on the A4055 existing transport corridor through Dinas Powys means that the benefit is anticipated to be minor.	+
Journey Quality	The broadly qualitative assessment completed using DMRB 11.3.9.2 (travellers' views) and 11.3.9.3/4 (traveller stress) has been considered alongside traveller care elements noted within TAG Unit A4.1.6 (Journey Quality Impacts). It is anticipated that the implementation of a new off-line bypass would establish moderate beneficial improvements in journey quality in comparison to the do-minimum scenario, with specific enhancements to traveller views and stress anticipated. However, the lower transfer of traffic from the A4055 as compared to the Green alignment suggests driver stress may remain high. In line with TAG Unit A4.1.6, a moderate impact rating has subsequently been applied to the scoring as the number of travellers affected is estimated to be less than 10,000 users per day based on the reassignment of traffic from the existing A4055 Cardiff Road link to a new bypass.	++
Accidents	A neutral impact is assumed for this option. The traffic levels on the A4055 through Dinas Powys will reduce slightly, but a new 60mph road may give rise to more fatalities due to speed. Overall no change from the do-minimum is anticipated.	0
Security	A slight beneficial score has been retained for the Blue, comparable to the analysis completed for the Green alignment.	+
Access to Employment	A slight reduction in benefit has been recorded for the Blue alignment compared to the Green, as the benefits to commuters and businesses are anticipated to be less than for the Green alignment.	+
Access to Services	A slight reduction in benefit has been recorded for the Blue alignment compared to the Green, as the benefits to other consumers are anticipated to be less than for the Green alignment	+
Affordability	The potential to divert trips from the car to public transport as a result of likely improved journey time and journey time reliability for buses is mitigated by the potential for the option to retain the car as the dominant mode of travel in the region.	0
Severance	The benefits and adverse impacts to severance identified for the Green alignment are anticipated to be less for the Blue alignment given there	0

Bypass / Blue Alignment (east and south of Dinas Powys, interconnecting between the A4055 at Merrie Harrier and the B4267 Sully Moors Road/ Hayes Road roundabout)		
	would be less reduction in traffic on Cardiff Road. It is also considered that the Blue alignment will increase traffic flow along the B4267 between Sully Moors Road/ Hayes Road roundabout and the Biglis roundabout adversely impacting on informal crossing locations, and subsequently leading to increased localised severance. A neutral score has therefore been assigned.	
Option and Non-Use Values	No change in comparison to the Green alignment score.	+
Cultural		
Cultural Facilities	The Blue alignment passes close to a riding school and would introduce a traffic route to the west of Cosmeston Country Park. A potentially minor adverse impact is identified.	-
Welsh Language	No impact is envisaged.	0
Environmental		
Noise	Road transport is the dominant mode of transport for journeys in the study area (2011 Census) and thus contributes to noise pollution. This review is not yet quantifiable in the absence of quantitative data, but a moderate adverse impact is considered reasonable to assume whilst also noting the impacts from short-term construction noise associated with the new route. The traffic assessment suggests that a relatively small proportion of traffic would transfer from the existing A4055 Cardiff Road, thus not bringing benefits to residents in Dinas Powys. Moreover, the option establishes a new noise pollution source along the bypass alignment with the potential to adversely impact dwellings situated to the east of Dinas Powys, west of Penarth and north of Sully. In most cases mitigation measures should be available to help alleviate any associated short and long-term noise pollution but this would need to be considered against the potential to establish adverse landscape impacts (e.g. implementation of noise bunds). The traffic noise impacts would however need to be modelled in accordance with DMRB to quantify the noise impacts and consider the detailed propagation path for the alignment. This would allow for a detailed comparison of all bypass alignments against the do-minimum scenario and quantify the number of properties that would be adversely affected as well as the number of properties that would benefit from a new bypass proposal.	--
Air Quality	An increase in adverse impacts to moderate has been applied to the Blue alignment (in comparison with the Green alignment). Traffic reductions and air quality benefits would be less through Dinas Powys and there is the potential for dwellings/ businesses situated along the B4267 to be affected as there may be increases traffic flow between the Sully Moors Road/ Hayes Road roundabout and the Biglis roundabout would be assumed.	--
Greenhouse Gases	The traffic analysis has assumed that a small proportion existing A4055 Cardiff Road vehicle trips will divert onto a new bypass as opposed to the establishment of new vehicle trips on the highway network. On this	-

Bypass / Blue Alignment (east and south of Dinas Powys, interconnecting between the A4055 at Merrie Harrier and the B4267 Sully Moors Road/ Hayes Road roundabout)		
	assumption no increase in Greenhouse gas emissions would be assumed over and above forecast traffic growth/ committed development trips included as part of the traffic modelling assessment. There may also be additional trips encouraged through the provision of the new route. Thus, while the impact is not yet quantifiable, a slight adverse impact is considered reasonable.	
Landscape	The impact on landscape is assessed as the same as the Green alignment.	--
Townscape	The impact on landscape is assessed as the same as the Green alignment.	0
Historic Environment	The bypass alignment has the potential to have a slight adverse impact on 'unknown' non-designated heritage assets, as well as the potential to directly impact on buried archaeological remains which could result in the permanent and irreversible loss of assets. A neutral impact has been determined on the settings of the Listed Buildings and Scheduled Monument and on the Conservation Area in Dinas Powys.	-
Bio-Diversity	This route option crosses Cog Moors SSSI and SINC, an area of ancient woodland, and will lead to the loss of trees covered by a tree preservation order. Priority habitats are present along this route option including woodland, watercourses and hedgerows and there is potential for protected and priority species to be affected by the scheme. The bypass alignment is likely to have a major adverse impact on biodiversity due to the loss of and damage to protected and notable habitats and species including those within Cog Moors SSSI. A specific mitigation strategy will need to be agreed with Natural Resources Wales for Cog Moors SSSI and protected species. Consultation at an early stage is recommended. The implementation of standard site practices and adherence with guidelines will ensure that adverse effects on habitat and species in the wider landscape are not adversely affected by the scheme.	---
Water Environment	The potential impacts to the 'main rivers' and ordinary water courses concerns a possible accidental spillage, construction activities and routine run-off. This potential impact requires further investigation as the River Cadoxton has achieved a 'moderate' WFD score. Following further investigations, mitigation measures may be required as part of the design. A construction environmental management plan should be put in place during the construction of the alignment which will minimise the risk of pollution to watercourses during construction. Approximately nine ordinary watercourses are crossed as part of the Blue alignment. The alignment crosses the floodplain to the south of Dinas Powys and east of Barry in Flood Zone C2/B. The floodplain is associated with the Cadoxton River. NRW flood maps show that flood risk is high to moderate in the areas where the Blue Alignment interacts with the floodplain. Potential effects include for the loss of floodplain storage volume and impediment of floodplain flow paths. To mitigate, there may be a need to provide compensation storage, culverts through embankments to maintain continuity of flow conveyance. Any new crossings of smaller watercourses also has the potential to impact flood risk, careful design of crossings should avoid impacts/ mitigate risks.	-

Bypass / Blue Alignment (east and south of Dinas Powys, interconnecting between the A4055 at Merrie Harrier and the B4267 Sully Moors Road/ Hayes Road roundabout)		
Residential Amenity	The impact on residential amenity considers the cumulative impact of air quality, noise and visual intrusion on residential properties. The combined assessment from the above indicates that there will be limited benefits for properties in Dinas Powys from reductions in traffic through the village. A large number of properties to the east of Dinas Powys, west of Penarth will however experience adverse impacts due to proximity of the alignment, as well as residents living to the north and west of Sully. There is potential for these impacts to be mitigated as part of design development of the bypass however there may also be impacts of visual intrusion based on longer distance views.	--
Economic		
Journey Time Changes	Journey time benefits on the Blue alignment are potentially marginal for the majority of existing traffic on the A4055 Cardiff Road. They would be benefits for the traffic travelling to and from the Sully Moors roundabout. A minor benefit has been recorded for the Blue alignment.	+
Journey Time Reliability Changes	As with journey time changes, a slight improvement in reliability of journey times is anticipated compared to the do-minimum, for vehicles from the Sully Moors roundabout area.	+
Transport Costs	Transport costs for road users are anticipated to reduce for some users compared to the do-minimum (those to and from the Sully Moors roundabout) reflecting the journey time savings. Overall it is anticipated that delivery of a new road link and associated junction improvements would have a negligible impact on transport costs compared to the do-minimum option	0
Accidents	A neutral impact is assumed for this option. The traffic levels on the A4055 through Dinas Powys will reduce slightly, but a new 60mph road may give rise to more fatalities due to speed. Overall no change from the do-minimum is anticipated.	0
Wider Economic Impacts	In comparison to the Green alignment, a moderate benefit to the wider economic impacts has been assumed given the potential for enhanced strategic interconnectivity with commercial/ industrial zones situated to the south east of Barry, including Atlantic Trading Estate for example. This may include induced investment through additional strategic development arising as a result of improved connectivity between the local urban centres of Barry and Cardiff.	++
Land and Property	No change in comparison to the Green alignment score.	--
Capital Costs	The delivery of a bypass would require a high capital investment from the public sector. The cost estimate, in undiscounted 2017 market prices, is £52.323M.	---
Revenue Costs	No change in comparison to the Green alignment score.	--

3.4 Value for Money Assessment

3.4.1 Background

This section sets out the impact on public accounts and the results of the Analysis of Monetarised Costs and Benefits (AMCB) based on the Green alignment bypass option, using costs calculated by Arcadis and the benefits derived from the outputs of the traffic modelling completed. Full discussion of the methodology and results is included in Appendix F.

3.4.2 Public Accounts

The effects of the options on public finances are shown in Table 31, taking into account the impact on the broad transport budget after allowing for changes in revenues. It also includes changes in the broader indirect tax revenues which accrue to the government. The net impact on the transport budget is estimated at £31m.

The indirect tax revenue values show a decrease in revenue to the wider public finances and, in accordance with WebTAG guidance, are included in the calculation of the Present Value of Benefits (PVB). The sign of the value in the Public Accounts (PA) table is reversed in the AMCB table because the PA table presents costs to the public accounts as positive values. The AMCB tables combine the results from the TEE tables and the PA tables supplemented by information on accidents and environmental effects.

Table 31 Public Accounts (PVC £000's 2010 prices discounted to 2010)

Scheme Costs	Bypass – Green Alignment
Investment Costs	27.37
Operator Costs	-
Revenue	-
Indirect Tax Revenue	3.44
Net Impact	**30.81**

3.4.3 Analysis of Monetarised Costs and Benefits

The AMCB table combines the results from the TEE table and the PA table and supplements it with the information on accidents. A summary of the results for the scheme appraisal is set out in Table 32.

Table 32 AMCB summary table (prices in £m, discounted to 2010)

	Scheme costs	Bypass – Green Alignment
A	Accidents	3.66
B	Economic efficiency: Commuting	23.43
C	Economic efficiency: Other	28.08
D	Economic efficiency: Business	24.07
E	Wider Public Finances (ITR)	-2.19

	Scheme costs	Bypass – Green Alignment
F	PVB (A+B+C+D+E)	78.03
G	PVC	27.37
H	**Net Present Value (F-G)**	**50.66**
I	**Benefit Cost Ratio (F/G)**	**2.9**

3.4.4 Summary of Economic Appraisal

The Green alignment produces a total PVB of £78m and a cost of £27m. This results in a Net Present Value of £50m and a Benefit Cost Ratio of 2.9. This suggests that the scheme would represent high value for money.

These results do not reflect the longer journey times that would be experienced on the existing road in the do-minimum as a result of higher traffic levels, and in this respect underestimate the benefits from the scheme. However, they also do not reflect possible additional delays to existing users at the junctions at either end of the new bypass which would reduce the benefits of the bypass. Any increase in the cost of the scheme would further reduce the benefit cost ratio and the value for money for the scheme.

An analysis of the projected traffic flows through Dinas Powys suggests that the road will come under increasing pressure from increased traffic in the future. A full business case would need to further consider the impact on the Merrie Harrier and Barons Court junctions.

3.4.5 Sensitivity Test

By varying the assumptions regarding speed on the new bypass a range of results can be obtained to inform the likely economic performance of the scheme. Table 33 provides the range of BCRs from the testing of varying average speeds on the bypass and hence time savings. Unless otherwise stated the results are from the runs using the TEMPro growth factors.

Table 33 Sensitivity Test Benefit Cost Ratios

Journey Time on bypass	PVB weekdays only (£m)	BCR
Same speed as on existing road	**-156**	**0.0**
55mph + 1mins	82.13	3.0
50mph + 1mins (core scenario)	**78.03**	**2.9**
50mph + 2mins	64.10	2.3
40mph + 1mins	66.20	2.4
40mph + 2 mins	52.11	1.9
50mph + 1 mins (SEWTM growth)	86.91	3.2

4 Financial Case

The financial case *'presents information on whether an option is affordable in the first place and long-term financial viability. It covers both capital and annual revenue requirements over the life cycle of the project and the implications of these for the balance sheet, income and expenditure accounts of public sector organisations'.*

4.1 Option Costs

This section sets out the estimated implementation costs for each of the options, including the further development and assessment work required in later WelTAG stages to take the option forward. At this stage, the lifetime costs of the options have therefore not been estimated. The implementation costs encompass the start of Stage Three WelTAG up to and including delivery of the scheme. Costs beyond the scheme delivery would relate to ongoing maintenance and monitoring with the maintenance costs dependent on each option.

4.1.1 Bypass Alignments

Assumptions

The costing of the bypass options has been developed with the following assumptions:

- The following items have been taken from the average cost of 3 live projects (based on construction cost value), currently within the realm of Arcadis:
    - Preliminaries at 25%.
    - Detailed Design at 4.5%.
    - Supervision at 2%.
    - Contractors Fee at 9%.
    - Without NRSWA C2 preliminary enquiries to identify the stats involved we have assumed Statutory Undertakers diversion costs of £1.5m. This is based on our experience of other similar schemes, however, C2 preliminary enquiries at a later stage will be required to confirm the budget.
    - Based on other projects, Employers Agent fess have been assumed at £1.5m, with an estimated Employers Risk of £2.5m.
    - An allowance of £2m has been placed against the Merrie Harrier Junction Improvements.
    - Land costs have been calculated for both alignments based on similar projects within the area and prorated against the length.
- A risk item of 14% has been used to build up the cost for both alignment options.
- An Optimism Bias (OB) of 30% which is averaged between the Stage One and Stage Two from recommendations in WebTAG Unit 1.2 has also been used, OB is used in order for additional costs that may come about as further investigative and survey works are carried out. It is considered that the 30% is still valid due to the unknowns within the projects such as ground data, additional junctions and possible improvements required to existing junctions.

Bill of Quantities Items

Table 34 describes the assumptions used in the bill of quantities for the scheme cost estimates.

Table 34 Bill of Quantities Items

Bill Item	Description
Preliminaries	Using live project rates, a percentage of the estimated construction cost of has been used to establish the amount for preliminaries.

Bill Item	Description
Site Clearance	The site clearance has been determined by the extent of the project with boundaries taken to the extent of earthworks. A hedge has been assumed within each parcel of land that the option intersects with, this has been estimated at 30m in length multiplied by the number of parcels. Further site clearance items have been allowed for and are indicated as items as quantities are unable to be estimated at this stage. For these items, values have been taken from a live project.
Fencing	To determine fencing requirements, it has been assumed that the entire length of both sides of the road will require fencing to separate land. Fencing has been assumed to be a Timber Post and Four Rail Fence in accordance with Highways Construction Detail (HCD) HCD/13. Steel gates for Accommodation Works have been allowed for where existing parcels of land have been segregated, this has been determined from analysis of the OS data available. Gates would be in accordance with HCD/H19. Where the bypass passes a number of houses and element of 4m high Acoustic Fencing has been allowed for (based on length).
Road Restraint Systems	Safety barrier has been allowed for within the cost makeup on both sides of the new carriageway in order to protect cyclists from live running traffic and also protect traffic from embankment areas. It is considered that through further design and the completion of a RRRAP Assessment the length of Road Restraint can be reduced.
Drainage	Carriageway drainage has been assumed as a concrete channel placed in the verge areas, which will drain to gullies then into a carrier drain below. Cut-off drainage via concrete channels has also been allowed for at back of cycleway in cuttings. Formal drainage outfall points cannot be determined at this stage however, six outfalls have been allowed for with drainage pipes/headwalls etc in the cost estimate.
Earthworks	Earthworks have been determined using the provided data from the Vale of Glamorgan which has been input into Civils 3D. From this, using 1 in 3 embankments the cut and fill has been determined.
Pavement	The depth of pavement allows for poor ground conditions and therefore can be taken as a possible opportunity once ground conditions are established by undertaking a ground investigation. Taking this into account the greatest depth of sub-base has been allowed within the construction make up of 450mm with a geotextile membrane. Other elements of the pavement make up are as below: • Surface Course – 40mm thick • Binder Course – 60m thick • Base Course – 200mm thick • Sub-Base – 450mm thick • Geotextile membrane
Footway/ Cycleway	The footway/ cycleway has been positioned on the same side of the village of Dinas Powys on both bypass options, to allow for direct access from the village. The shared footway/cycleway has been designed at 3.5m wide and allows for no segregation of pedestrians and cyclists. The vertical and horizontal alignment will follow that of the bypass option, however where junctions need to be negotiated, there will be localised amendments to the alignment. This would be identified during the next stage of the project where junctions have been designed and greater knowledge of the surrounding area is understood. The makeup of the footway/cycleway is assumed to be: • Surface Course – 40mm thick • Binder Course – 60mm thick

Bill Item	Description
	• Sub-base – 100mm thick
Signage and Road markings	An estimate has been allowed for the cost of signs and road markings as £100k for both options, which has been based on similar projects. Carriageway centre line and edge of carriageway ribbed lines have been determined based on the length of road considered.
Lighting and Electricity	Lighting has been considered at roundabouts and new junctions only, due to the rural nature of the route.
Lighting of Footway/ Cycleway	**LTN 2/04 states** *'Pedestrians and cyclists dislike using unlit facilities after dark for personal security reasons, particularly when they are located away from well used routes. On facilities alongside existing carriageways, street lighting may be adequate, but old or sub-standard street lighting may need to be replaced to improve conditions to encourage greater use. New lighting may need to be considered on new facilities away from the carriageway. If lighting cannot be provided or is deemed undesirable, a lit on-road alternative should be signed where available. Issues of light pollution should be considered, particularly in rural areas. Adequate lighting and sightlines, and the absence of any hiding places close to the route can help to provide a sense of security for pedestrians and cyclists. This is particularly important for isolated facilities'.* Taking this statement into account and in accordance with Sustrans Guidance 5m high columns have been chosen for the length of the cycleway at 35m centre and included within the cost makeup for each option. It is recommended that due to the close proximity to the bypass alignment that a risk assessment be carried out during the next stage to ensure that the lighting doesn't confuse traffic using the bypass.
Ducting	Communication ducting has been allowed for the entire length of new road, with road crossings included where required.
Structures	The only structures being utilised on both alignments are Non-Motorised User (NMU) bridges which will be designed to allow pedestrians to pass over the bypass to continue on a Public Right of Way. In order to determine the cost of the structures, the square area costs have been calculated from a live project of a similar type bridge that will be required. This square area cost has then been multiplied by the estimated square area for each bridge. Structures have an assumed headroom clearance of 5.3m above exiting ground level with an estimate of 0.7m on top to allow for the structure construction depth.
Accommodation Works and Statutory undertakers	A percentage cost for Accommodation Works has been determined from the average of three live projects, due to the current stage of the project we are unable to determine the extent of Statutory Undertakers works required and any accommodation works due to unknown land owner and extents of land owned by others. Therefore, an amount of £1.5m has been allowed for Statutory Undertakers Works with a 3% value of the construction cost allowed for Accommodation Works.
Landscaping and Environmental Works	A percentage cost for Landscaping and Environmental Works has been determined from the average of 3 live projects, due to the current stage of the project it is difficult to calculate actual costs, therefore it was considered that a percentage allowance of 1.84% would be the best way to inform the cost.

Summary

Green and Pink Alignments

Both options considered allow for the bypassing of Dinas Powys and allow for a compliant DMRB single 60mph carriageway from the Merrie Harrier Junction to Cardiff Road, however both alignments also have their risks. It is expected that there is further archaeology within the area that is not currently identified on the constraints plan and also the ground conditions are currently unknown.

Both options impact on similar environmental constraints, similar PRoW and have very similar costs. However, the Pink alignment does allow for less waste to be disposed of off-site and includes a roundabout to connect onto Murch Road. No large structures are associated with either route however there are three NMU Bridges and two large box culverts associated with each route to allow the continuance of the PRoWs.

The current estimated total cost difference is in the region of £600k, this is mainly due to the amount of material to be disposed of offsite. It is anticipated that once a contract is let for further design and construction the amount of material being disposed of off site can be reduced for both options. It should be noted that the cost estimates at this stage have been built up using comparable rates and with assumptions due to the early stage of development. We have followed guidance within the Transport analysis guidance: WebTAG, in the application of risk and Optimism Bias.

It is recommended that further survey work and design and cost development in liaison with stakeholders and Statutory Environmental Bodies is required.

Blue Alignment

There are departures from standards at Cog Moors that need to be confirmed at the next stage when further design work has been carried out. The Blue alignment impacts on environmental constraints, PRoW and Barry Docks. There is a large structure over Cadoxton River and there are two NMU Bridges and three large box culverts associated with the route to allow the continuance of the PRoWs.

It should be noted that the cost estimate at this stage has been built up using comparable rates and with assumptions due to the early stage of development. We have followed guidance within the Transport analysis guidance: WebTAG, in the application of risk and Optimism Bias. It is subsequently recommended that further survey work and design and cost development in liaison with stakeholders and Statutory Environmental Bodies is required.

Option Summary

Table 35 summarises the key features and costs of each of the highway alignments.

In addition to providing costs for the green, pink and blue alignments, a cost has also been estimated for taking the blue alignment further west to connect through the industrial area and docks to Ffordd y Mileniwm. This scheme is estimated as an additional £20M, due to the length of additional route and the potential need to form a new bridge crossing of the Cadoxton River.

Table 35 Bypass Option Summary including Cost Estimates

Item	Bypass Green Alignment	Bypass Pink Alignment	Bypass Blue Alignment	Bypass Blue Alignment (including on-line enhancements west of Sully Moors Road)
Length of New Bypass	3,565 metres	3,617 metres	5,046 metres	5,046 metres
Length of new Carriageway through the docks site	n/a	n/a	n/a	518 metres
Length of existing carriageway upgrade (Hayes Road)	n/a	n/a	n/a	1,806 metres

Item	Bypass Green Alignment	Bypass Pink Alignment	Bypass Blue Alignment	Bypass Blue Alignment (including on-line enhancements west of Sully Moors Road)
Cut and Fill Balance	Disposal of 53,300m^3	Disposal of 21,600m^3	Import 206,029m^3	Import 142,612m^3
Public Right of Way Impacts	2 Bridges / 3 Culverts	2 Bridges / 3 Culverts	2 Bridges / 3 Culverts	2 Bridges / 3 Culverts
No of Structures	0	0	0	1
Archaeology Affected	1	1	1	1
Houses Affected	0	0	0	0
Ancient Woodland	1 Area	1 Area	1 Area	1 Area
TPO	0	0	0	0
Construction Cost	£17,180M	£16,830M	£24,190M	£36,196M
Total Cost including Stage Three	£39,463M	£38,878M	£52,323M	£72,393M

4.1.2 Multi-Modal Option

Table 36 outlines the estimated costs associated with the multi-modal option.

Table 36 Multi-Modal Option Summary including Cost Estimates

Item	Description	Estimated Cost
Bus Park and Ride	Costs have been calculated using the Spons directory to determine an overall rate, which advises on an average of £123.20 per m^2 with preliminaries of around 25%. It should be noted that these are provisional values and more detailed analysis would need to be undertaken, including detailed topographical surveys to confirm with greater accuracy the number of spaces that could be provided.	£2,300,000
	Bus service connections £150,000 per bus, three buses required for 20 minutes service.	£450,000
Bus Enhancements	Gold Approximately cost per bus stop - £13,050.00 Silver Approximately cost per bus stop - £12,550.00 Bronze Approximately cost per bus stop - £10,050.00 Dinas Powys Bus Stop Enhancements - one gold bus stop (£13,050), two silver bus stops (£25,100) and six bronze bus stops (£60,300).	£98,450
	Merrie Harrier Junction (2015 estimated costs).	£1,120.000

Item	Description	Estimated Cost
Walking and Cycling	Barry to Dinas Powys Cycle Route (Biglis Roundabout to Dinas Powys) - 2015 estimated cost.	£3,500,000
	Dinas Powys to Penarth (2017 estimated cost).	£442,640
	Merrie Harrier to Barons Court cycle scheme – standalone cost estimate project (could potentially be delivered as part of the bus enhancements which may identify cost savings).	£3,000,000
Rail Enhancements	Costs are subject to third party project development and have not therefore been estimated as part of this WelTAG Stage Two assessment.	-
	Total	**£10,911,090**

4.2 Funding and Accounting Implications

4.2.1 Bypass Alignments

There are no certainties with respect to funding sources for the bypass options at present. There is no committed funding identified for scheme delivery and currently a proposal for a Dinas Powys bypass is not named in Welsh Government's National Transport Finance Plan 2017 Update for expenditure over the next two financial years (up to 2020).

It is assumed that if funding were available, the scheme would be delivered by Vale of Glamorgan Council with funding support from Welsh Government and potentially from the Cardiff Capital Regional City Deal. If any public-sector borrowing is undertaken for the project, it is assumed that this would be paid back over time by the local authority. There may be potential for some private contributions from local and strategic developments via Section 106 agreements however recent contributions are set aside for sustainable travel and this would need to be explored.

For the Blue alignment, this may facilitate additional development and regeneration and provide some funding for a new link; at present however, the extent to which this is the case cannot be assessed as there are no committed development proposals in the LDP.

On-going revenue costs of maintaining the scheme are assumed to be met by Vale of Glamorgan Council through highways maintenance budgets. The costs of the scheme and ongoing costs are assumed to be captured on the Council's budget accounting procedures, although the source of grant funding would also fall on the grant body (e.g. Welsh Government).

4.2.2 Multi-Modal Option

It is assumed that funding for bus service and infrastructure enhancements would be required from local authority funding and Cardiff Capital Regional City Deal/ Welsh Government funding where applicable. There is also be opportunity for private contributions from developers through Section 106 agreements, with a sum of approximately £1M having been agreed for recent developments for sustainable travel improvements in Dinas Powys. Ongoing revenue costs would typically fall on the bus provider and subsidisation from the local authority.

In addition, funding for new walking and cycling routes and enhancements together with a new Park and Ride facility is likely to come from a combination of local authority capital budgets and Welsh Government grants. Ongoing revenue costs following implementation of any new bus services to support the Park and Ride facility would typically be met by the bus provider and subsidisation from the local authority.

The multi-modal option has outlined the potential benefits of rail service and infrastructure enhancements assuming implementation of measures outlined by the new Wales and Borders rail franchisee, KeolisAmey (as of October 2018). It is subsequently assumed that funding for rail enhancements is likely to be required as part of the Metro development, using funding via Cardiff Capital Regional City Deal/ Transport for Wales/ Welsh Government together with contributions from the Train Operating Company (KeolisAmey from October 2018) through the Wales and Borders franchise agreement, as well as other private contributions from developers through Section 106 agreements. Ongoing revenue costs (as well as any income from car parking revenue, for example) would typically fall on the Train Operating Company.

4.3 Financial Case Assessment

The financial case is summarised in Table 37, giving an evaluation of each element for each of the options.

Table 37 Financial Case Assessment

Option	Lifetime Costs of the Project		Source of Funding	Accounting Implications	
Do-minimum	0	The delivery of new capital schemes and the continued support for regional and local bus services, requires capital and revenue funding from the public sector.	Local transport fund (capital – to local authorities from the Welsh Government)	**Capital**	Welsh Government
				Revenue	Local Authority Welsh Government
Bypass Green Alignment	---	High initial capital costs to deliver a new bypass. Revenue implications are likely to exist throughout the lifetime of the project in terms of maintaining the asset, with the potential to adversely impact on the increasingly stretched local authority revenue budgets.	Local transport fund (capital) Welsh Government (capital) Local authority funding (capital and revenue) Road safety grant (capital)	**Capital**	Welsh Government Local Authority
				Revenue	Local authority
Bypass Pink Alignment	---	High initial capital costs to deliver a new bypass. Revenue implications are likely to exist throughout the lifetime of the project in terms of maintaining the asset, with the potential to adversely impact on the increasingly stretched local authority revenue budgets.	Local transport fund (capital) Welsh Government (capital and revenue) Local authority funding (capital and revenue) Road safety grant (capital)	**Capital**	Welsh Government Local Authority
				Revenue	Local authority

Option	Lifetime Costs of the Project		Source of Funding	Accounting Implications	
Multi-Modal Option	--	Low to high initial capital costs to implement enhanced rail facilities and interchange. It is anticipated that high costs associated with delivering enhanced rail services would be accommodated by wider regional investment in local routes and therefore not specific to Dinas Powys. Revenue implications are likely to exist throughout the lifetime of the project with any increases in services. Capital costs to deliver bus infrastructure enhancements would be at the commencement of the project. Capital costs to purchase additional buses would be at the commencement of the project, but there would be continued revenue support to maintain the vehicles and purchase replacement vehicles over time. Revenue implications are likely to exist throughout the lifetime of the project. Low to moderate capital costs to deliver walking and cycling enhancements would be at the commencement of the project. Revenue implications are likely to exist throughout the lifetime of the project in terms of maintaining the asset however these are anticipated to be relatively low and not significantly impact on the increasingly stretched local authority revenue budgets.	Local transport fund (capital) Welsh Government (capital and revenue) Network Rail Train Operating Company Local authority funding (capital and revenue) Road safety grant (capital) Local Bus Operators S.106 Planning contributions	**Capital**	Local authorities via the local transport fund from Welsh Government, and allocation of S.106 receipts
				Revenue	Local authorities via the Regional Transport Services Grant and Bus Services Support Grant from Welsh Government Welsh Government
Bypass **Green Alignment** **+** **Multi-Modal Option**	---	See specific option descriptions.	Local transport fund (capital) Welsh Government (capital and revenue) Network Rail	**Capital**	Welsh Government Local Authority (bypass) Local authorities via the local transport fund from Welsh Government and allocation of S.106 monies

Option	Lifetime Costs of the Project		Source of Funding	Accounting Implications	
	🟥		Train Operating Company Local authority funding (capital and revenue) Road safety grant (capital) Local Bus Operators S.106 planning contributions	**Revenue**	Local authority (bypass) Local authorities via the Regional Transport Services Grant and Bus Services Support Grant from Welsh Government Welsh Government
Bypass **Blue Alignment**	🟥 ---	High initial capital costs to deliver a new bypass. Revenue implications are likely to exist throughout the lifetime of the project in terms of maintaining the asset, with the potential to adversely impact on the increasingly stretched local authority revenue budgets.	Local transport fund (capital) Welsh Government (capital and revenue) Local authority funding (capital and revenue) Road safety grant (capital) Developer funding	**Capital**	Welsh Government Local Authority Developer funding
				Revenue	Local authority

5 Commercial Case

5.1 Overview

The commercial case covers *'whether it is going to prove possible to procure the scheme and then to continue with it in the future'.* The case considers the level and type of involvement from the private sector, as well as potential effects on the on-going viability of the option/ scheme.

5.2 Procurement Strategy

5.2.1 Full Business Case

A WelTAG Stage Three study would need to be commissioned to progress development of the full business case for the preferred option. The study would need to undertake the relevant environmental and topographical surveys, together with a ground investigation assessment to support detailed design development. With specific regard to the highway options, the business case would need to be refined with further transport modelling to test the final scheme and junction arrangements and provide an update to the cost benefit analysis. A wider economic impact assessment should also be undertaken.

With regard to rail service and infrastructure enhancements, this would require technical feasibility work and economic forecasting as part of the Network Rail GRIP process, and to be in alignment with the rail franchise process by Welsh Government and Transport for Wales.

At this stage it is anticipated that the Vale of Glamorgan would procure the WelTAG Stage Three study via competitive tender or framework, however the proposed procurement strategy is subject to confirmation.

5.2.2 Implementation

The process of implementation and post-implementation would also need to be captured through formal completion of WelTAG stages four and five respectively. The principle aims of Stage Four and Five is to subsequently record what happens so that lessons can be learnt. They may lead to alterations to the current scheme and will form valuable evidence for use in future WelTAG appraisals. The procurement strategy of these two stages would be subject to confirmation.

5.3 Bypass Scheme Implementation

5.3.1 Procurement Options

A consultant, contractor or a combination of both would be required to take the project forward through the statutory process, detailed design, construction and post-implementation. The different procurement options available for this stage are as outlined below:

- Early Contractor Involvement (ECI) – Under ECI, the Contractor is appointed under a two-stage Engineering and Construction Contract before the final scheme design has been fully developed and priced. This procurement method has its advantages where the construction of the project is complex.
- Design and Build (D&B) – Under a Design and Build Contract, the Employer employs a consultant under a Professional Services Contract who takes the project through the design and statutory process. A Contractor with Consultant is then procured to carry out the detailed design and construction of the works. This procurement method is more suited to the simpler projects where an ECI contractor would not have much to bring the early stages of the design process.
- Employers Design (ED) – With an Employers Design Contract the Employer employs a consultant under a Professional Services Contract who takes the project through the design, statutory process and into the detailed design process. Once the detailed design is complete a contractor is procured to complete the construction and maintenance works.

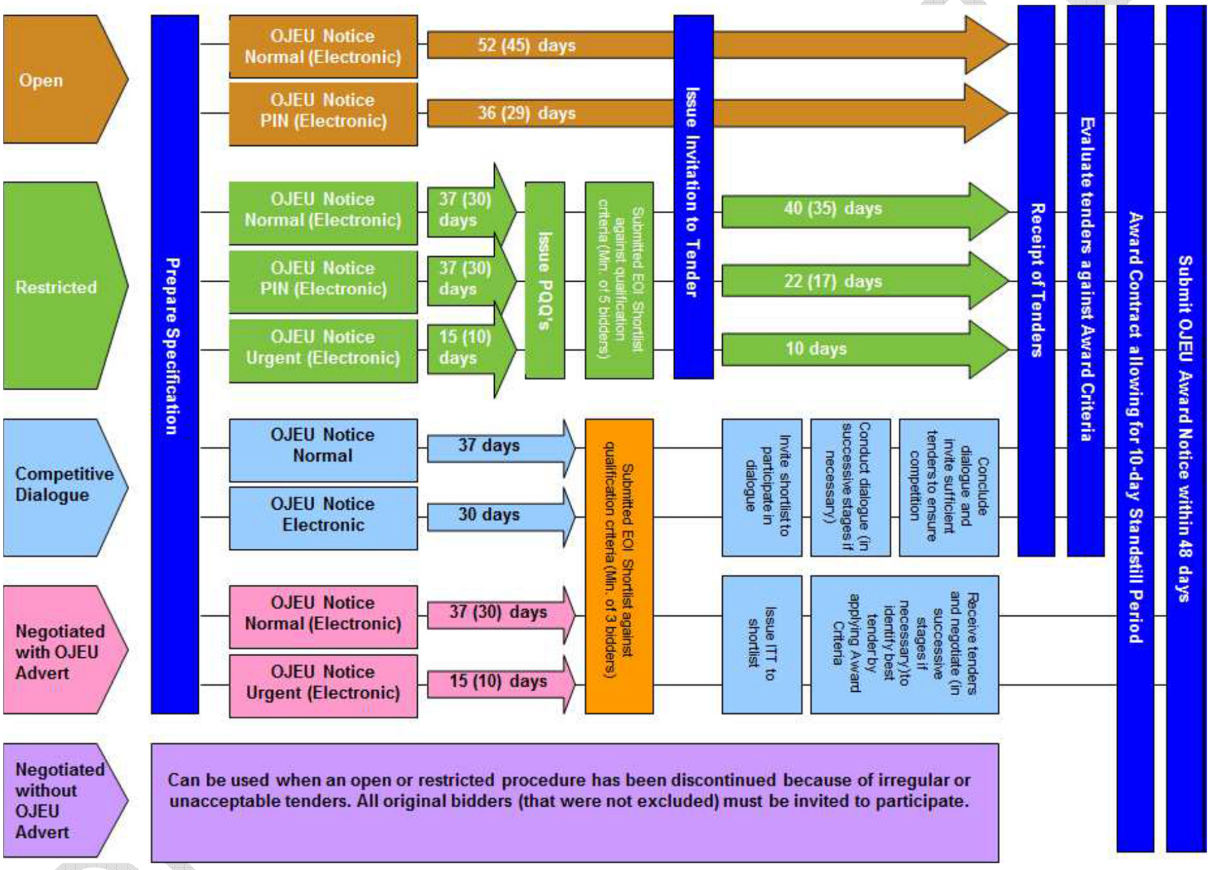
5.3.2 Contract Type

The type of contract is dependent upon which procurement option is chosen. With regard to the above procurement options it would be recommended that one of the options from the NEC is used, ideally a Target Cost option for the construction stage which provides the client and chosen consultant/ contractor with a fair allocation of risk and also allows for a fair pain/ gain result. Due to the nature of the project, it would not be advised to use a bill of quantities option as this has the potential to place the client at risk due to the many unknown quantities.

5.3.3 Procurement Process

The procurement process should comply with the corresponding UK Public Contract Regulations 2015 and the Welsh Government Key Stage Approval process. Given the estimated contract value, an OJEU Prior Information Notice (PIN) would need to be published, giving potential bidders notification of the proposed contract. The PIN will detail the scope of works along with the cost estimate of the scheme. The procurement strategy adopted would follow the OJEU Restricted process as set out in Figure 2. This would mean that potential bidders for the work would need to complete and submit a Pre-Qualification Questionnaire (PQQ).

Figure 2 OJEU Process[8]



Bidders who successfully complete the PQQ process would then be invited to tender for the works in accordance with the procurement method, whether an ECI or Employers Design contract. Subject to the outcome of the statutory procedures and the performance of the Contractor, the contract also provides a procedure for the Contractor to undertake the detailed design and construction of the works.

5.3.4 Suppliers

Within the OJEU Notice, the Employer can stipulate where the consultant/ contractor should operate. In addition to this the Employer can insert additional clauses into the contract which stipulates that the employed contractor/ consultant should use make use of local resources/ materials/ suppliers where

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[8] Source: http://www.hacw.nhs.uk/our-services/procurement/ojeu-tenders/

possible. A percentage of overall costs may also be inserted into the contract which ensures the employed contractor/ consultant complies with the relevant clauses and uses all local resources/ materials/ suppliers.

5.3.5 Contract Length

Within the Contract Notice, the duration of the chosen contract is estimated, it is estimated by providing a given an estimated start and end date. In addition, the contract would be structured around key stages, relating to Welsh Government's Transport Division's linear Key Stage Approval process which is used to obtain approval for projects through all stages of design, construction and aftercare. Therefore, it is likely within each key stage within the project, week numbers will be identified which in turn show the overall duration. Depending on the procurement method chosen, the following Key Stages apply:

- Key Stage 3 (KS3) – Preliminary design and preparation of Environmental Statement and draft Orders;
- Key Stage 4 (KS4) – Public Inquiry (if required);
- Key Stage 5 (KS5) – Procure Contractor (this key stage is only used where an Employers Design or Design and Build Contract is utilised, and does not apply to ECI Contracts); and
- Key Stage 6 (KS6) – Detailed Design, Construction and Maintenance (ECI and D&B Stages only, for Employers Design KS6 relates to Construction and Maintenance as Detailed Design is completed during KS4).

5.3.6 Allocation of Risk

The allocation of risk would need to be covered in a project risk register following risk workshops conducted throughout the project design stage and further in the construction stage. Allocation of risk would also be specified in the chosen contracts, utilising contract conditions and any additional clauses required by the Employer.

5.3.7 Payment Mechanisms

The chosen contract will stipulate what the payment mechanisms/ arrangements are for each stage. However, the employer may make amendments to these payment process to suit their requirements, any amendments will be detailed in the relevant contract documents. If a Target Cost contract is utilised a pain/ gain mechanism would need to be developed identifying the necessary, share. Therefore, any over-spend or under-spend is shared between the Employer and Consultant/ Contractor in accordance with these share ranges.

5.4 Whole Life Cost Assessment

There would be on-going revenue support required for each of the options, although these are expected to be greatest for the public transport options (but the extent of each is currently unknown). It is however also anticipated that the delivery of a new bypass would have the potential to adversely impact on existing maintenance budgets which are already under considerable pressure.

6 Management Case

6.1 Overview

The Management Case considers the delivery arrangements for the project and how the project is going to be managed through its lifetime. The Management Case shows the project is achievable and identifies the different arrangements put in place to deliver the project.

6.2 Bypass Highway Options

6.2.1 Project Plan

How a bypass is delivered would be delivered would be determined at the next stage, however the two options available are to Procure an ECI Contractor or to Procure via a Design and Build Contract.

ECI - design and build contract using the NEC Professional Services and Engineering Construction target cost Contracts. These types of contract have been successfully used on a number of schemes including the A40 Penblewin to Slebech Park, A477 St Clears to Red Roses and A465 Heads of the Valley Dualling, Sections 2 and 3.

As mentioned above, which ever procurement method is chosen, the project will need to align with the Welsh Government Approvals Process. The KSA process provides a staged financial approval system to manage the process of projects from inception, through to construction and initial maintenance and complies with the principles of PRINCE2 project management:

- Milestones
- Approvals

6.2.2 Legal Requirements

The Highway scheme would be required to conform to all legal requirements and will be delivered under the Highways Act 1980. Land required for the Scheme will be acquired via the Acquisition of Land Act 1981 via a Compulsory Purchase Order.

Design and construction of the project will be undertaken with due consideration of the following key items:

- Construction (Design and Management) Regulations 2015;
- Equality Act 2010;
- Active Travel (Wales) Act 2013;
- The Wellbeing and Future Generations (Wales) Act 2015;
- Wales Act 2017 and Welsh Language Standards (Welsh Ministers, County and County Borough Councils, and National Park Authorities) Regulations 2015; and
- The project should also conform to all EU and UK Environmental Legislation.

6.2.3 Governance

Organisational Structure

Depending on the type of procurement method used for further design and construction, the anticipated core parties involved in the delivery of the project would be:

- The Employer – representing the Vale of Glamorgan.
- The Employer's Agent – acting as the Vale of Glamorgan's representative, providing financial, project management, contract and technical advice throughout the project.

Design and Build Contract

Contractor – commissioned to undertake detailed design, construction and aftercare of the project.

Designers – commissioned to carry out the preliminary environmental and engineering design for the preferred route, as well as undertake all activities necessary for the publication of orders, and procure the Contractor

ECI Contract (ECI)

ECI Contractor – commissioned to develop the outline design, prepare the necessary statutory orders and EIA documentation, publish draft Orders, progress the project through the statutory process, including Public Inquiry if required and, if successful, then to undertake the detailed design, construction and aftercare of the project.

ECI Contractor's Designers – employed by the ECI Contractor to carry out the preliminary environmental and engineering design for the preferred route, as well as undertake all activities necessary for the publication of orders, and to complete detailed design.

Employers Design

Contractor – commissioned to undertake construction and aftercare of the project.

Designers – commissioned to carry out the preliminary environmental and engineering design for the preferred route, as well as undertake all activities necessary for the publication of orders, Detailed Design and procure the Contractor

6.2.4 Project Reporting

The project would be managed following the principles of the PRINCE2 project management process combined with a compatible web-based project management system. The key stages of the project will form the Stage Boundaries within PRINCE2 and will require Project Board approval.

The project would be led by Vale of Glamorgan Council as the Employer. The Employer will also include other individuals and departments within the local authority identified by the Project Engineer and Project Director for the delivery of the project.

Interaction with the Employer, unless otherwise agreed, will be made through the Project Director or the Project Engineer as identified within the contract documents (once the procurement route has been determined).

Progress meetings should be held at monthly intervals with the Designer/ Contractor/ Employers Agent and Employer.

Quarterly Financial Review meetings should also be utilised to discuss financial matters and to ensure the project stays on track within budget and to agreed timescales.

6.2.5 Communication and Stakeholder Management

To ensure the management of stakeholders and communication on the project is managed correctly, a Communications Plan should be drafted which identifies how all communications between project team members and external parties will be managed. All parties adhering to the communications plan should ensure that the needs of the Employer are met, and the project is delivered successfully.

6.2.6 Monitoring and Evaluation

Some of the Monitoring that would be required to be undertaken during the life of the project are outlined below:

- Environmental aftercare;
- Annual Environmental Performance and Monitoring Report (AEPMR);
- Health and Safety File; and
- Safety audits following completion of design and then construction works.

WelTAG 2017 includes the requirement for a detailed monitoring and evaluation plan to be drawn up in Stage Three. This plan would describe what evidence would be used in the project's evaluation report and how it will be collected. Evidence is required on the actual inputs used when implementing the scheme and during its on-going operation, what was actually delivered, the impacts experienced, to what extent the intervention met its objectives and how they were achieved.

6.2.7 Risk Management

Risk will be managed on the project in accordance with the procedures set out in the latest version of the Value for Money Manual – Risk Analysis and Management.

A risk workshop should be conducted early in the next stage of the project (WelTAG Stage Three). A Risk Register should then be developed and reviewed and updated (where required) as a minimum every three months throughout the projects life.

6.3 Multi-Modal Option

It is anticipated that the delivery of bus enhancements, walking and cycling improvements and a new Park and Ride facility would be managed by the Vale of Glamorgan Council utilising Welsh Government grant funding where available. Subject to confirmation it would be assumed that Welsh Government/ Transport for Wales would be responsible for the delivery of rail enhancements, with implementation of service and infrastructure enhancements the responsibility of Network Rail and the newly appointed Wales and Borders rail franchisee, KeolisAmey (as from October 2018). The management and delivery of the scheme would likely follow the key stages Network Rail GRIP process encompassing scheme initiation and feasibility, option selection, design development, construction and project close out. The development of rail enhancements would subsequently be anticipated to be progressed in close consultation with integral stakeholders as well as through public consultation.

6.4 Review Group

A Strategic Group has been set up to guide the WelTAG process and have met previously to discuss the project. The membership of the group has been confirmed by the Vale of Glamorgan Council.

7 Conclusions and Recommendations

7.1 Introduction

The WelTAG Stage Two report has developed and appraised options to address the study objectives and thereby counter the problems identified and contribute to the goals of the Well-being of Future Generations (Wales) Act 2015, together with Welsh Government strategies and outcomes.

This represents an outline business case, for which a quantitative assessment of the value for money of the scheme, and appraisal of the social, environmental, cultural and economic impacts has been undertaken.

7.2 Options Overview

The work undertaken to inform this study has identified that the current transport corridor is very congested, with traffic saturating the existing A4055 and consequently impacting on the key junctions. Moreover, this is anticipated to be exacerbated in the future, do-minimum scenario, with traffic growth. In addition, the public transport services suffer from overcrowding and poor quality facilities and the walking and cycling network is limited.

The range of options considered in this report include bypass alignments, a package of multi-modal measures, and a combination of a bypass and multi-modal measures. The appraisal indicates that a bypass may offer value for money, although it is likely to have significant environmental and amenity impacts and require substantial public funding. Of the bypass options, the Green alignment offers the highest potential benefits, with the Blue alignment not likely to establish a high level of displacement of traffic from the corridor through Dinas Powys.

The benefits of multi-modal measures are harder to quantify at this stage but would offer more travel options and potential for sustainable travel. Overall, the highest performing option appears to be the combination of the Green bypass alignment and multi-modal measures.

7.3 Traffic Capacity Constraints at Key Junctions

It should be highlighted that the options have been considered in the context of achieving benefits of reducing traffic and encouraging sustainable travel within Dinas Powys. As a separate but interlinked exercise, traffic modelling analysis has been undertaken of the key junctions and their interaction (Murch Road, Merrie Harrier and Barons Court using LinSig and Vissim) to understand how the corridor will function in future and the impact of the various options. The modelling work is set out in detail in Appendix C.

This analysis has confirmed that the junctions are at or above capacity at present and this will worsen in the do-minimum.

With regards to the Barons Court junction, in the future year the junction is over saturated with significant queuing. Minor changes to cycle times have been included in modelling to minimise capacity issues. Possible improvements would involve enabling three lanes of traffic travelling straight ahead from Barry Road to the Cogan Spur in the northbound direction. However, the space is limited and given that this may require widening of the bridge, it is questionable whether this is a feasible or desirable option.

The Merrie Harrier junction presents a pinch point, with only one lane northbound on Barry Road through the junction. As a result, modelling indicates there would be queuing back from the junction with Penlan Road, and with a bypass, this would queue back through the roundabout junction. Provision of two lanes would require land take and property demolition on the north side of the road, affecting the Merrie Harrier public house.

With a bypass, the proposed roundabout junction with Redlands Road is anticipated to function within capacity, subject to queue back, and the Murch Road junction would experience less delay due to reduced traffic on the existing A4055.

Creation of a bus lane between the Merrie Harrier and Barons Court junctions is feasible in terms of capacity, although requires significant costs to benefit a relatively small number of buses.

In summary, the bypass option and the multi-modal offer benefits to the Dinas Powys transport network but the key junctions will continue to pose a constraint and negate the benefits of journey time savings through Dinas Powys. There are potential options for mitigation, but they require significant additional costs.

7.4 Report Status and Next Steps

This report is a draft with no status at present. The initial findings were considered by the Review Group on 2nd October 2018.

At the end of Stage Two, the guidance sets out that the report should:

- Determine whether there are any transport options that can address the issues identified, contributes positively to the well-being goals and objectives, and can be delivered within technical and financial constraints.
- Select a preferred option to be taken forward to WelTAG Stage Three.
- Agree the methods to be used to provide additional evidence where required for Stage Three.
- Identify any legislative requirements that need to be met during Stage Three.
- Document the decisions of the Stage Two Review Group, and the basis for these decisions.

The initial recommendations were that prior to proceeding with a Stage Three study, in order to make best and prudent use of public resources, and be in line with the intention of WelTAG to provide information to decision makers in a stepped manner, there is a need to:

- Engage with Network Rail to understand the feasibility and costs of constructing the bypass and roundabout junction over the railway tunnel. This represents a significant risk to cost and deliverability, and requires feasibility work; and
- Commission strategic traffic modelling using the SEWTM. This would seek to understand the benefits of a Dinas Powys bypass and multi-modal improvements in the sub-regional context. It would need to take account of other proposals such as the Eastern Bay Link which may impact on the corridor through Dinas Powys, as well as the wider network constraints. This would enable a fuller understanding of the business case for the options.

As a result of discussion at the Review Group, the following was agreed at the Review Group:

- The study has been completed in accordance with the assigned brief and extension to the study area to consider possible local benefits as a result of the options assessed.
- There was general consensus that there is a need to consider the wider strategic impacts of the proposals including how extant capacity issues at the Merrie Harrier and Barons Court junctions affect the benefits realised as part of the Stage Two study completed.
- The importance of strategic modelling using SEWTM was identified as a key driver in the assessment of any potential wider benefits beyond the Dinas Powys study area. The impact of other strategic proposals (e.g. M4 J34-A48 scheme proposals) was also raised and how these could impact on the Dinas Powys options. There is also a risk that local improvements to the highway network via a new bypass and/ or online highway improvements could exacerbate extant issues at the Barons Court junction with limited/ restricted opportunity to effectively mitigate.
- Once a public consultation programme was agreed, events should be considered outside of the Dinas Powys community to include locations in Barry and Penarth. Strategic assessment should be completed however prior to engaging with the public.
- There was strong support to consult with Network Rail at the earliest opportunity to assess the risk associated with the Vale of Glamorgan line tunnel situated to the south of the Merrie Harrier junction. There was concern that this could be a ‘show stopper’ and therefore represents a significant risk to the scheme.
- It was recommended that the Blue route needs additional analysis to recognise the potential wider strategic benefits, this would require further consideration by the Council.

- It was recognised that commuters/ other users want safer routes to encourage cycling. Other sustainable improvements to transport hubs will also help to encourage sustainable travel by walking and cycling.

Glossary of Terms and Acronyms

AEPMR	Annual Environmental Performance and Monitoring Report
AMCB	Analysis of Monetarised Costs and Benefits
ANPR	Automatic Number Plate Recognition
AQMA	Air Quality Management Area
BCR	Benefit Cost Ratio
CCTV	Closed-Circuit Television
CDM	Construction (Design and Management) Regulations
COBALT	**CO**st and **B**enefit to **A**ccidents – **L**ight **T**ouch
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
D&B	Design & Build
ECI	Early Contractor Involvement
ED	Employers Design
EU	European Union
FCA	Flood Consequence Assessment
HCD	Highways Construction Detail
HGV	Heavy Goods Vehicle
KPH	Kilometres per Hour
KS	Key Stage
LDP	Local Development Plan
LinSig	Design and assessment tool for traffic signal junctions and urban networks
LTN	Local Transport Note
LTP	Local Transport Plan
MCC	Manual Classified Counts
MPH	Miles per Hour
NMU	Non-Motorised User
NO2	Nitrogen Dioxide
NPV	Net Present Value
NRSWA	New Roads and Street Works Act 1991 (and amendments)
NTEM	National Trip End Model
OB	Optimism Bias
OJEU	Official Journal of the European Union
OS	Ordinance Survey
PA	Public Accounts
PIN	Prior Information Notice
PQQ	Pre-Qualification Questionnaire

PRINCE2	**PR**ojects **IN** **C**ontrolled **E**nvironments
PRoW	Public Right of Way
PVB	Present Value of Benefits
RRRAP	Road Restraints Risk Assessment Process
Sewta	South East Wales Transport Alliance
SEWTM	South East Wales Transport Model
SINC	Site of Nature Conservation
SPG	Supplementary Planning Guidance
TEE	Transport Economic Efficiency
TEMPro	Trip End Model Presentation Program
UK	United Kingdom
Vissim	Microscopic multi-modal traffic flow simulation software package
WebTAG	Web-based Transport Analysis Guidance
WelTAG	Welsh Transport Appraisal Guidance
WFD	Water Framework Directive
WIMD	Welsh Index of Multiple Deprivation
WTS	Wales Transport Strategy

APPENDIX A

Dinas Powys Community Council Additional Bypass Route Proposal

APPENDIX B

Green and Pink Bypass Alignments

APPENDIX C

Traffic Modelling Technical Notes

APPENDIX D

Multi-Modal Option

APPENDIX E

Blue Bypass Alignment

APPENDIX F

Economic Appraisal

APPENDIX G

WebTAG Assessment Sheets

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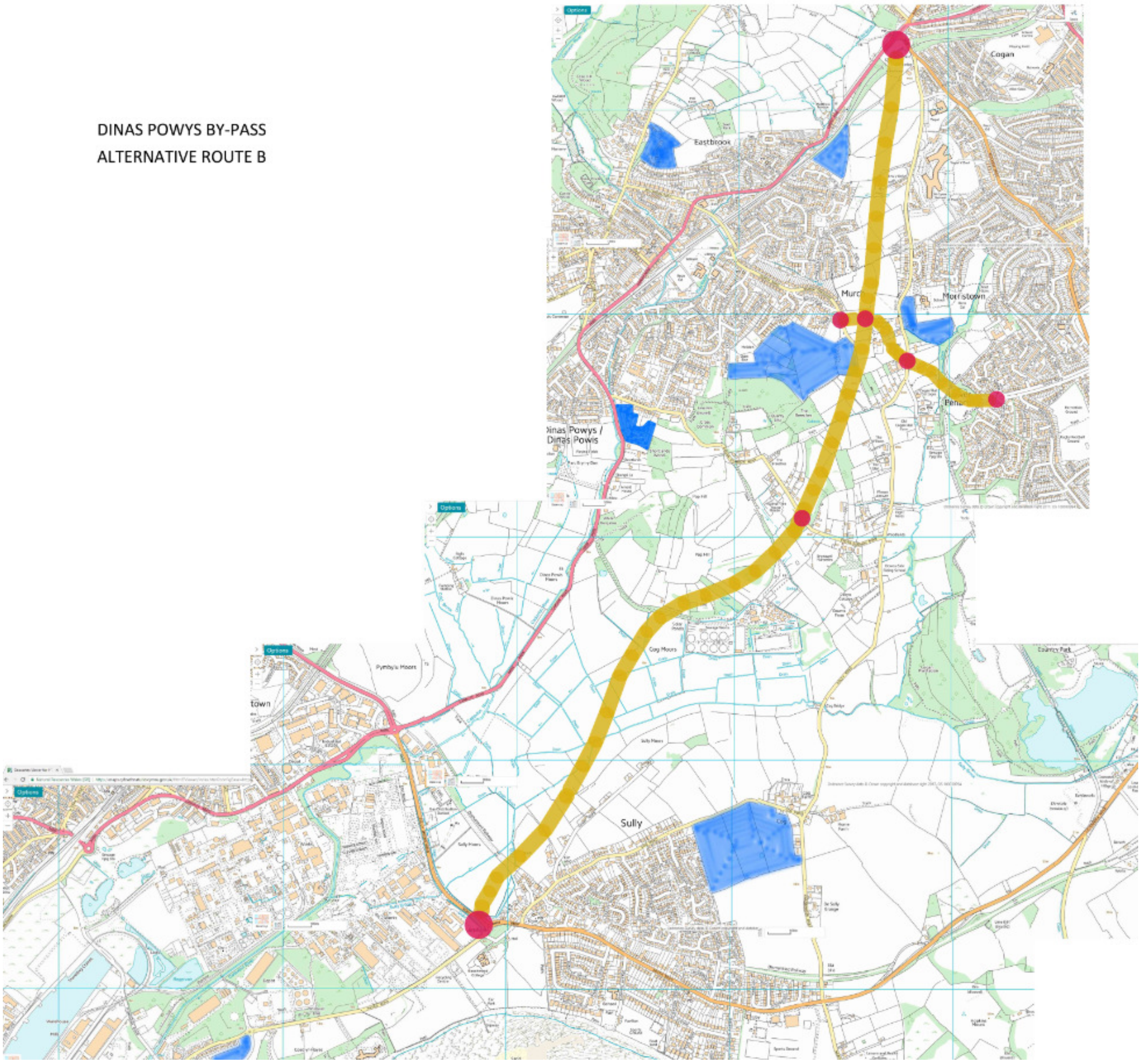
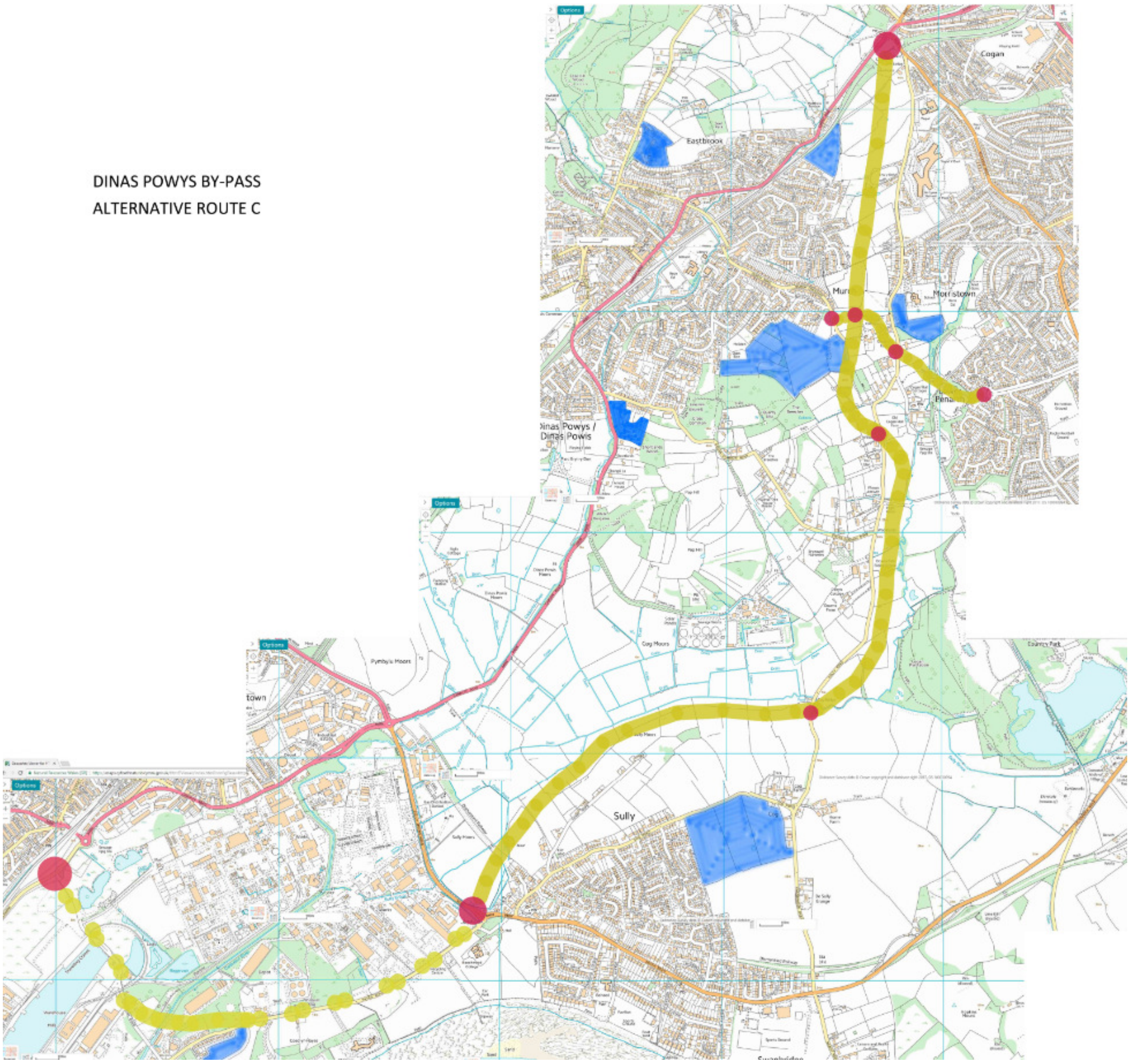
APPENDIX A

Dinas Powys Community Council Additional Bypass Route Proposal

DINAS POWYS BY-PASS
ALTERNATIVE ROUTE B

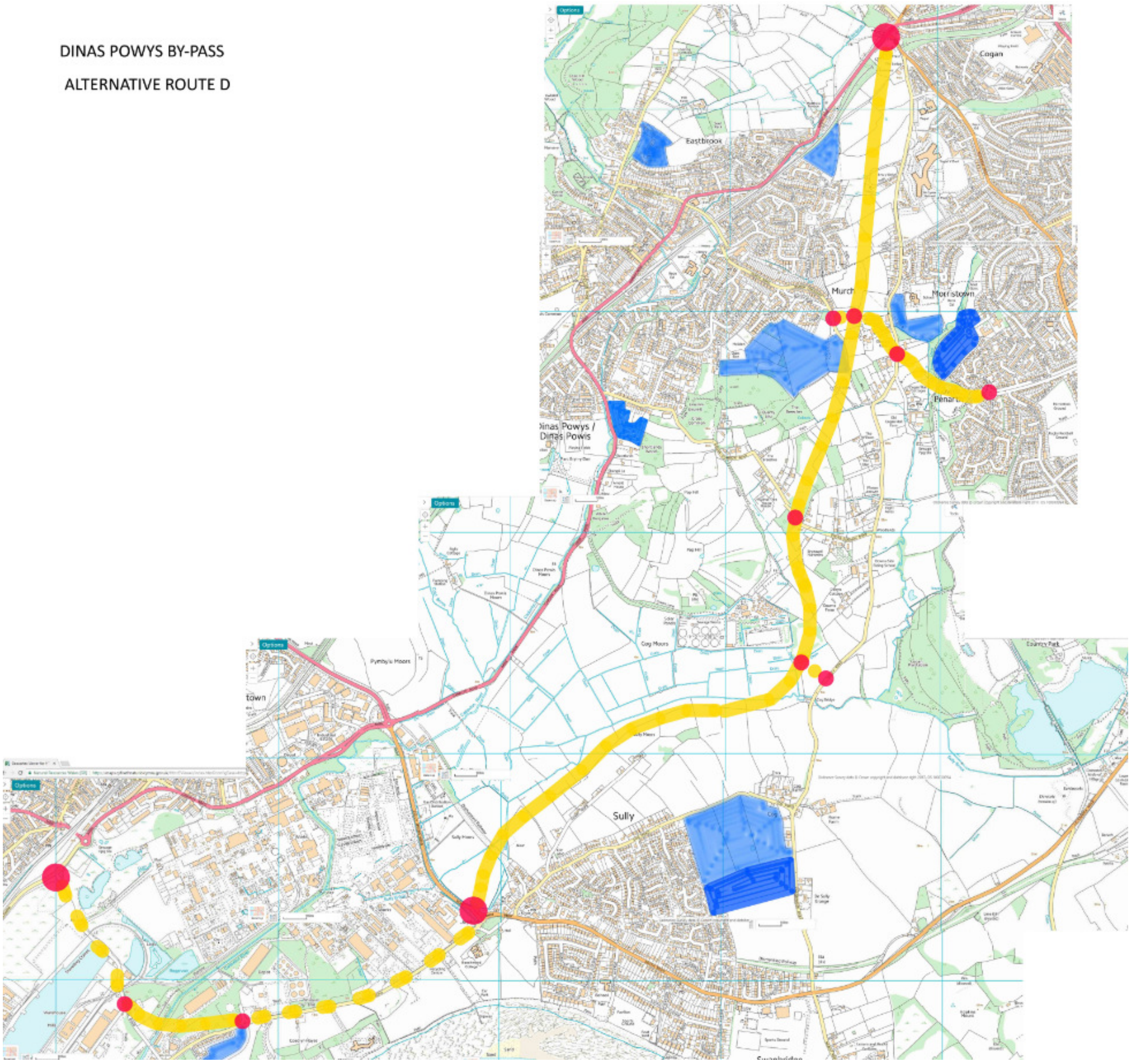


DINAS POWYS BY-PASS
ALTERNATIVE ROUTE C



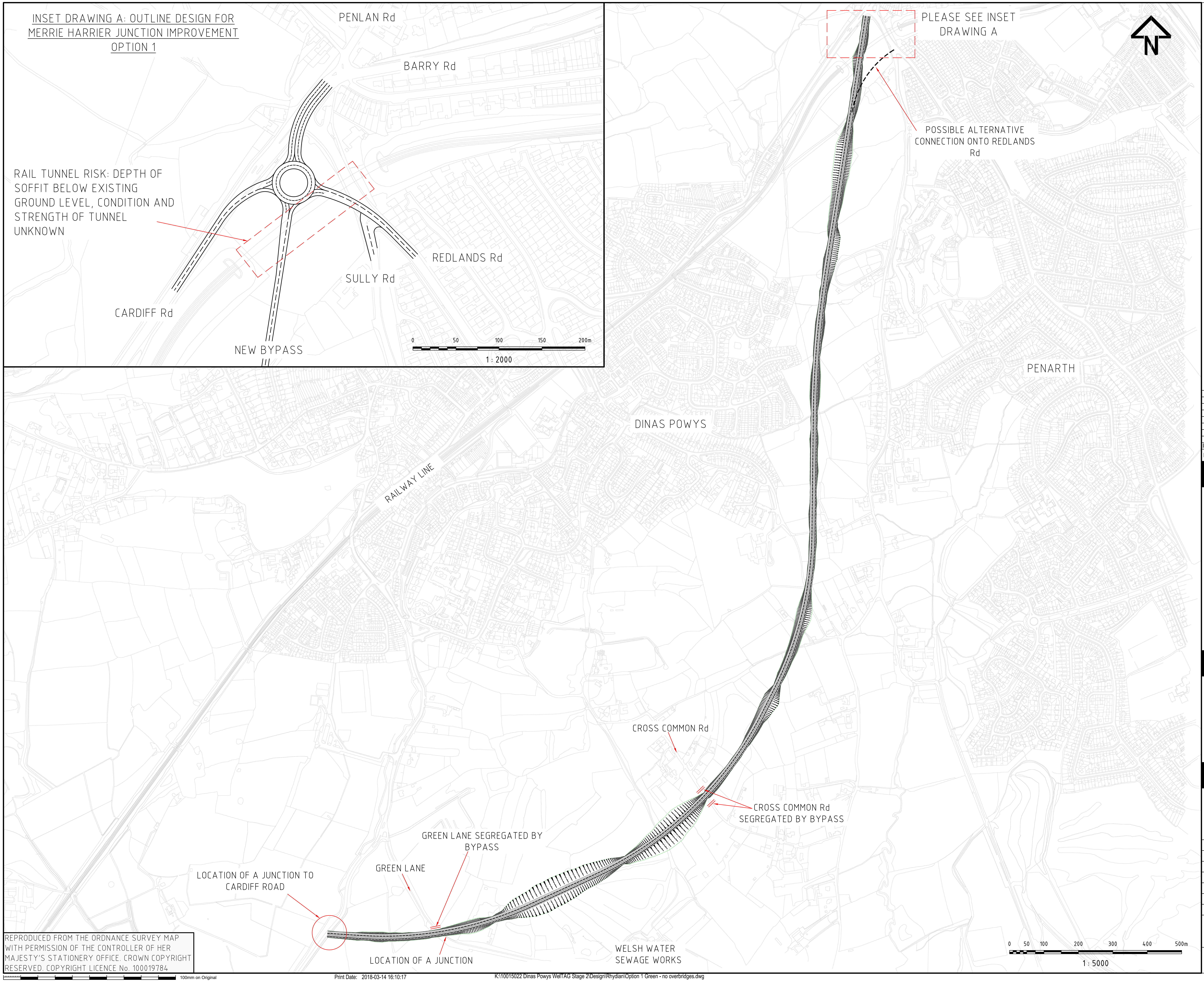
DINAS POWYS BY-PASS

ALTERNATIVE ROUTE D



APPENDIX B

Green and Pink Bypass Alignments



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NOTES:

OPTION 1 AND OPTION 2 OF THE MERRIE HARRIER JUNCTION IMPROVEMENT CAN BE ADOPTED FOR BOTH THE GREEN AND PINK ALIGNMENT. OUTLINE DESIGN OF OPTION 2 CAN BE FOUND IN DRAWING 10015022-ARC-XX-XX-DR-HE-0008.

LEGEND:

Rev	Date	Description	Drawn	Check	Approv
P1.0	08/03/18	FIT FOR INFORMATION	RE	MT	GH

Client

VALE OF
GLAMORGAN

PROJECT:
Dinas Powys
WelTAG S2

Site

VALE OF GLAMORGAN

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TITLE:

GREEN OPTION ALIGNMENT

Designed	R. ELLIS	Signed	Date 08MAR2018
Drawn	R. ELLIS	Signed	Date 08MAR2018
Checked	M. THOMAS	Signed	Date 08MAR2018
Approved	G. HARRIS	Signed	Date 08MAR2018
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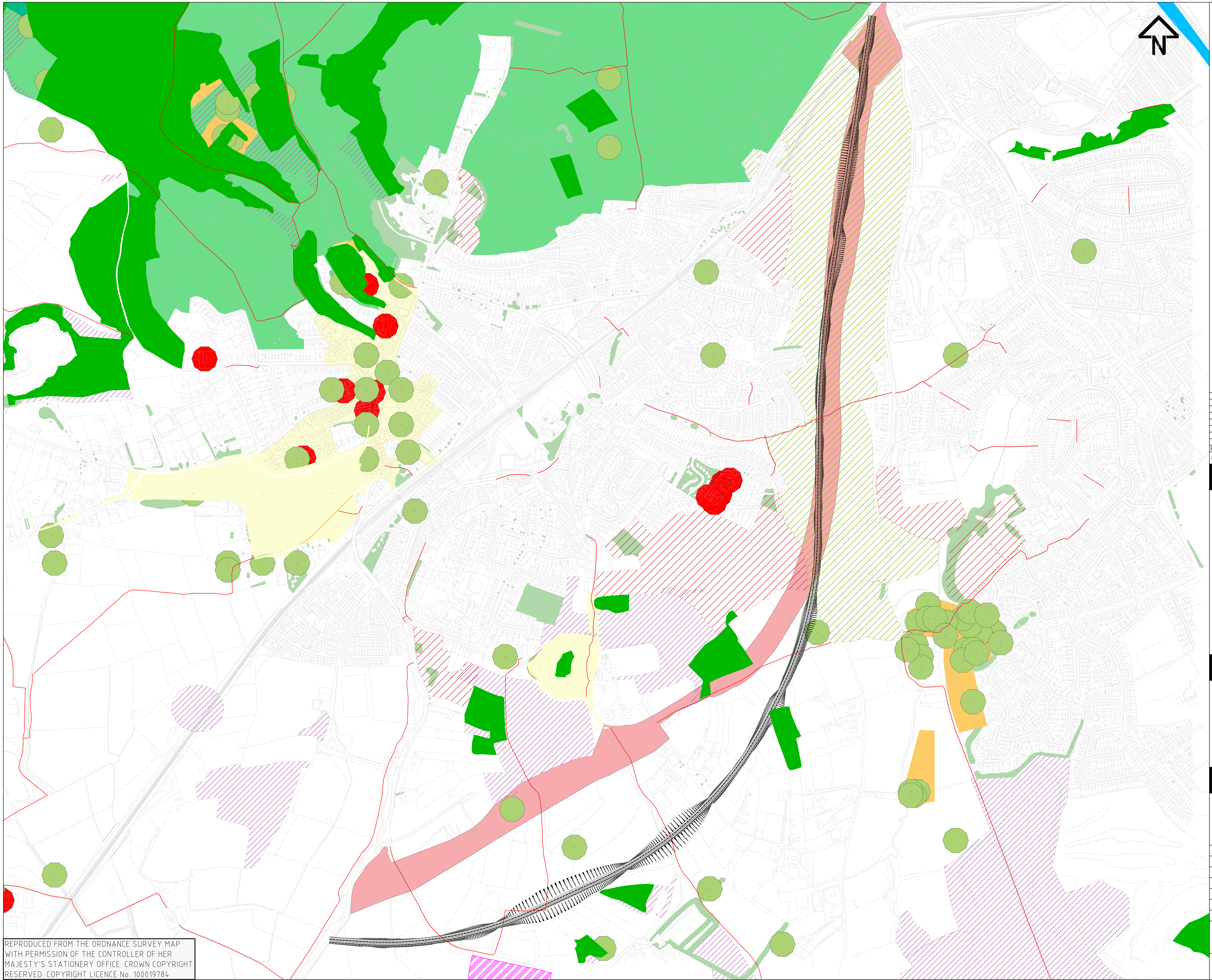
Original Size:	A1	Grid:	OS
Suitability Code:	S2	Project Number:	10015022

Suitability Description:
FIT FOR INFORMATION

Drawing Number:
10015022-ARC-XX-XX-DR-HE-0004

Revision:
P1.0



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NOTES:

LEGEND:

- ▬ PUBLIC RIGHT OF WAY
- ▨ SITE OF SPECIAL SCIENTIFIC INTEREST
- ▨ SITES OF IMPORTANCE FOR NATURE CONSERVATION
- 🟩 TREE PRESERVATION ORDER
- 🟩 SPECIAL LANDSCAPE AREAS
- 🟦 AIR QUALITY MANAGEMENT AREA
- 🟧 ANCIENT MONUMENTS
- ● LISTED BUILDINGS
- 🟨 CONSERVATION AREA
- 🟩 CADW PARKS AND GARDENS
- 🟩 ANCIENT WOODLAND
- ▨ GREEN WEDGE
- ● ARCHAEOLOGY FEATURE
- 🟥 UDP ROUTE
- ▨ LOCAL DEVELOPMENT PLAN

P1.0	07/03/18	FIT FOR INFORMATION	RE	MT	GH
Rev	Date	Description	Drawn	Check	Approv

Client

VALE OF GLAMORGAN

PROJECT:
Dinas Powys
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TITLE:

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Checked	M. THOMAS	Signed	Date 07MAR2018
Approved	G. HARRIS	Signed	Date 07MAR2018
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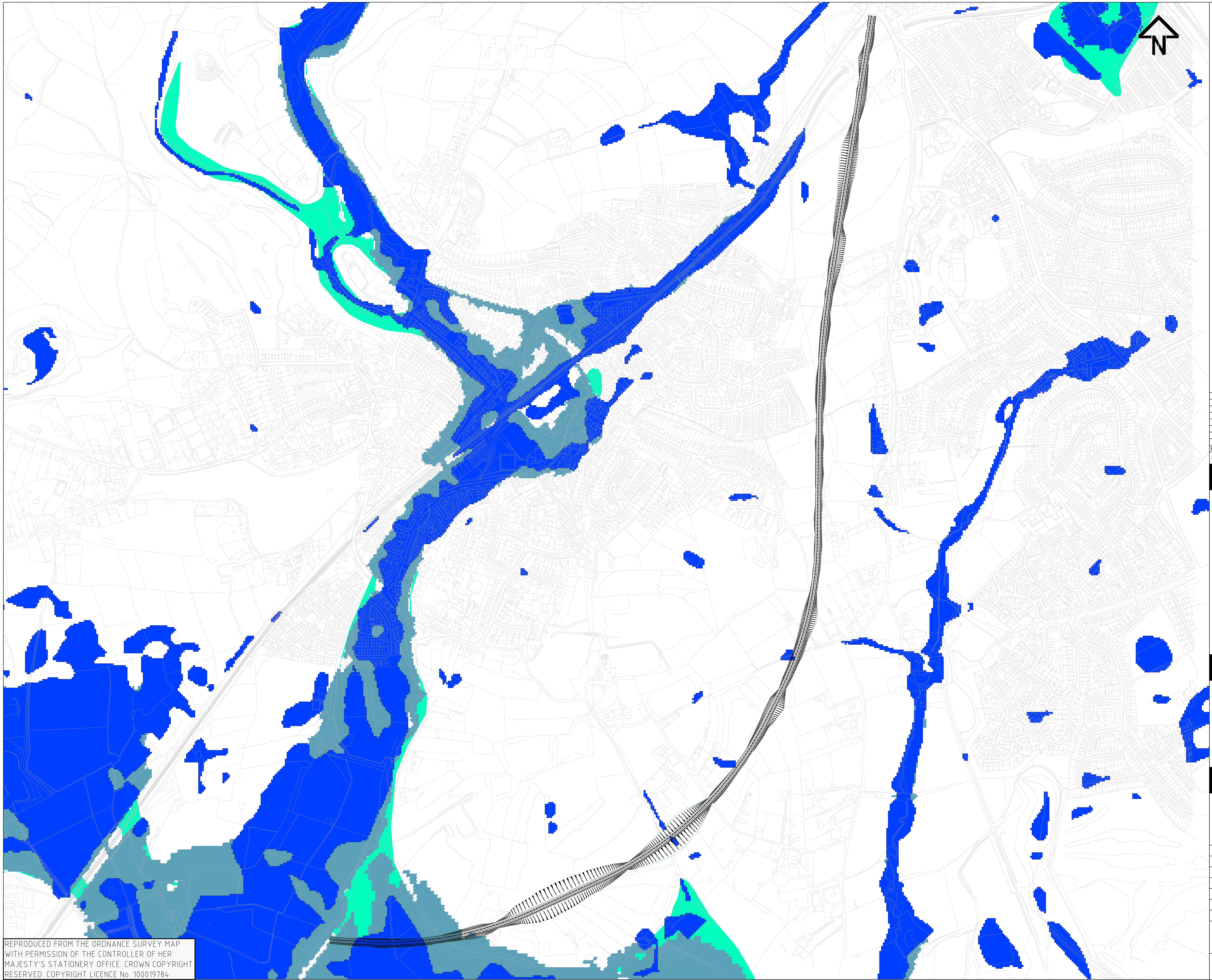

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🟩	FLOOD ZONE B
🟦	FLOOD ZONE C1
▨	FLOOD ZONE C2

Rev	Date	Description	Drawn	Check	Approv
P1.0	07/03/18	FIT FOR INFORMATION	MS	MT	GH

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TITLE:

GREEN OPTION ALIGNMENT
WITH
FLOOD ZONES

Designed	R. ELLIS	Signed	Date 07MAR2018
Drawn	M. SMITH	Signed	Date 07MAR2018
Checked	M. THOMAS	Signed	Date 07MAR2018
Approved	G. HARRIS	Signed	Date 07MAR2018
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Original Size:	A1	Grid:	OS
Suitability Code:	S2	Project Number:	10015022

Suitability Description:
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10015022-ARC-XX-XX-DR-HE-0006

Revision:
P1.0

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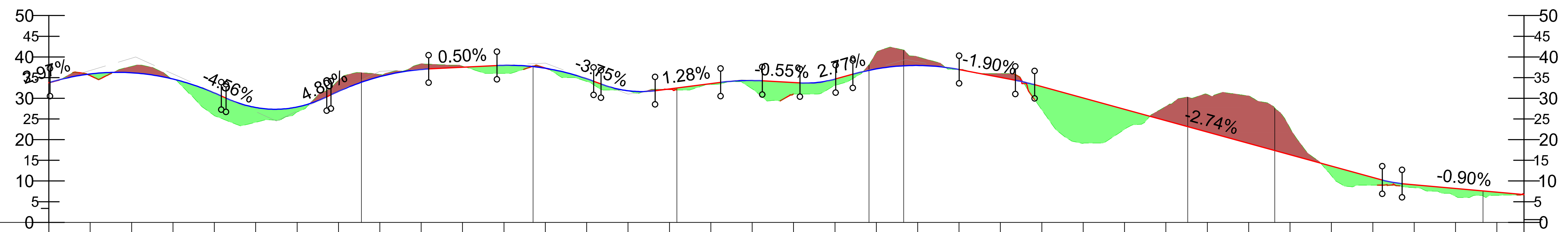

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Proposed Levels	33.766	35.879	36.175	34.653	31.312	27.767	27.888	31.670	35.229	36.970	37.500	37.974	37.258	34.724	31.821	32.277	33.555	34.303	33.804
Existing Levels	33.766	35.466	37.738	34.710	25.823	24.196	26.672	34.324	35.775	38.337	37.769	36.000	37.298	34.061	31.824	32.175	33.322	32.286	31.000
Level Difference	0.000	0.413	-1.563	-0.058	5.489	3.571	1.216	-2.654	-0.546	-1.367	-0.269	1.974	-0.039	0.663	-0.003	0.102	0.233	2.017	2.804

Chainage	1900.000	2000.000	2100.000	2200.000	2300.000	2400.000	2500.000	2600.000	2700.000	2800.000	2900.000	3000.000	3100.000	3200.000	3300.000	3400.000	3500.000	3565.453
Proposed Levels	34.623	37.103	37.935	36.950	35.051	32.809	30.066	27.323	24.580	21.837	19.094	16.351	13.608	10.865	9.097	8.194	7.291	6.700
Existing Levels	33.083	41.003	40.054	37.000	36.000	27.220	19.115	22.497	28.070	30.948	30.584	22.806	11.296	9.000	8.370	6.294	6.547	6.646
Level Difference	1.540	-3.901	-2.119	-0.050	-0.949	5.589	10.951	4.826	-3.490	-9.111	-11.490	-6.456	2.312	1.865	0.727	1.900	0.744	0.054

Horizontal Geometry

L =755.596
R: 2880.000 L: 414.811
L =347.526
R: 1020.000 L: 464.569
L =83.517
R: 1020.000 L: 686.751
L =210.184
R: 1020.000 L: 503.520
L =98.979

Vertical Geometry

G =2.968% L =3.001
R =5500.000 K =55.000 L =413.998
G =-4.559% L =11.336
R =2600.000 K =26.000 L =243.329
G =4.800% L =10.085
R =5500.000 K =55.000 L =236.500
G =0.500% L =164.875
R =5500.000 K =55.000 L =233.750
G =-3.750% L =17.769
R =2600.000 K =26.000 L =130.712
G =1.277% L =158.328
R =5500.000 K =55.000 L =100.633
G =-0.552% L =91.247
R =2600.000 K =26.000 L =86.462
G =2.773% L =41.246
R =5500.000 K =55.000 L =256.970
G =-1.899% L =135.936
R =5500.000 K =55.000 L =46.418
G =-2.743% L =840.483
R =2600.000 K =26.000 L =47.844
G =-0.903% L =294.531

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NOTES:

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Designed	R. ELLIS	Date	14MAR18	Signed	
Drawn	R. ELLIS	Date	14MAR18	Signed	
Checked	M. THOMAS	Date	14MAR18	Signed	
Approved	G.HARRIS	Date	14MAR18	Signed	
Scale:	As shown	Datum:	AOD		
Original Size:	A1	Grid:	OS		
Suitability Code:	S2	Project Number:	10015022		

PROJECT:
DINAS POWYS
WelTAG S2

TITLE:
GREEN OPTION
LONGSECTION

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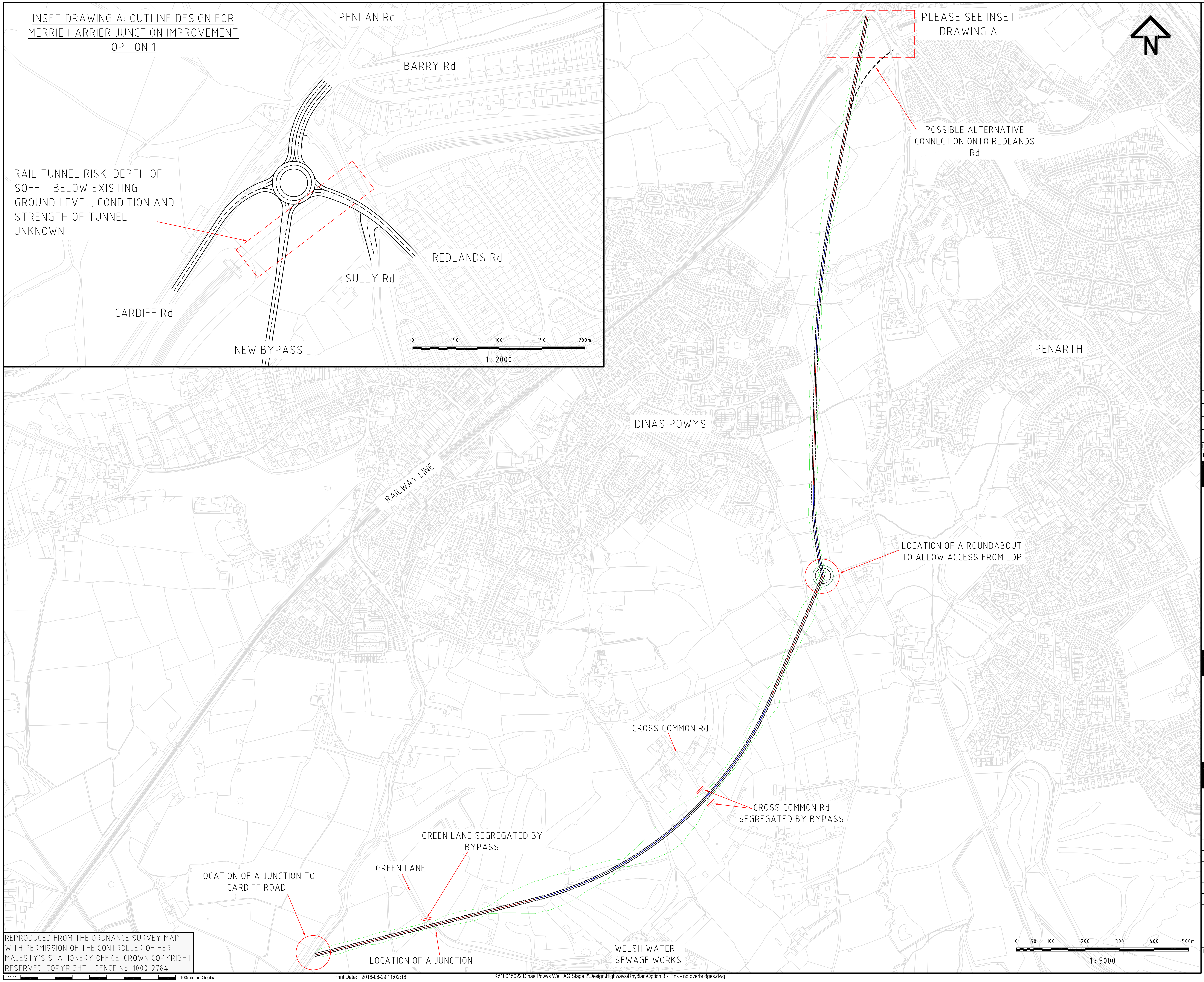
Revision: P01

APPENDIX B

Green and Pink Bypass Alignments



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NOTES:

OPTION 1 AND OPTION 2 OF THE MERRIE HARRIER JUNCTION IMPROVEMENT CAN BE ADOPTED FOR BOTH THE GREEN AND PINK ALIGNMENT. OUTLINE DESIGN OF OPTION 1 CAN BE FOUND IN DRAWING 10015022-ARC-XX-XX-DR-HE-0004.

LEGEND:

P1.0	01/03/18	FIT FOR INFORMATION	RE	MT	GH
Rev	Date	Description	Drawn	Check	Approv

Client

VALE OF
GLAMORGAN

PROJECT:
Dinas Powys
WelTAG S2

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TITLE:

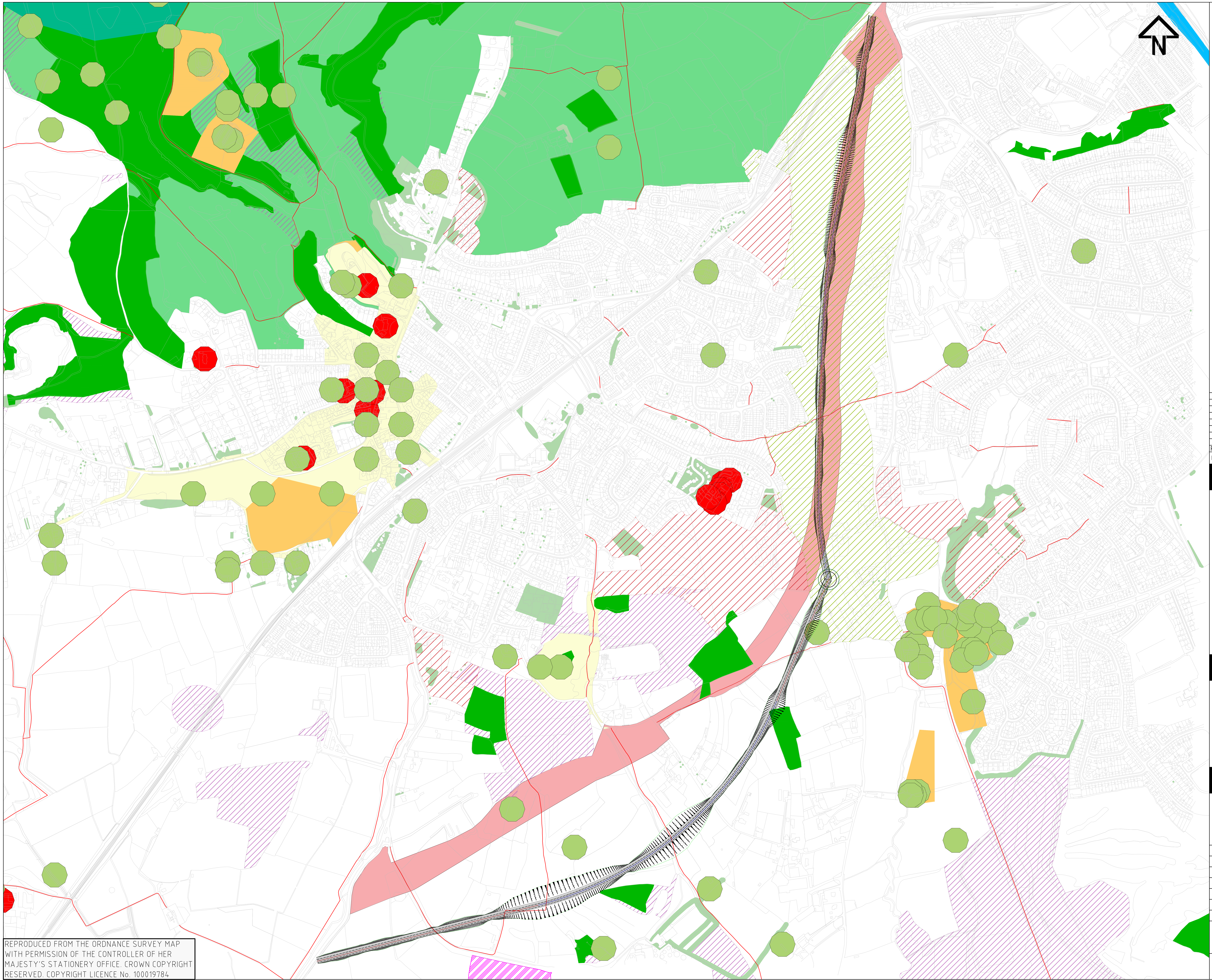
PINK OPTION ALIGNMENT

Designed	R. ELLIS	Signed	Date 01MAR2018
Drawn	R. ELLIS	Signed	Date 01MAR2018
Checked	M. THOMAS	Signed	Date 01MAR2018
Approved	G. HARRIS	Signed	Date 01MAR2018
Scale:	1:5000	Datum:	AOD
Original Size:	A1	Grid:	OS
Suitability Code:	S2	Project Number:	10015022

Suitability Description:
FIT FOR INFORMATION

Drawing Number:
10015022-ARC-XX-XX-DR-HE-0008

Revision:
P1.0



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NOTES:

LEGEND:

▬	PUBLIC RIGHT OF WAY
▨	SITE OF SPECIAL SCIENTIFIC INTEREST
▨	SITES OF IMPORTANCE FOR NATURE CONSERVATION
🟩	TREE PRESERVATION ORDER
🟩	SPECIAL LANDSCAPE AREAS
🟦	AIR QUALITY MANAGEMENT AREA
🟧	ANCIENT MONUMENTS
🔴	LISTED BUILDINGS
🟨	CONSERVATION AREA
🟩	CADW PARKS AND GARDENS
🟩	ANCIENT WOODLAND
▨	GREEN WEDGE
●	ARCHAEOLOGY FEATURE
🟥	UDP ROUTE
▨	LOCAL DEVELOPMENT PLAN

P1.0	08/03/18	FIT FOR INFORMATION	MS	MT	GH
Rev	Date	Description	Drawn	Check	Approv

Client

VALE OF
GLAMORGAN

VALE of GLAMORGAN
BRO MORGANNWG

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TITLE:

PINK OPTION ALIGNMENT WITH ENVIRONMENTAL CONSTRAINTS

Designed	R. ELLIS	Signed	Date 08MAR2018
Drawn	M. SMITH	Signed	Date 08MAR2018
Checked	M. THOMAS	Signed	Date 08MAR2018
Approved	G. HARRIS	Signed	Date 08MAR2018
Scale:	1:5000	Datum:	AOD
Original Size:	A1	Grid:	OS
Suitability Code:	S2	Project Number:	10015022

Suitability Description:
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Drawing Number:
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Revision:
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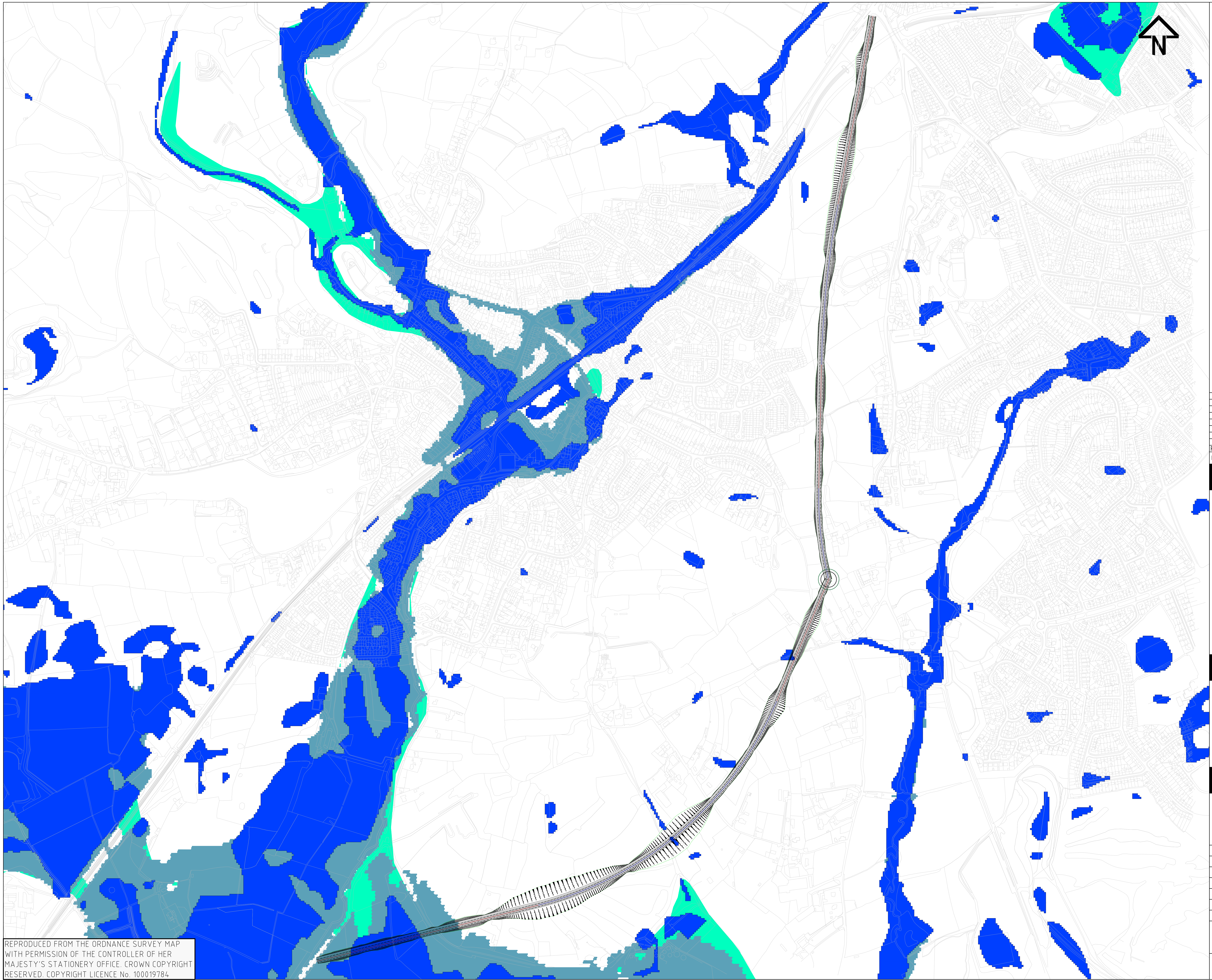

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NOTES:

LEGEND:

- 🟩 FLOOD ZONE B
- 🟦 FLOOD ZONE C1
- ▨ FLOOD ZONE C2

Rev	Date	Description	Drawn	Check	Approv
P1.0	08/03/18	FIT FOR INFORMATION	MS	MT	GH

Client

VALE OF GLAMORGAN

PROJECT:
Dinas Powys
WelTAG S2

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TITLE:

GREEN OPTION ALIGNMENT WITH FLOOD ZONES

Designed	R. ELLIS	Signed	Date 08MAR2018
Drawn	M. SMITH	Signed	Date 08MAR2018
Checked	M. THOMAS	Signed	Date 08MAR2018
Approved	G. HARRIS	Signed	Date 08MAR2018
Scale:	1:5000	Datum:	AOD
Original Size:	A1	Grid:	OS
Suitability Code:	S2	Project Number:	10015022

Suitability Description:
FIT FOR INFORMATION

Drawing Number:
10015022-ARC-XX-XX-DR-HE-0010

Revision:
P1.0

Option 3 - Pink R2 Alignment
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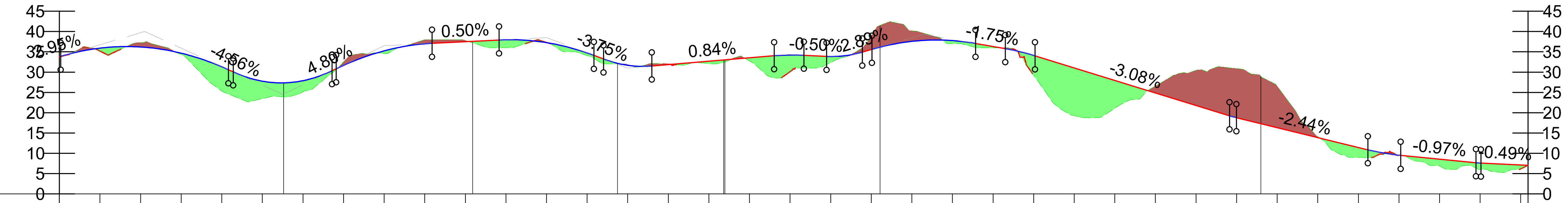
DATUM: 0.000



Chainage	00.000	100.000	200.000	300.000	400.000	500.000	600.000	700.000	800.000	900.000	1000.000	1100.000	1200.000	1300.000	1400.000	1500.000	1600.000	1700.000	1800.000
Proposed Levels	33.795	35.901	36.190	34.661	31.313	27.767	27.888	31.670	35.229	36.970	37.500	37.974	37.258	34.724	31.684	31.838	32.676	33.513	34.211
Existing Levels	33.795	35.171	37.266	34.300	25.312	23.450	25.124	32.502	34.575	37.980	37.785	36.000	37.311	34.075	31.838	31.934	32.075	32.725	30.098
Level Difference	0.000	0.730	-1.076	0.360	6.001	4.317	2.763	-0.832	0.654	-1.010	-0.285	1.974	-0.053	0.649	-0.154	-0.096	0.600	0.788	4.113

Chainage	1900.000	2000.000	2100.000	2200.000	2300.000	2400.000	2500.000	2600.000	2700.000	2800.000	2900.000	3000.000	3100.000	3200.000	3300.000	3400.000	3500.000	3600.000 3617.852
Proposed Levels	33.840	35.561	37.572	37.766	36.310	34.117	31.034	27.950	24.866	21.782	18.755	16.315	13.875	11.436	9.527	8.552	7.600	7.112 7.025
Existing Levels	32.317	38.790	40.143	37.000	36.000	29.240	19.245	21.069	26.559	30.428	30.864	26.496	14.060	9.000	9.427	6.832	6.000	6.162 7.000
Level Difference	1.523	-3.229	-2.571	0.766	0.310	4.877	11.789	6.881	-1.693	-8.646	-12.110	-10.181	-0.185	2.436	0.099	1.720	1.600	0.951 0.025

Horizontal Geometry

L =552.342
R: 2880.000 L: 465.483
L =356.795
R: 1020.000 L: 261.624
L =3.324
L =381.946
R: 1020.000 L: 938.390
L =657.948

Vertical Geometry

G =2.955% L =3.375
R =5500.000 K =55.000 L =413.250
G =-4.559% L =11.710
R =2600.000 K =26.000 L =243.329
G =4.800% L =10.085
R =5500.000 K =55.000 L =236.500
G =0.500% L =164.875
R =5500.000 K =55.000 L =233.750
G =-3.750% L =23.483
R =2600.000 K =26.000 L =119.283
G =0.838% L =301.100
R =5500.000 K =55.000 L =73.358
G =-0.496% L =55.863
R =2600.000 K =26.000 L =88.078
G =2.892% L =23.561
R =5500.000 K =55.000 L =255.278
G =-1.750% L =73.295
R =5500.000 K =55.000 L =73.385
G =-3.084% L =479.244
R =2600.000 K =26.000 L =16.754
G =-2.440% L =324.044
R =5500.000 K =55.000 L =80.679
G =-0.973% L =185.268
R =2600.000 K =26.000 L =12.621
G =-0.487% L =115.683

Rev	Date	Description	Drawn	Check	Approv
P01	14/03/18	FIT FOR INFORMATION	RE	MT	GH

NOTES:

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Drawn	R. ELLIS	Date 14MAR18	Signed
Checked	M. THOMAS	Date 14MAR18	Signed
Approved	G.HARRIS	Date 14MAR18	Signed
Scale:	As shown	Datum:	AOD
Original Size:	A1	Grid:	OS
Suitability Code:	S2	Project Number:	10015022

PROJECT:
DINAS POWYS
WelTAG S2

TITLE:
PINK OPTION
LONGSECTION

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Revision: P01

100mm on Original
Print Date: 2018-03-14 10:09:40
K:\10015022 dinas powys weltag stage 2\design\rhydian\civil 3d\Option 3 - Pink Civil 3D route 2 - No overbridges.dwg

APPENDIX C

Traffic Modelling Technical Notes

DINAS POWYS TRANSPORT NETWORK

Operational Modelling

DRAFT NO STATUS

JANUARY 2019

Incorporating

Dinas Powys Transport Network

Operational Modelling

Author	NC
Checker	DC
Approver	JH
Report No	10015022-ARC-XX-XX-RP-TP-0003
Date	JANUARY 2019

VERSION CONTROL

Version	Date	Author	Changes
D01	26th September 2018	NC	Confidential draft for review
D02	28th January 2019	NC	Draft No Status

This report dated 29 January 2019 has been prepared for Vale of Glamorgan Council (the "Client") in accordance with the terms and conditions of appointment dated 02 November 2017 (the "Appointment") between the Client Arcadis Consulting (UK) Limited ("Arcadis") for the purposes specified in the Appointment. For avoidance of doubt, no other person(s) may use or rely upon this report or its contents, and Arcadis accepts no responsibility for any such use or reliance thereon by any other third party.

Incorporating

EC HARRIS BUILT ASSET CONSULTANCY

Hyder

CONTENTS

1 Background

1.1 Introduction

1.1.1 Arcadis has been commissioned by the Vale of Glamorgan Council to develop and appraise potential options for improving the strategic transport network around Dinas Powys. The purpose of this transport technical note is to present the traffic operational assessment of the scheme proposals on the key junctions within the study area. This forms part of the WelTAG Stage Two assessment encompassing the proposed bypass (Green alignment) and multi-modal options against the do-minimum scenario.

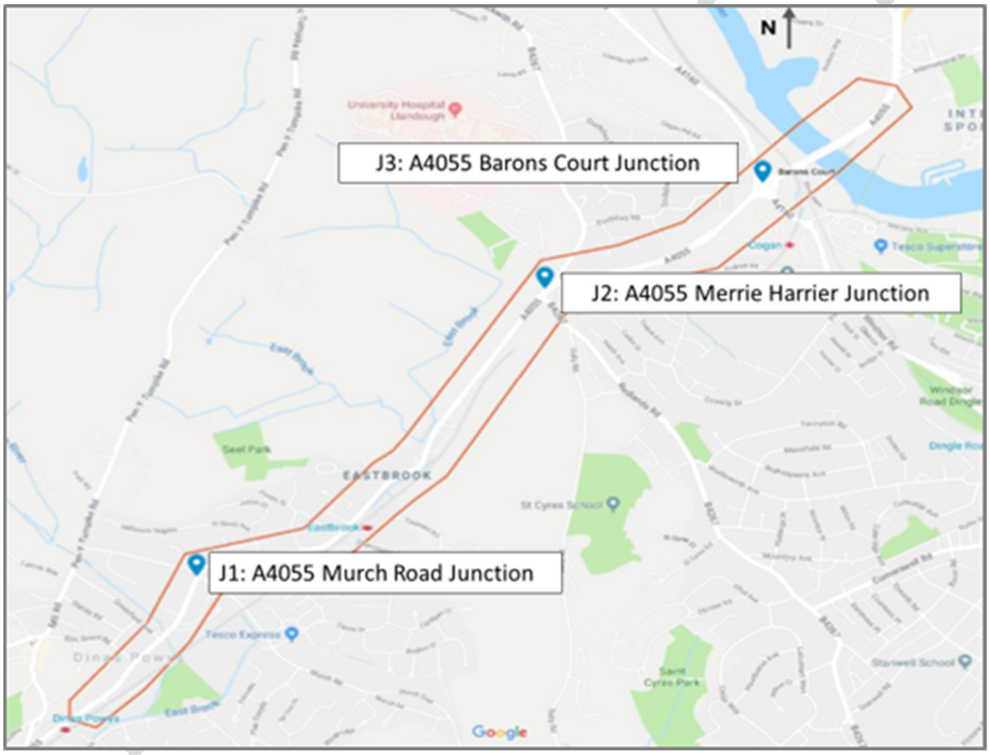
1.2 Study Area

1.2.1 The operational model covers a corridor of circa 3.3km and includes the following key junctions as shown in Figure 1:

- Junction 1: A4055 Murch Road Junction (Signal controlled)
- Junction 2: A4055 Merrie Harrier Junction (Signal controlled)
- Junction 3: A4055 Barons Court Junction (Signal controlled)

1.2.2 A LinSig model for each signalised junction has been developed as well as a Vissim model covering the area highlighted in red in Figure 1.

Figure 1 Study Area



1.3 Proposed Options

1.3.1 Two options have been tested as part of this assessment:

- The ‘Green alignment’ bypass option; and
- A multi-modal option.

2 Existing Situation

2.1 Background

2.1.1 The following chapter describes the performance of the base model year for 2017 in terms of junction and journey time performance.

2.2 Corridor DMRB Assessment

2.2.1 The A4055 corridor aligns through Dinas Powys and is classified as an A-Road-Primary Road Network. The area surrounding the A4055 consists of B-Road-Rural and Classified Unnumbered roads.

2.2.2 A cross-section analysis was undertaken on the A4055 corridor which is made of five sections entitled Sections 1, 6, 9, 10 and 12. The purpose of the cross-section analysis is to determine the carriageway standard requirements and check that the existing standard is appropriate against Design Manual for Road and Bridges (DMRB) standards. This assessment considered the two-way annual average daily traffic (AADT) for the opening year 2023 and design year 2036.

2.2.3 The AADT was calculated based on an assignment model for the opening year (2023) and design year (2036). Table 1 summarises the AADT for each section shown in Figure 2.

Table 1 AADT Summary

	AADT Flow					
A4055 Corridor	**Base 2017**	**DM 2023**	**DM 2036**	**DM 2051**	**Existing Carriageway Standard**	**Required Carriageway Standard**
Section 9	15037	15904	17076	17076	S2	WS2
Section 6	16428	17379	18662	18662	S2	WS2
Section 1	22433	23722	25465	25465	D2AP	D2AP
Section 10	14190	15006	16110	16110	S2	WS2
Section 12	17511	18513	19869	19869	S2	WS2

Table 2 Flow-based Carriageway Requirements (DMRB Volume 5, Section 2, Part 3 TD 46/97 chapter - 2.4, Pg No. 2/1)

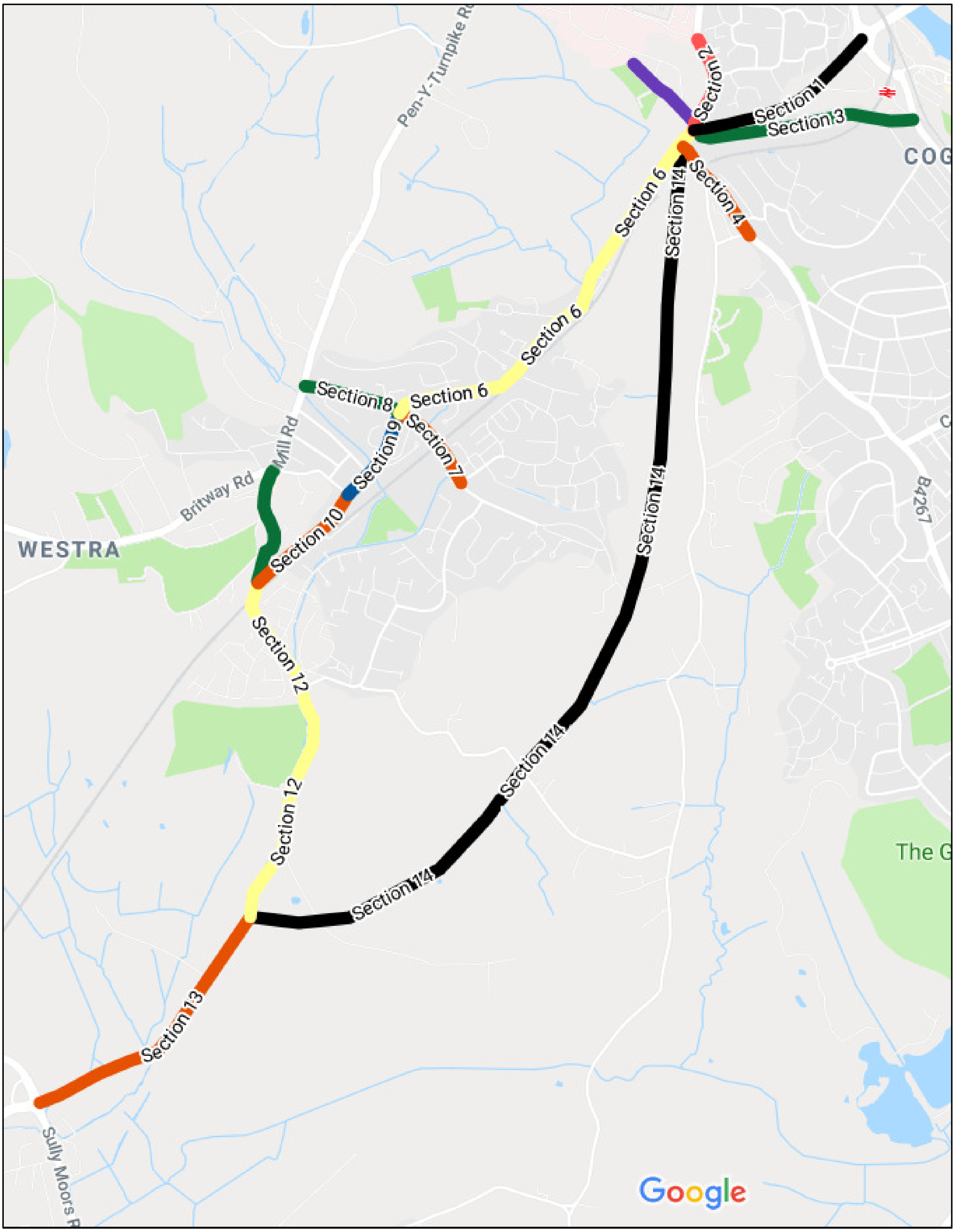
Carriageway Standard	Opening Year AADT (vehicles)	
	Minimum	**Maximum**
S2	Up to 13,000	
WS2	6,000	21,000
D2AP	11,000	39,000
D3AP	23,000	54,000
D2M	Up to 41,000	
D3M	25,000	67,000
D4M	52,000	90,000

2.2.4 The cross-section analysis shown in Table 1 confirmed that all sections are currently S2 carriageway standard, except Section 1 which is D2AP.

2.2.5 The analysis has shown that the AADT on all S2 sections are above the 13,000 vehicles limit in 2017 as well as for future years hence these sections would align with a WS2 category as a minimum, or a possibly a dual two lane D2AP.

2.2.6 Section 1 is the only section where the AADT values are below the stated threshold in 2017.

Figure 2 Map of Assigned Sections



2.3 Junction Assessment

2.3.1 A LinSig and Vissim model of the study area has been prepared to assess the scheme at a junction and corridor level. Both models have been validated and calibrated against site observations. The following section summarises the results of the base 2017 model in terms of degree of saturation, delay and queues.

Junction 1: A4055 Cardiff Road/ Murch Road Junction

2.3.2 The A4055 Cardiff Road/ Murch Road Junction is over saturated during the PM peak period with a DOS above 90% on Millbrook Road Southbound, the A4055 Cardiff Road Southbound and Murch Road. The PRC results of the optimised base model performed in a similar way as the base model for the AM and PM peak period.

2.3.3 It can be concluded that the MOVA system performs at a satisfactory level. Overall the junction performs under capacity during the AM peak period with a PRC value of 6%, however the PM peak period perform over capacity with a value of -7.9%.

Table 3 AM Base Model – A4055 Cardiff Road/ Murch Road Junction

			AM Base Model 2017			AM Base Model 2017 - Optimised		
Item	**Lane Description**	**Mvt**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**
1_1	A4055 Cardiff Road NB	Left + Straight	76.0%	39.1	17.1	76.0%	38.6	16.2
1_2	A4055 Cardiff Road NB	Right	11.0%	58.7	1.1	11.0%	58.2	1
3/2+3/1	Millbrook Road SB	Left + Straight	54.4 : 54.4%	76	3	54.4 : 54.4%	75.6	2.8
5/1+5/2	A4055 Cardiff Road SB	Straight + Right	82.5 : 82.5%	51.8	25.4	82.5 : 82.5%	51.3	24
7_1	Murch Road NB	All Mvts	84.9%	84.8	14.5	84.9%	84.4	14
		PRC Over All Lanes (%):	6.0			6.0		
		Total Delay Over All Lanes(pcuHr):	23.99			23.80		
		Cycle Time:	136			136		

Table 4 PM Base Model – A4055 Cardiff Road/ Murch Road Junction

			PM Base Model 2017			PM Base Model 2017 - Optimised		
Item	**Lane Description**	**Mvt**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**
1_1	A4055 Cardiff Road NB	Left + Straight	71.1%	33.3	15.9	71.8%	33.4	15.1
1_2	A4055 Cardiff Road NB	Right	17.5%	57.7	1.7	17.5%	57.5	1.7
3/2+3/1	Millbrook Road SB	Left + Straight	97.1 : 97.1%	161.5	12.3	94.0 : 94.0%	136.9	11
5/1+5/2	A4055 Cardiff Road SB	Straight + Right	94.0 : 94.0%	70.3	35.8	94.8 : 94.8%	71.5	34.6
7_1	Murch Road NB	All Mvts	93.1%	131.3	13.1	93.1%	130.9	13.4
		PRC Over All Lanes (%):	-7.9			-5.4		
		Total Delay Over All Lanes(pcuHr):	36.90			35.71		
		Cycle Time:	132			132		

Junction 2: Merrie Harrier

2.3.4 The Merrie Harrier junction is congested in the A4055 northbound direction as well as on Redland Road and the B4267 Penlan Road with a DOS above 90% during the AM and PM peak periods. The PRC results of the optimised base model perform in a similar way than the base model for the AM and PM peak period.

2.3.5 It is concluded that the MOVA system performs at a satisfactory level. Overall the PRC values show that the junction is congested in both peak period with a respective PRC value of -9.1% and -3.7%.

Table 5 AM Base LinSig Model – Merrie Harrier Junction

			AM Base Model 2017			AM Base Model 2017 - Optimsed		
Item	**Lane Description**	**Mvt**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**
1_1	A4055 Barry Road SB	Left	56.3%	16.9	13.3	56.3%	16.9	13.6
1_2	A4055 Barry Road SB	Left	86.3%	101.2	5.2	80.9%	78.1	4.5
7_1	Redlands Road	Letf and Right	90.8%	80.9	20.5	89.9%	69.6	16.7
7_2	Redlands Road	Left	90.9%	80.9	20.7	89.6%	68.7	16.6
9/1+9/2	A4055 Barry Road NB	Right + Right	94.4 : 94.4%	66.1	26.3	95.1 : 95.1%	71.4	28.8
3_1	B4267 Penlan Rd	Ahead + Left	96.6%	138.9	12.6	96.6%	141.9	13
3_2	B4267 Penlan Rd	Ahead	16.5%	38.3	1.8	16.5%	39.5	2.1
5/1+5/2	Barry Rd NB internal	Right	98.2 : 98.2%	54.1	94.3	98.2 : 98.2%	46	62.7
6/1+6/2	Barry Rd SB internal	Left and Straight	54.8 : 54.8%	7.6	19.4	54.4 : 54.4%	7.6	20.5
6_3	Barry Rd SB internal	Straight	6.9%	7.3	0.5	6.8%	6.6	0.5
		PRC Over All Lanes (%):	-9.1			-9.1		
		Total Delay Over All Lanes(pcuHr):	73.48			67.61		
		Cycle Time	107			107		

Table 6 PM Base LinSig Model – Merrie Harrier Junction

			PM Base Model 2017			PM Base Model 2017 - Optimised		
Item	**Lane Description**	**Mvt**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**
1_1	A4055 Barry Road SB	Left	78.8%	33.4	28	76.0%	30.9	25.5
1/2+1/3	A4055 Barry Road SB	Ahead + Ahead	63.5%	53.7	3.5	66.9%	52.4	3.8
1_4	Redlands Road	Right	90.8%	113.4	18.3	92.6%	104.9	16.2
2/2+2/1	Redlands Road	Ahead + Left	90.9%	113.5	18.6	92.7%	105	16.4
2/3+2/4	A4055 Barry Road NB	Right + Right	93.4 : 93.4%	74.8	28.8	92.4 : 92.4%	69.8	27.9
3/2+3/1	B4267 Penlan Rd	Ahead + Left	92.1%	87.1	20.4	92.1%	87	20.1
3_3	B4267 Penlan Rd	Ahead	20.4%	35.6	3.3	20.9%	37	3.7
3_4	Barry Rd NB internal	Right	88.7 : 88.7%	22.9	55.6	87.6 : 87.6%	19.2	50
4_1	Barry Rd SB internal	Left	62.7 : 62.7%	7.1	33.8	69.5 : 69.5%	15.4	31
4/2+4/3	Barry Rd SB internal	Ahead + Right	15.0%	5	2.9	19.6%	6.5	3.3
		PRC Over All Lanes (%):	-3.7			-3.1		
		Total Delay Over All Lanes(pcuHr):	63.18			61.58		
		Cycle Time	131			131		

Junction 3: Barons Court

2.3.6 The Barons Court junction is congested during the AM and PM peak periods with a practical reserve capacity (PRC) of -9.5% and -6.0% respectively during the AM and PM peak period. The highest Degree of Saturation (DoS) for the AM peak period is on the A4160 Windsor Road and A4055 Barry Road with 98% and 94%.

2.3.7 A long queue was observed on the A4055 Barry Road in the northbound direction due to a large number of vehicles travelling towards Cardiff during the AM peak period. It was also observed that Windsor Road gets called twice in a single cycle during the AM peak period via stage 3 and 5.

2.3.8 The Barons Court junction is running under MOVA control with a cycle time of 165 seconds. The signal Green time and cycle time used in the model have been observed on site. The results of the PM peak period show that Penarth Road is congested with a DOS of 95%. Windsor Road gets called once every cycle and the observed cycle time is 145 seconds.

2.3.9 The base 2017 model was optimised, and the results were compared with the observed based model to determine if the junction could be optimised further. The results show that the PRC has increased from -9.5% to -4.7% for the AM peak period and -6.0% to +0.3% for the PM peak period.

2.3.10 The analysis demonstrates that the signal timings used on site are not optimum and that the MOVA system could be optimised further. This discrepancy could be due to heavy vehicles on the A4055 and Windsor Road which impact the vehicle discharged rate on the MOVA loop. The observed cycle time for the AM and PM peak period are very long with respectively 165 seconds and 145 seconds.

Table 7 AM Base LinSig Model – Barons Court Junction

			AM Base Model 2017			AM Base Model 2017 - Optimised		
Item	**Lane Description**	**Mvt**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**
1_1	A4055 Cogan Spur SB	Left	39.5%	2.8	5.3	39.5%	2.8	5.3
1/2+1/3	A4055 Cogan Spur SB	Ahead + Ahead	86.4 : 86.4%	85.6 (85.6:85.6)	18	78.5 : 78.5%	72.3 (72.3:72.2)	16.3
1_4	A4055 Cogan Spur SB	Right	47.0%	95	3.5	47.0%	95	3.5
2/2+2/1	A4160 Windsor Rd	Ahead + Left	87.5 : 87.5%	42.0 (46.3:33.0)	17.1	82.1 : 82.1%	35.5 (39.6:26.8)	17
2/3+2/4	A4160 Windsor Rd	Right + Right	98.5 : 98.5%	79.0 (79.0:79.0)	29.5	94.2 : 94.2%	54.1 (54.1:54.1)	26.6
3/2+3/1	A4055 Barry Rd NB	Ahead + Left	94.5 : 94.5%	84.4 (105.8:53.2)	23.4	86.2 : 86.2%	59.2 (79.7:29.3)	19.5
3_3	A4055 Barry Rd NB	Ahead	91.8%	106.3	21.6	81.9%	80.9	18.8
3_4	A4055 Barry Rd NB	Right	35.8%	90.6	2.6	35.8%	90.6	2.6
4_1	Penarth Rd	Left	9.4%	2	0.8	9.4%	2	0.8
4/2+4/3	Penarth Rd	Ahead + Right	62.4 : 62.4%	71.8 (71.8:71.9)	8.8	84.0 : 85.7%	96.4 (96.3:96.5)	11.1
PRC Over All Lanes (%):			-9.5			-4.7		
Total Delay Over All Lanes(pcuHr):			73.62			60.75		
Cycle Time:			165			165		

Table 8 PM Base LinSig Model – Barons Court Junction

			PM Base Model 2017			PM Base Model 2017 - Optimised		
Item	**Lane Description**	**Mvt**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**
1_1	A4055 Cogan Spur SB	Left	48.1%	3.4	7.1	48.1%	3.4	7.1
1/2+1/3	A4055 Cogan Spur SB	Ahead + Ahead	80.4 : 80.4%	59.3 (59.3:59.3)	17.9	82.1 : 82.1%	61.8 (61.8:61.8)	18.2
1_4	A4055 Cogan Spur SB	Right	43.6%	81	3.2	43.6%	81	3.2
2/2+2/1	A4160 Windsor Rd	Ahead + Left	77.3 : 77.3%	54.3 (63.5:39.4)	14.8	81.3 : 81.3%	59.8 (69.2:44.6)	15.4
2/3+2/4	A4160 Windsor Rd	Right + Right	78.9 : 78.9%	60.3 (60.3:60.3)	11.7	82.0 : 82.0%	64.8 (64.8:64.8)	12.4
3/2+3/1	A4055 Barry Rd NB	Ahead + Left	74.0 : 74.0%	43.1 (56.0:16.2)	15.5	75.7 : 75.7%	44.4 (57.8:16.5)	15.7
3_3	A4055 Barry Rd NB	Ahead	66.7%	55.9	14.7	68.4%	57.5	14.9
3_4	A4055 Barry Rd NB	Right	75.2%	104.1	6.5	75.2%	104.1	6.5
4_1	Penarth Rd	Left	10.2%	2.2	0.9	10.2%	2.2	0.9
4/2+4/3	Penarth Rd	Ahead + Right	95.4 : 95.4%	99.0 (99.8:98.0)	20.2	89.7 : 89.7%	77.6 (78.4:76.7)	16.7
PRC Over All Lanes (%):			-6.0			0.3		
Total Delay Over All Lanes(pcuHr):			63.64			60.38		
Cycle Time:			145			145		

2.4 Network Assessment

2.4.1 The journey time measurements consist of two routes as shown in Figure 3, one northbound and another southbound which travel along the A4055 from the south of the Murch Road junction to the north of Barons Court junction.

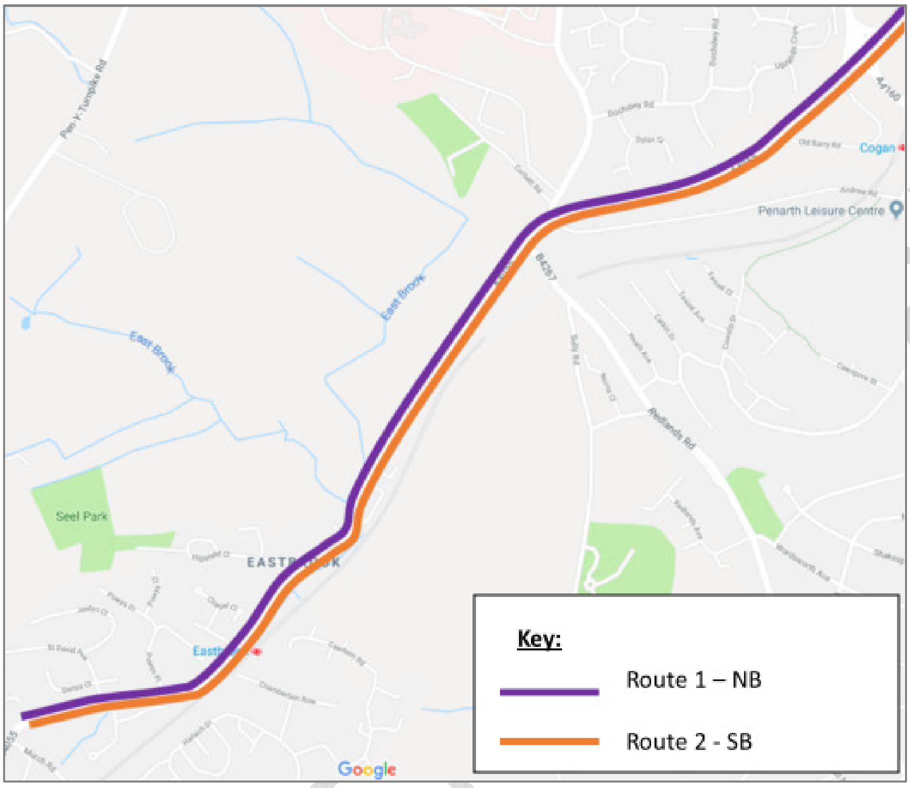
2.4.2 The journey time of the base model confirmed that the nature of the model is tidal with a predominant journey time value in the northbound direction during the morning peak reversing to the southbound direction during the afternoon peak.

2.4.3 The journey time between light vehicles (cars and vans) and heavy vehicles (HGVs) is consistent with a maximum difference of 16 seconds in the southbound direction. The base model is representative of the observed congestion in terms of DOS and journey time.

Table 9 Journey Time Base Model 2017 – All Vehicles

Route Nb	Direction	AM Base 2017 (s)	PM Base 2017 (s)	
1	NB	902	330	**Lights**
2	SB	331	628	
1	NB	914	338	**Heavies**
2	SB	347	638	

Figure 3 Route Map



3 Do-Minimum Assessment 2036

3.1 Background

3.1.1 The following chapter describes the performance of the do-minimum model for year 2036 in terms of junction delay, DOS, queue and journey times.

3.2 Junction Assessment

Junction 1: A4055 Cardiff Road/ Murch Road Junction

3.2.1 The 2036 do-minimum scenario used the same cycle time and green time as in the base model which was observed on site. The 2036 do-minimum results show that the AM and PM peak period are more congested than the 2017 model with a respective decrease of PRC of 17% and 64%.

3.2.2 Murch Road, the A4055 northbound and southbound perform above 96% capacity during the AM peak period. Millbrook Road, Murch Road and the A4055 southbound perform above 109% capacity during the PM peak period. The A4055 Cardiff Road/ Murch Road junction is saturated and exceeds the maximum recommended DOS requirement.

Table 10 AM Do-Minimum 2036 Model – A4055 Cardiff Road/ Murch Road Junction

			AM Base Model 2017			AM 2036 DM		
Item	Lane Description	Mvt	Deg Sat (%)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)	Deg Sat (%)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
1_1	A4055 Cardiff Road NB	Left + Straight	76.0%	39.1	17.1	96.0%	78.4	26.7
1_2	A4055 Cardiff Road NB	Right	11.0%	58.7	1.1	21.6%	60.6	2.1
3/2+3/1	Millbrook Road SB	Left + Straight	54.4 : 54.4%	76	3	63.6 : 63.6%	79.9	3.7
5/1+5/2	A4055 Cardiff Road SB	Straight + Right	82.5 : 82.5%	51.8	25.4	97.7 : 97.7%	95.4	36.2
7_1	Murch Road NB	All Mvts	84.9%	84.8	14.5	99.9%	142.8	27.2
PRC Over All Lanes (%):			6.0			-11.0		
Total Delay Over All Lanes(pcuHr):			23.99			50.04		
Cycle Time:			136			136		

Table 11 PM Do-Minimum 2036 Model – A4055 Cardiff Road/ Murch Road Junction

			PM Base Model 2017			PM 2036 DM		
Item	Lane Description	Mvt	Deg Sat (%)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)	Deg Sat (%)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
1_1	A4055 Cardiff Road NB	Left + Straight	71.1%	33.3	15.9	76.6%	34.9	18.8
1_2	A4055 Cardiff Road NB	Right	17.5%	57.7	1.7	31.2%	63.4	3.6
3/2+3/1	Millbrook Road SB	Left + Straight	97.1 : 97.1%	161.5	12.3	133.9 : 133.9%	676.7	59.8
5/1+5/2	A4055 Cardiff Road SB	Straight + Right	94.0 : 94.0%	70.3	35.8	109.8 : 109.8%	268.5	96
7_1	Murch Road NB	All Mvts	93.1%	131.3	13.1	154.7%	902	84.2
PRC Over All Lanes (%):			-7.9			-71.9		
Total Delay Over All Lanes(pcuHr):			36.90			201.88		
Cycle Time:			132			132		

Junction 2: Merrie Harrier Junction

3.2.3 The 2036 do-minimum scenario has been optimised using the same cycle time as in the base model which was observed on site. The 2036 do-minimum results show that the AM and PM peak period are more congested than the 2017 base model with a respective decrease of PRC of 10.8% and 12.8%. All approaches perform above 90% of capacity in both peak periods. The A4055 northbound, Redlands Road and the B4267 experience the highest degree of saturation with values above 100%.

3.2.4 The Merrie Harrier junction is saturated and exceeds the maximum recommended DOS requirement. Internal reservoirs show a large queue in the northbound direction which would require the installation of a yellow box to avoid vehicles blocking other traffic streams.

Table 12 AM Do-Minimum 2036 Model – Merrie Harrier Junction

			AM Base Model 2017			AM 2036 DM		
Item	**Lane Description**	**Mvt**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**
1_1	A4055 Barry Road SB	Left	56.3%	16.9	13.3	70.9%	20.3	19.4
1_2	A4055 Barry Road SB	Left	86.3%	101.2	5.2	92.8%	134.1	6.6
7_1	Redlands Road	Letf and Right	90.8%	80.9	20.5	107.6%	261.9	46.4
7_2	Redlands Road	Left	90.9%	80.9	20.7	107.5%	261	46.4
9/1+9/2	A4055 Barry Road NB	Right + Right	94.4 : 94.4%	66.1	26.3	108.2 : 108.2%	250	77
3_1	B4267 Penlan Rd	Ahead + Left	96.6%	138.9	12.6	108.8%	312.8	26.3
3_2	B4267 Penlan Rd	Ahead	16.5%	38.3	1.8	22.9%	42	3
5/1+5/2	Barry Rd NB internal	Right	98.2 : 98.2%	54.1	94.3	107.0 : 106.9%	200.2	382.3
6/1+6/2	Barry Rd SB internal	Left and Straight	54.8 : 54.8%	7.6	19.4	67.1 : 65.1%	11.1	30.7
6_3	Barry Rd SB internal	Straight	6.9%	7.3	0.5	9.3%	8.5	1.1
PRC Over All Lanes (%):			-9.1			-20.9		
Total Delay Over All Lanes(pcuHr):			73.48			250.93		
Cycle Time			107			107		

Table 13 PM Do-Minimum 2036 Model – Merrie Harrier Junction

			PM Base Model 2017			PM 2036 DM		
Item	**Lane Description**	**Mvt**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**
1_1	A4055 Barry Road SB	Left	78.8%	33.4	28	95.5%	62.3	42.8
1/2+1/3	A4055 Barry Road SB	Ahead + Ahead	63.5%	53.7	3.5	81.6%	79.2	6.1
1_4	Redlands Road	Right	90.8%	113.4	18.3	103.2%	204.6	25.1
2/2+2/1	Redlands Road	Ahead + Left	90.9%	113.5	18.6	103.4%	205.5	25.7
2/3+2/4	A4055 Barry Road NB	Right + Right	93.4 : 93.4%	74.8	28.8	104.8 : 104.8%	185.5	57.5
3/2+3/1	B4267 Penlan Rd	Ahead + Left	92.1%	87.1	20.4	104.1%	190.8	36.5
3_3	B4267 Penlan Rd	Ahead	20.4%	35.6	3.3	27.6%	38	4.9
3_4	Barry Rd NB internal	Right	88.7 : 88.7%	22.9	55.6	91.5 : 91.2%	23.7	51.9
4_1	Barry Rd SB internal	Left	62.7 : 62.7%	7.1	33.8	76.1 : 75.0%	12	43.7
4/2+4/3	Barry Rd SB internal	Ahead + Right	15.0%	5	2.9	20.4%	6.2	4.6
PRC Over All Lanes (%):			-3.7			-16.5		
Total Delay Over All Lanes(pcuHr):			63.18			135.56		
Cycle Time			131			131		

Junction 3: Barons Court Junction

3.2.5 The 2036 do-minimum scenario has been optimised using the same cycle time as in the base model which was observed on site. The 2036 do-minimum results show that the AM and PM peak period are more congested than the 2017 model with a respective decrease of PRC of 18.2% and 3.8%. The A4055 southbound and northbound approaches performed with a DOS above 95% for both the AM and PM peak periods. The A4160 Windsor Road also experienced an increase of DOS in both peak periods reaching 107% and 95% respectively. The Barons Court junction is saturated and exceeds the maximum recommended DOS requirement.

Table 14 AM Do-Minimum 2036 Model – Barons Court Junction

			AM Base Model 2017			AM 2036 DM		
Item	**Lane Description**	**Mvt**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**
1_1	A4055 Cogan Spur SB	Left	39.5%	2.8	5.3	39.8%	2.8	5.3
1/2+1/3	A4055 Cogan Spur SB	Ahead + Ahead	86.4 : 86.4%	85.6 (85.6:85.6)	18	82.5 : 82.5%	72.2 (72.2:72.2)	19.6
1_4	A4055 Cogan Spur SB	Right	47.0%	95	3.5	55.0%	99.2	4.2
2/2+2/1	A4160 Windsor Rd	Ahead + Left	87.5 : 87.5%	42.0 (46.3:33.0)	17.1	85.8 : 85.8%	40.4 (44.8:32.0)	19.4
2/3+2/4	A4160 Windsor Rd	Right + Right	98.5 : 98.5%	79.0 (79.0:79.0)	29.5	107.2 : 107.2%	197.9 (197.9:197.9)	71.7
3/2+3/1	A4055 Barry Rd NB	Ahead + Left	94.5 : 94.5%	84.4 (105.8:53.2)	23.4	98.9 : 98.9%	105.2 (122.0:79.4)	34.5
3_3	A4055 Barry Rd NB	Ahead	91.8%	106.3	21.6	94.6%	105.8	28.3
3_4	A4055 Barry Rd NB	Right	35.8%	90.6	2.6	34.5%	90.1	2.5
4_1	Penarth Rd	Left	9.4%	2	0.8	8.9%	2	0.8
4/2+4/3	Penarth Rd	Ahead + Right	62.4 : 62.4%	71.8 (71.8:71.9)	8.8	99.3 : 114.9%	262.3 (123.2:382.2)	29.8
PRC Over All Lanes (%):			-9.5			-27.7		
Total Delay Over All Lanes(pcuHr):			73.62			139.82		
Cycle Time:			165			165		

Table 15 PM Do-Minimum 2036 Model – Barons Court Junction

			PM Base Model 2017			PM 2036 DM		
Item	**Lane Description**	**Mvt**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**
1_1	A4055 Cogan Spur SB	Left	48.1%	3.4	7.1	55.6%	3.9	9.5
1/2+1/3	A4055 Cogan Spur SB	Ahead + Ahead	80.4 : 80.4%	59.3 (59.3:59.3)	17.9	97.6 : 97.6%	102.1 (102.1:102.1)	30.9
1_4	A4055 Cogan Spur SB	Right	43.6%	81	3.2	39.6%	79.5	2.9
2/2+2/1	A4160 Windsor Rd	Ahead + Left	77.3 : 77.3%	54.3 (63.5:39.4)	14.8	95.7 : 95.7%	95.1 (104.2:82.0)	23.6
2/3+2/4	A4160 Windsor Rd	Right + Right	78.9 : 78.9%	60.3 (60.3:60.3)	11.7	87.6 : 87.6%	71.8 (71.8:71.8)	15.3
3/2+3/1	A4055 Barry Rd NB	Ahead + Left	74.0 : 74.0%	43.1 (56.0:16.2)	15.5	81.0 : 81.0%	44.9 (60.5:19.5)	17.6
3_3	A4055 Barry Rd NB	Ahead	66.7%	55.9	14.7	73.6%	60.2	16.5
3_4	A4055 Barry Rd NB	Right	75.2%	104.1	6.5	81.0%	114.3	7.4
4_1	Penarth Rd	Left	10.2%	2.2	0.9	10.1%	2.2	0.8
4/2+4/3	Penarth Rd	Ahead + Right	95.4 : 95.4%	99.0 (99.8:98.0)	20.2	98.8 : 98.8%	114.6 (115.0:114.2)	27.3
PRC Over All Lanes (%):			-6.0			-9.8		
Total Delay Over All Lanes(pcuHr):			63.64			95.01		
Cycle Time:			145			145		

3.3 Network Assessment

3.3.1 The journey time has been measured in Vissim and a comparison was done between the base and the do-minimum scenario. A journey time increase of up to 121 seconds in the northbound direction on route 1 during the PM peak model for cars and light goods vehicles (LGVs) was observed. A similar increase has also been observed for the HGVs. This is due to the increase in the volume of traffic between 2017 and 2036 in the do-minimum scenario.

3.3.2 **The Vissim model has shown that the network is oversaturated in 2036 across the entire corridor due to traffic growth and the poor performance of the Barons Court junction.**

3.3.3 The latent demand has been extracted in Vissim and show the number of vehicles which do not enter the network during the modelled period due to queues reaching the length of the entry link. This analysis show that the base has no latent demand in 2017. This latent demand increases in 2036 with figure reaching 586 and 110 vehicles during the AM and PM peak period respectively.

Table 16 Journey Time Comparison Table

		AM Peak Model			PM Peak Model			
Route Nb	**Direction**	**Base (s)**	**DM 2036 (s)**	**Difference (s)**	**Base (s)**	**DM 2036 (s)**	**Difference (s)**	
1	NB	902	1010	109	330	452	121	**Lights**
2	SB	331	344	13	628	670	41	
1	NB	914	1032	118	338	505	167	**Heavies**
2	SB	347	363	17	638	717	79	

Table 17 - Latent Demand Do-Minimum

	Latent Demand (Vehicles)	
Scenario	**AM Peak**	**PM Peak**
Base Model	0	0
DM 2036 model	586	110

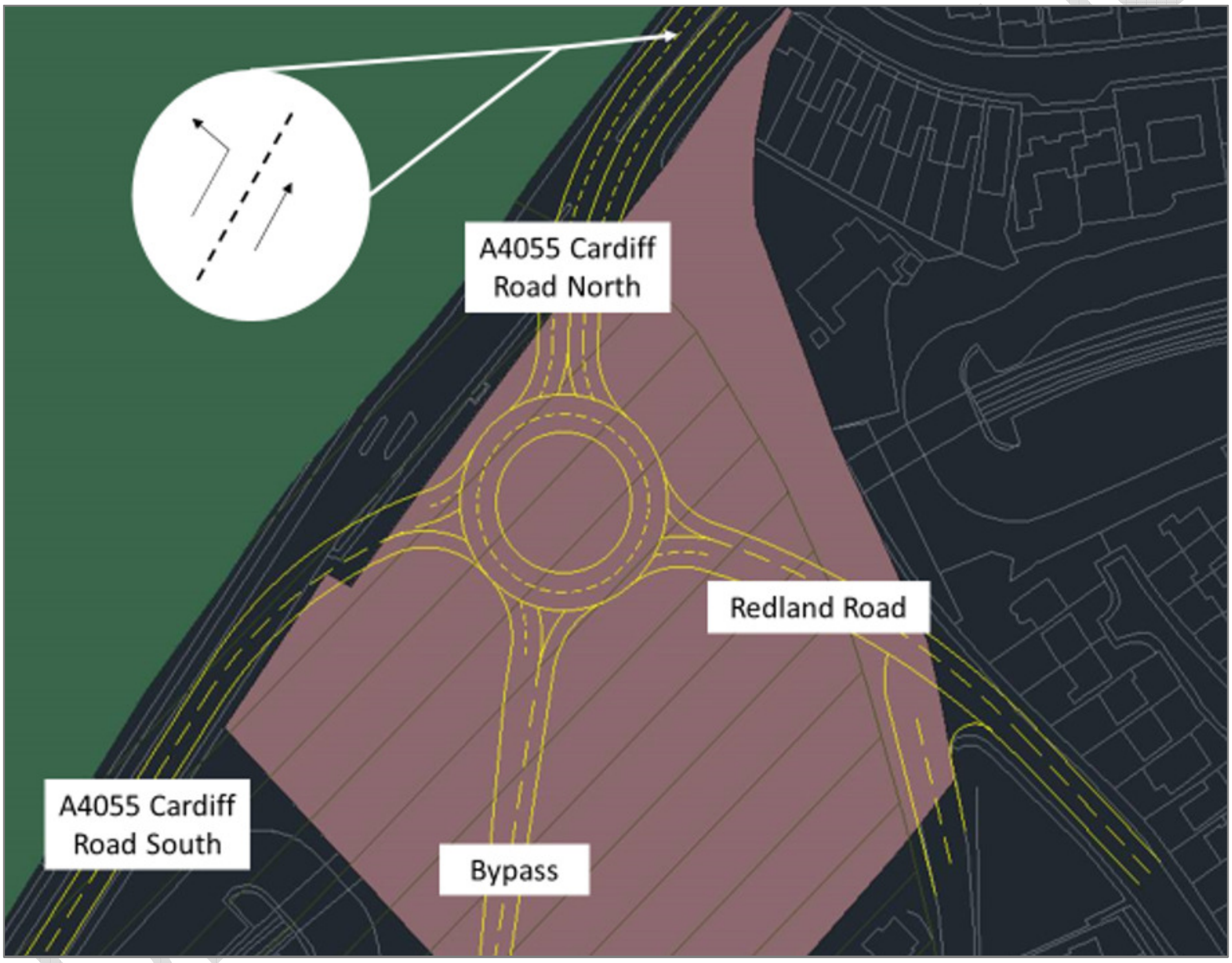
4 Traffic Assessment – Bypass Option (2036)

4.1 Background

4.1.1 This chapter describes the performance of the do-something scenario for year 2036 in terms of junction delay, DOS, queue and journey times. This scenario consists of modelling the proposed bypass option (Green alignment).

4.1.2 The Green alignment has been selected to relocate Dinas Powys 'through' traffic onto a bypass located east of the A4055 Cardiff Road (10015022-ARC-XX-XX-DR-HE-0004, 0005, 0006 and 0007). The scheme is proposed to join the A4055 Cardiff Road south of the Merrie Harrier junction via a new roundabout layout as shown in Figure 4.

Figure 4 Bypass – Green Alignment Northern Roundabout South of Merrie Harrier



4.2 Junction Assessment

Junction 1: A4055 Cardiff Road/ Murch Road Junction

4.2.1 The 2036 do-something bypass scenario has been optimised using the same cycle time as in the do-minimum model to allow for a fair comparison of the scenarios. The introduction of the bypass has improved the performance of the junction in both the AM and PM peak periods, due to the reduction of traffic through Dinas Powys. The highest DOS is 58% on the A4055 Cardiff Road southbound in the AM peak period and 91% during the PM peak period. The introduction of the bypass has significantly improved the performance of the junction by a PRC value of 64.8% and 69.4% respectively during the AM and PM peak period.

Table 18 AM Do-Something Bypass 2036 Model – A4055 Cardiff Road/ Murch Road Junction

			AM 2036 DM			AM 2036 DS - Bypass Option		
Item	**Lane Description**	**Mvt**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**
1_1	A4055 Cardiff Road NB	Left + Straight	96.0%	78.4	26.7	13.6%	45.8	1.1
1_2	A4055 Cardiff Road NB	Right	21.6%	60.6	2.1	21.6%	60.1	2
3/2+3/1	Millbrook Road SB	Left + Straight	63.6 : 63.6%	79.9	3.7	57.7 : 57.7%	73.3	3.2
5/1+5/2	A4055 Cardiff Road SB	Straight + Right	97.7 : 97.7%	95.4	36.2	58.5 : 58.5%	60.9	7.3
7_1	Murch Road NB	All Mvts	99.9%	142.8	27.2	58.2%	40.1	13.8
PRC Over All Lanes (%):			-11.0			53.8		
Total Delay Over All Lanes(pcuHr):			50.04			12.29		
Cycle Time:			136			136		

Table 19 PM Do-Something Bypass 2036 Model – A4055 Cardiff Road/ Murch Road Junction

			PM 2036 DM			PM 2036 DS - Bypass Option		
Item	**Lane Description**	**Mvt**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**
1_1	A4055 Cardiff Road NB	Left + Straight	76.6%	34.9	18.8	23.5%	33.4	3
1_2	A4055 Cardiff Road NB	Right	31.2%	63.4	3.6	31.2%	59.9	3
3/2+3/1	Millbrook Road SB	Left + Straight	133.9 : 133.9%	676.7	59.8	89.7 : 89.7%	98.2	12.7
5/1+5/2	A4055 Cardiff Road SB	Straight + Right	109.8 : 109.8%	268.5	96	91.3 : 91.3%	76.6	22.5
7_1	Murch Road NB	All Mvts	154.7%	902	84.2	89.7%	95.6	15.7
PRC Over All Lanes (%):			-71.9			-1.5		
Total Delay Over All Lanes(pcuHr):			201.88			28.76		
Cycle Time:			132			132		

Junction 2: Merrie Harrier Junction

4.2.2 The 2036 do-something bypass scenario has been optimised using the same cycle time as in the do-minimum model to allow for a fair comparison of the scenarios. The introduction of the bypass includes the construction of a roundabout to the south of the Merrie Harrier junction while the northern part of the Merrie Harrier junction remains unchanged.

4.2.3 The results of the A4055 Barry Road/ Penlan Road junction show that the junction performed to a PRC value of 0.4% and 8.9% for the AM and PM peak period. All approaches perform below 90% however the queue on the A4055 Barry Road northbound is 35 and 25 PCUs during the AM and PM peak period respectively. This queue will be located on the offside lane and will exceed the maximum reservoir capacity of 18 PCUs (thus leading to queue back to the roundabout junction). The junction does not perform at a satisfactory level and would require improvements.

4.2.4 The above issue was confirmed by the Vissim model as shown in Figure 5.

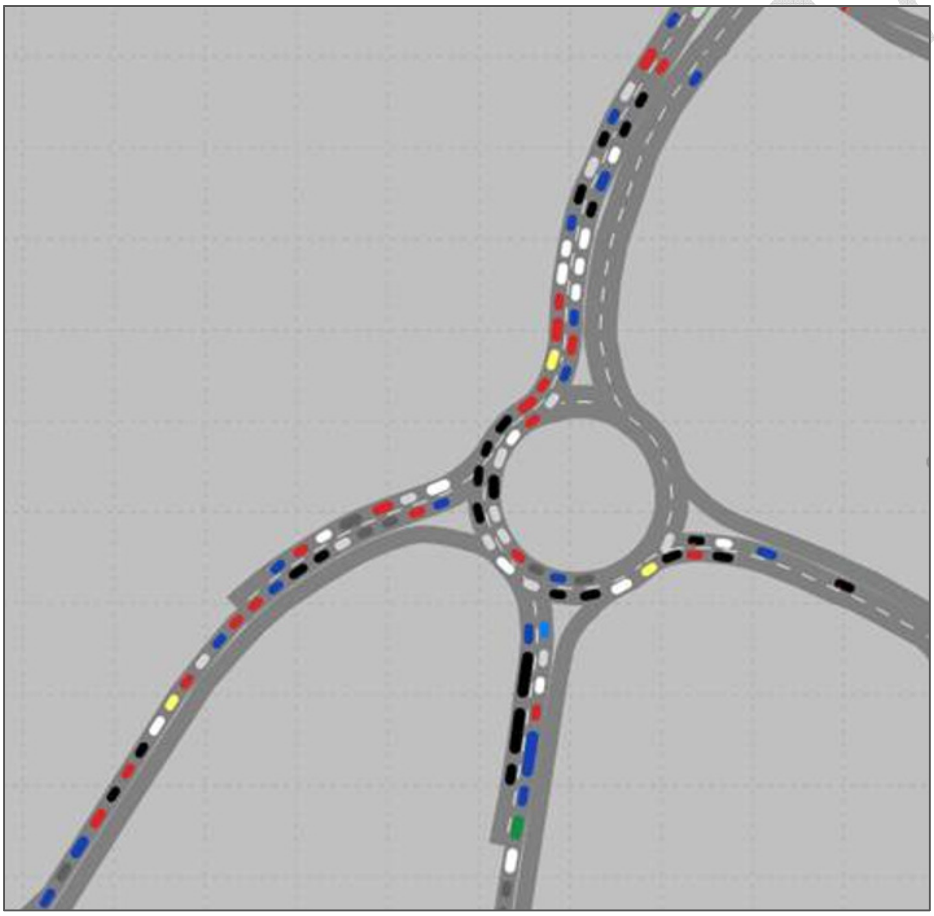
Table 20 AM Do-Something Bypass 2036 Model – Merrie Harrier Junction

			AM 2036 DS - Bypass Option		
Item	**Lane Description**	**Mvt**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**
1_1	A4055 Barry Road SB	Left	55.3%	11.4	12.6
1_2	A4055 Barry Road SB	Left	88.4%	111.2	5.1
5_1	A4055 Barry Road NB	Left	29.6%	3.3	3.8
5_2	A4055 Barry Road NB	Straight	89.6%	28.7	35.1
5_3	A4055 Barry Road NB	Straight	-	-	-
3_1	B4267 Penlan Rd	Ahead + Left	61.9%	74.3	4.1
3_2	B4267 Penlan Rd	Ahead	87.0%	88.6	10.1
PRC Over All Lanes (%):			0.4		
Total Delay Over All Lanes(pcuHr):			27.00		
Cycle Time			107		

Table 21 PM Do-Something Bypass 2036 Model – Merrie Harrier Junction

			PM 2036 DS - Bypass Option		
Item	**Lane Description**	**Mvt**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**
1_1	A4055 Barry Road SB	Left	78.2%	23.7	26.7
1_2	A4055 Barry Road SB	Left	50.0%	29.8	3.4
5_1	A4055 Barry Road NB	Left	15.8%	2.1	1.9
5_2	A4055 Barry Road NB	Straight	74.7%	23.7	25.1
5_3	A4055 Barry Road NB	Straight	-	-	-
3_1	B4267 Penlan Rd	Ahead + Left	70.4%	63.1	10.2
3_2	B4267 Penlan Rd	Ahead	82.6%	68.4	15.2
PRC Over All Lanes (%):			8.9		
Total Delay Over All Lanes(pcuHr):			26.50		
Cycle Time			131		

Figure 5 Northbound Blocking Back from the Merrier Harrier Junction Screenshot



4.2.5 Possible improvements to the junction include the introduction of two lanes of traffic on the A4055 Barry Road approach northbound to increase the stacking capacity on this approach. This option would require further land take to introduce a new traffic lane as shown on Figure 6 and Figure 7.

4.2.6 The new roundabout south of the existing Merrie Harrier junction as outlined in Figure 8 has been modelled using the Arcady modelling package.

Figure 6 Aerial View of the Possible Improvements

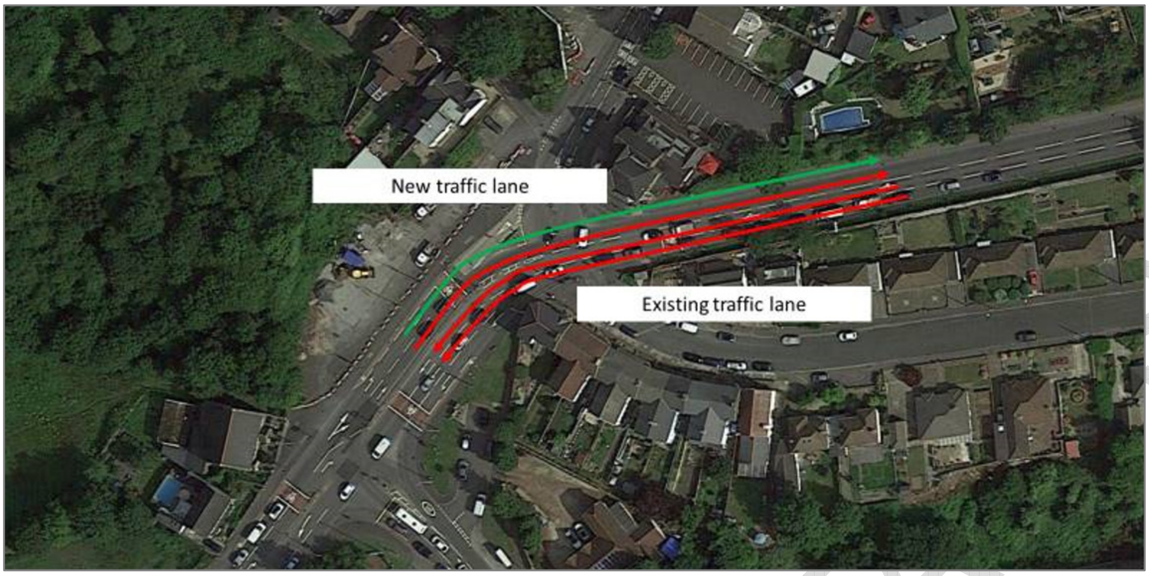


Figure 7 Street Level View of the Possible Improvements

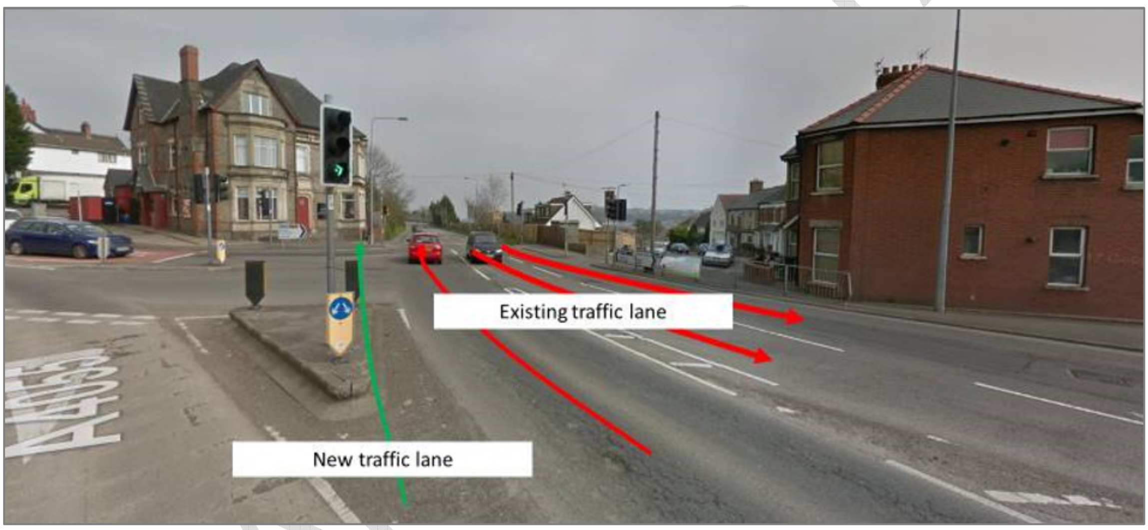


Figure 8 Green Alignment Northern Roundabout Arrangement

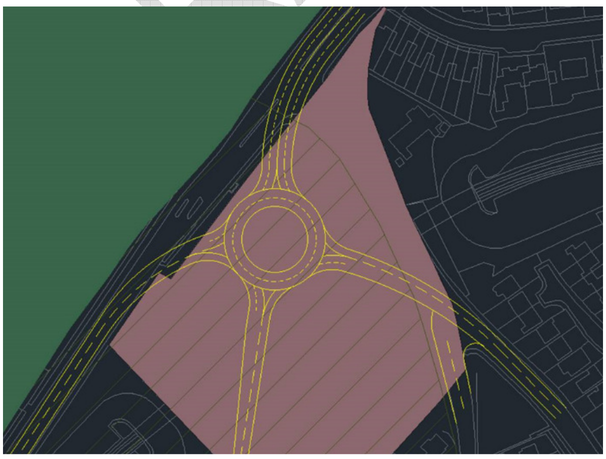


Table 22 Do-Something Bypass 2036 Model – Merrie Harrier Roundabout

			Merrie Harrier Roundabout					
			AM 2036 DS - Bypass Option - opt1			PM 2036 DS - Bypass Option - opt1		
Item	Lane Description	Mvt	RFC (%)	Delay (Veh. / s)	Queues (Vehs)	RFC (%)	Delay (Veh. / s)	Queues (Vehs)
A	A4055 Cardiff Road SB	All mvts	35.6	3.18	0.9	35.53	5.82	2.4
B	B4267 Redland Road WB	All mvts	28.74	4.98	1.4	26.02	4.02	0.7
C	Bypass NB	All mvts	22.14	4.74	0.7	22.48	4.14	0.5
D	A4055 Cardiff Road NB	All mvts	16.69	5.28	0.4	21.63	3.72	0.3

4.2.7 The results show that the roundabout works at an acceptable level with the Ratio of Flow to Capacity (RFC) below 36% for both AM and PM Peak. The 2036 flow can be accommodated by the proposed design however, the results in Table 22 come from an isolated Arcady model and do not consider queueing at the Merrie Harrier signalised junction.

4.2.8 The queue from the Merrie Harrier signalised junction on the A4055 Barry Road northbound will reach the roundabout and reduce its capacity. This capacity reduction has not been assessed in Table 22. The result above can be reasonably expected if a viable solution is identified at the Merrie Harrier junction.

Junction 3: Barons Court Junction

4.2.9 The 2036 do-something bypass scenario has been optimised using the same cycle time as in the do-minimum model to allow for a fair comparison of the scenarios. The 2036 do-something results are identical to the do-minimum because there are no improvements proposed at this junction. The junction is over saturated with a PRC of -27.7% and -9.8% for the AM and PM peak period and mitigation will be needed at this junction.

4.2.10 To improve the performance of this junction the implementation of three lanes traffic travelling straight ahead over the bridge in a northbound direction would be needed. Given that this is a bridge deck over the river and railway, it is unlikely that there is a feasible/ deliverable solution in this location.

Table 23 AM Do-Something Bypass 2036 Model – Barons Court Junction

			AM 2036 DM			AM 2036 DS - Bypass Option		
Item	Lane Description	Mvt	Deg Sat (%)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)	Deg Sat (%)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
1_1	A4055 Cogan Spur SB	Left	39.8%	2.8	5.3	39.8%	2.8	5.3
1/2+1/3	A4055 Cogan Spur SB	Ahead + Ahead	82.5 : 82.5%	72.2 (72.2:72.2)	19.6	82.5 : 82.5%	72.2 (72.2:72.2)	19.6
1_4	A4055 Cogan Spur SB	Right	55.0%	99.2	4.2	55.0%	99.2	4.2
2/2+2/1	A4160 Windsor Rd	Ahead + Left	85.8 : 85.8%	40.4 (44.8:32.0)	19.4	85.8 : 85.8%	40.4 (44.8:32.0)	19.4
2/3+2/4	A4160 Windsor Rd	Right + Right	107.2 : 107.2%	197.9 (197.9:197.9)	71.7	107.2 : 107.2%	197.9 (197.9:197.9)	71.7
3/2+3/1	A4055 Barry Rd NB	Ahead + Left	98.9 : 98.9%	105.2 (122.0:79.4)	34.5	98.9 : 98.9%	105.2 (122.0:79.4)	34.5
3_3	A4055 Barry Rd NB	Ahead	94.6%	105.8	28.3	94.6%	105.8	28.3
3_4	A4055 Barry Rd NB	Right	34.5%	90.1	2.5	34.5%	90.1	2.5
4_1	Penarth Rd	Left	8.9%	2	0.8	8.9%	2	0.8
4/2+4/3	Penarth Rd	Ahead + Right	99.3 : 114.9%	262.3 (123.2:382.2)	29.8	99.3 : 114.9%	262.3 (123.2:382.2)	29.8
PRC Over All Lanes (%):			-27.7			-27.7		
Total Delay Over All Lanes(pcuHr):			139.82			139.82		
Cycle Time:			165			165		

Table 24 PM Do-Something Bypass 2036 Model – Barons Court Junction

			PM 2036 DM			PM 2036 DS - Bypass Option		
Item	Lane Description	Mvt	Deg Sat (%)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)	Deg Sat (%)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
1_1	A4055 Cogan Spur SB	Left	55.6%	3.9	9.5	55.6%	3.9	9.5
1/2+1/3	A4055 Cogan Spur SB	Ahead + Ahead	97.6 : 97.6%	102.1 (102.1:102.1)	30.9	97.6 : 97.6%	102.1 (102.1:102.1)	30.9
1_4	A4055 Cogan Spur SB	Right	39.6%	79.5	2.9	39.6%	79.5	2.9
2/2+2/1	A4160 Windsor Rd	Ahead + Left	95.7 : 95.7%	95.1 (104.2:82.0)	23.6	95.7 : 95.7%	95.1 (104.2:82.0)	23.6
2/3+2/4	A4160 Windsor Rd	Right + Right	87.6 : 87.6%	71.8 (71.8:71.8)	15.3	87.6 : 87.6%	71.8 (71.8:71.8)	15.3
3/2+3/1	A4055 Barry Rd NB	Ahead + Left	81.0 : 81.0%	44.9 (60.5:19.5)	17.6	81.0 : 81.0%	44.9 (60.5:19.5)	17.6
3_3	A4055 Barry Rd NB	Ahead	73.6%	60.2	16.5	73.6%	60.2	16.5
3_4	A4055 Barry Rd NB	Right	81.0%	114.3	7.4	81.0%	114.3	7.4
4_1	Penarth Rd	Left	10.1%	2.2	0.8	10.1%	2.2	0.8
4/2+4/3	Penarth Rd	Ahead + Right	98.8 : 98.8%	114.6 (115.0:114.2)	27.3	98.8 : 98.8%	114.6 (115.0:114.2)	27.3
		PRC Over All Lanes (%):	-9.8			-9.8		
		Total Delay Over All Lanes(pcuHr):	95.01			95.01		
		Cycle Time:	145			145		

4.3 Network Assessment

4.3.1 The Vissim model has been developed with a two-lane approach on the A4055 Barry Road northbound direction as suggested in Table 24 paragraph 4.2.6. The results of the revised layout are shown in Table 25.

4.3.2 The feasibility of the two-lane approach has not been assessed in term of design. It will require further assessment to check if the implementation is feasible on site.

Table 25 Do-Something 2036 Journey Time Result Table

		AM Peak Model			PM Peak Model			
Route Nb	Direction	DM 2036 (s)	DS 2036 bypass (s)	Difference (s)	DM 2036 (s)	DS 2036 bypass (s)	Difference (s)	
1	NB	1010	933	-77	452	257	-195	Lights
2	SB	344	454	110	670	357	-312	
1	NB	1032	953	-79	505	227	-278	Heavies
2	SB	363	580	217	717	348	-369	

4.3.3 Overall a reduction of the journey time was observed for both northbound and southbound traffic flows with time savings of up to 369 and 312 seconds respectively for heavy vehicles (HGVs) and the light vehicles (cars & LGVs) vehicles. This is due to the introduction of the bypass combined with the additional northbound lane from the Merrie Harrier junction. An increase in journey times has been observed in the southbound direction of up to 217 seconds for heavy vehicles during the AM peak period and 110 seconds for the lights. The journey time increase is due to vehicles travelling northbound from Redland Road sporadically blocking the roundabout and delaying the southbound movement in the process.

4.3.4 Journey time improvements have been observed for buses in all directions based on the bus network shown in Figure 9.

4.3.5 A maximum cumulative journey time improvement of 332 seconds for buses was observed in the southbound direction during the PM peak period.

4.3.6 The introduction of the bypass improves the performance of the Merrie Harrier junction and the A4055 Cardiff Road/ Murch Road junction allowing for more traffic to travel in the northbound direction. However, this additional traffic arriving at the Barons Court junction has created longer queues on the Cardiff Road approach as shown on Figure 10.

Figure 9 Bus Section Map

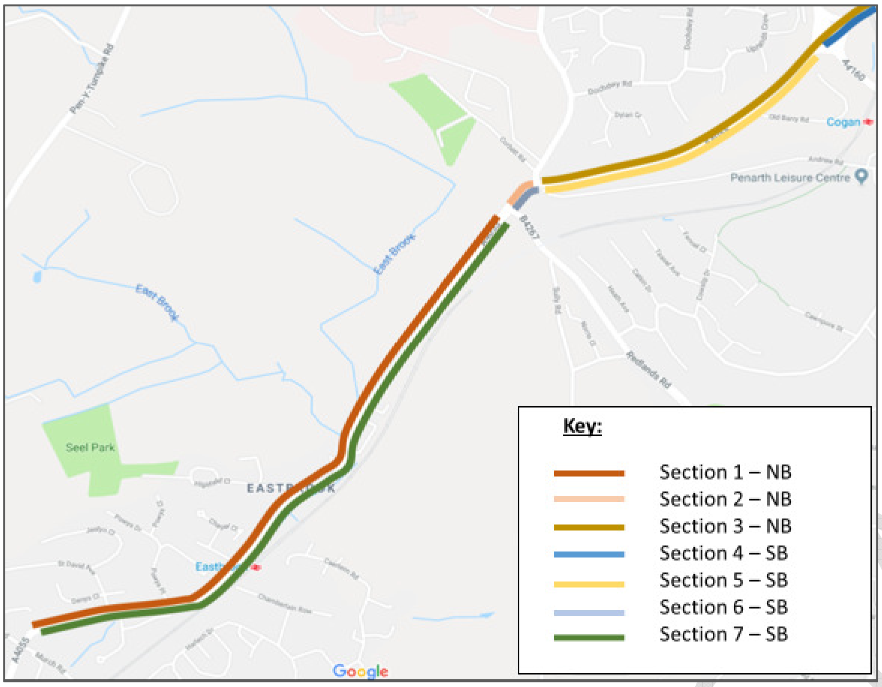
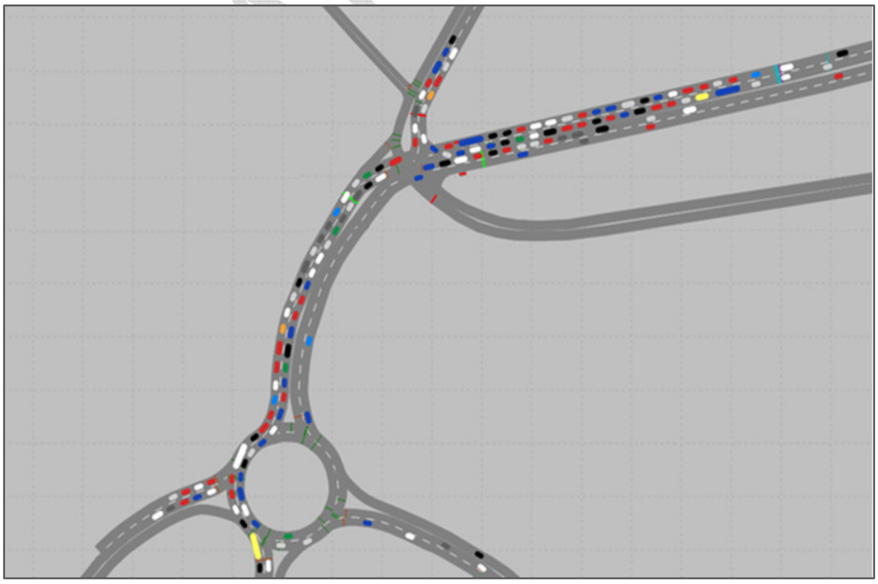


Table 26 Do-Something 2036 Bus Journey Time Results Table

		AM Peak Period			PM Peak Period			
Section Nb	Direction	DM 2036 (s)	DS 2036 bypass (s)	Difference (s)	DM 2036 (s)	DS 2036 bypass (s)	Difference (s)	
Section 1	NB	508	459	-49	297	160	-137	Buses
Section 2	NB	6	16	10	4	3	-1	
Section 3	NB	441	441	0	-	139	-	
Section 4	SB	75	88	13	60	69	9	
Section 5	SB	89	106	17	103	37	-66	
Section 6	SB	20	4	-16	17	17	0	
Section 7	SB	176	149	-27	527	252	-275	

Figure 10 Northbound Blocking Back from Barons Court



4.3.7 The results of the latent demand confirm that the bypass option has capacity issues. It was observed that 619 and 240 vehicles could not enter the network during the AM and PM peak period has shown in Table 27. These values confirm the capacity issues experienced at the Barons Court Junction.

Table 27 Latent Demand Bypass Model

	Latent Demand (Veh)	
Scenario	AM Peak	PM Peak
Base Model	39	0
DM 2036 model	586	110
DS 2036 bypass	619	240

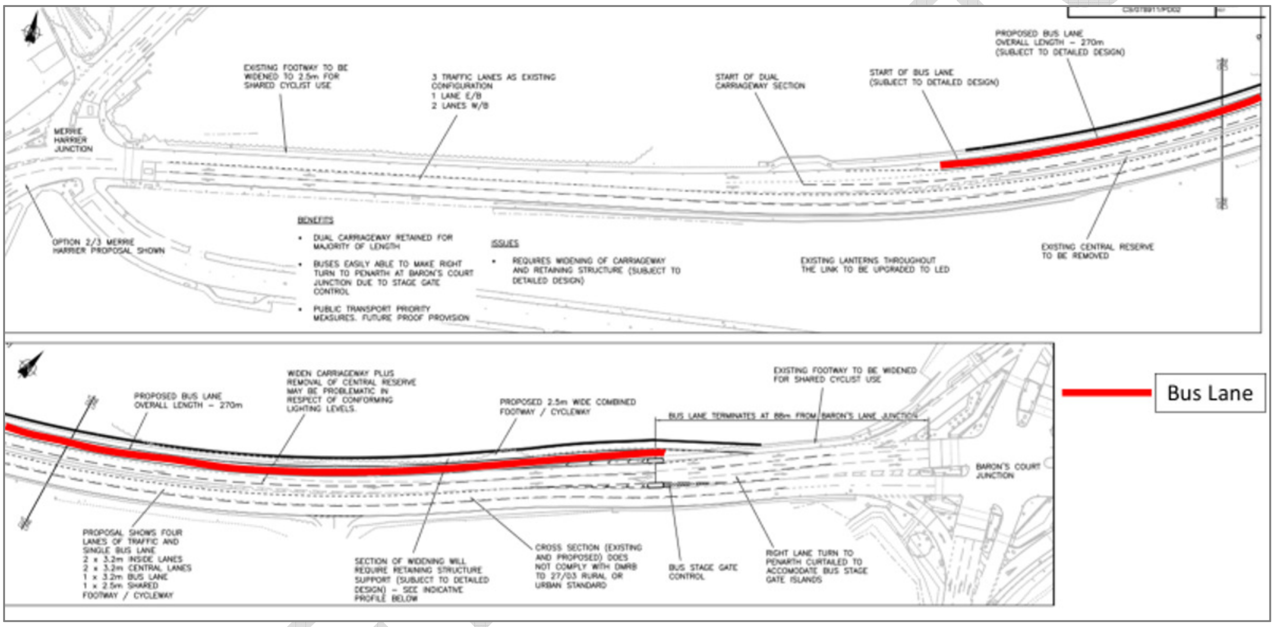
5 Traffic Assessment – Multi-Modal Option (2036)

5.1 Background

5.1.1 This chapter describes the performance of the do-something multi-modal scenario for the future year 2036 in terms of junction delay, DOS, queue and journey times. This scenario consists of modelling the multi-modal option.

5.1.2 The multi-modal option has been designed to allow for buses to travel via a dedicated bus lane between the Merrie Harrier and Barons Court junction in the northbound direction. The bus lane would connect with the A4055 Cardiff Road via a bus gate as shown in Figure 11. The eastbound direction consists of one lane flaring into two lanes while two lanes of traffic are maintained in the westbound direction along Cardiff Road. This is based on initial design work undertaken by Capita.

Figure 11 Option 2 Multi-Modal Option[1]



5.2 Junction Assessment

Junction 3: A4055 Cardiff Road/ Murch Road Junction

5.2.1 The 2036 do-something multi-modal scenario has been optimised using the same cycle time as in the base model which was observed on site. This scenario shows that the A4055 Cardiff Road/ Murch Road junction works over capacity during the AM and PM peak period with a respective PRC of -11% and -71.9%. The highest degree of saturation is above 97% on the A4055 northbound and Murch Road. The PM peak period is more congested than the AM peak period with 133% on Millbrook Road and 109% on the A4055 Cardiff Road southbound.

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[1] Vale of Glamorgan Council; Dinas Powys to Cardiff Corridor Bus Priority Measures; Capita (May 2015)

Table 28 AM Do-Something Multi-Modal 2036 Model – A4055 Cardiff Road/ Murch Road Junction

			AM 2036 DM			AM 2036 DS - Multimodal Option		
Item	**Lane Description**	**Mvt**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**
1_1	A4055 Cardiff Road NB	Left + Straight	96.0%	78.4	26.7	96.0%	78.4	26.7
1_2	A4055 Cardiff Road NB	Right	21.6%	60.6	2.1	21.6%	60.6	2.1
3/2+3/1	Millbrook Road SB	Left + Straight	63.6 : 63.6%	79.9	3.7	63.6 : 63.6%	79.9	3.7
5/1+5/2	A4055 Cardiff Road SB	Straight + Right	97.7 : 97.7%	95.4	36.2	97.7 : 97.7%	95.4	36.2
7_1	Murch Road NB	All Mvts	99.9%	142.8	27.2	99.9%	142.8	27.2
PRC Over All Lanes (%):			-11.0			-11.0		
Total Delay Over All Lanes(pcuHr):			50.04			50.04		
Cycle Time:			136			136		

Table 29 PM Do-Something Multi-Modal 2036 Model – A4055 Cardiff Road/ Murch Road Junction

			PM 2036 DM			PM 2036 DS - Multimodal Option		
Item	**Lane Description**	**Mvt**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**
1_1	A4055 Cardiff Road NB	Left + Straight	76.6%	34.9	18.8	76.6%	34.9	18.8
1_2	A4055 Cardiff Road NB	Right	31.2%	63.4	3.6	31.2%	63.4	3.6
3/2+3/1	Millbrook Road SB	Left + Straight	133.9 : 133.9%	676.7	59.8	133.9 : 133.9%	676.7	59.8
5/1+5/2	A4055 Cardiff Road SB	Straight + Right	109.8 : 109.8%	268.5	96	109.8 : 109.8%	268.5	96
7_1	Murch Road NB	All Mvts	154.7%	902	84.2	154.7%	902	84.2
PRC Over All Lanes (%):			-71.9			-71.9		
Total Delay Over All Lanes(pcuHr):			201.88			201.88		
Cycle Time:			132			132		

Junction 2: Merrie Harrier Junction

5.2.2 The 2036 do-something multi-modal scenario has been optimised using the same cycle times as in the base model which was observed on site. This scenario shows a similar level of congestion than the do-minimum because no improvements are proposed at the junction.

5.2.3 The PRC indicates that the junction performed poorly during the AM and PM peak period respectively a value of -20.9% and -16.5%. Internal reservoirs show a large queue in the northbound direction which will require a yellow box to avoid vehicles to block other traffic streams.

Table 30 AM Do-Something Multi-Modal 2036 Model – Merrie Harrier Junction

			AM 2036 DM			AM 2036 DS - Multimodal Option		
Item	**Lane Description**	**Mvt**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**
1_1	A4055 Barry Road SB	Left	70.9%	20.3	19.4	70.9%	20.3	19.4
1_2	A4055 Barry Road SB	Left	92.8%	134.1	6.6	92.8%	134.1	6.6
7_1	Redlands Road	Letf and Right	107.6%	261.9	46.4	107.6%	261.9	46.4
7_2	Redlands Road	Left	107.5%	261	46.4	107.5%	261	46.4
9/1+9/2	A4055 Barry Road NB	Right + Right	108.2 : 108.2%	250	77	108.2 : 108.2%	250	77
3_1	B4267 Penlan Rd	Ahead + Left	108.8%	312.8	26.3	108.8%	312.8	26.3
3_2	B4267 Penlan Rd	Ahead	22.9%	42	3	22.9%	42	3
5/1+5/2	Barry Rd NB internal	Right	107.0 : 106.9%	200.2	382.3	107.0 : 106.9%	200.2	382.3
6/1+6/2	Barry Rd SB internal	Left and Straight	67.1 : 65.1%	11.1	30.7	67.1 : 65.1%	11.1	30.7
6_3	Barry Rd SB internal	Straight	9.3%	8.5	1.1	9.3%	8.5	1.1
PRC Over All Lanes (%):			-20.9			-20.9		
Total Delay Over All Lanes(pcuHr):			250.93			250.93		
Cycle Time			107			107		

Table 31 PM Do-Something Multi-Modal 2036 Model – Merrie Harrier Junction

			PM 2036 DM			PM 2036 DS - Multimodal Option		
Item	**Lane Description**	**Mvt**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**
1_1	A4055 Barry Road SB	Left	95.5%	62.3	42.8	95.5%	62.3	42.8
1/2+1/3	A4055 Barry Road SB	Ahead + Ahead	81.6%	79.2	6.1	81.6%	79.2	6.1
1_4	Redlands Road	Right	103.2%	204.6	25.1	103.2%	204.6	25.1
2/2+2/1	Redlands Road	Ahead + Left	103.4%	205.5	25.7	103.4%	205.5	25.7
2/3+2/4	A4055 Barry Road NB	Right + Right	104.8 : 104.8%	185.5	57.5	104.8 : 104.8%	185.5	57.5
3/2+3/1	B4267 Penlan Rd	Ahead + Left	104.1%	190.8	36.5	104.1%	190.8	36.5
3_3	B4267 Penlan Rd	Ahead	27.6%	38	4.9	27.6%	38	4.9
3_4	Barry Rd NB internal	Right	91.5 : 91.2%	23.7	51.9	91.5 : 91.2%	23.7	51.9
4_1	Barry Rd SB internal	Left	76.1 : 75.0%	12	43.7	76.1 : 75.0%	12	43.7
4/2+4/3	Barry Rd SB internal	Ahead + Right	20.4%	6.2	4.6	20.4%	6.2	4.6
PRC Over All Lanes (%):			-16.5			-16.5		
Total Delay Over All Lanes(pcuHr):			135.56			135.56		
Cycle Time			131			131		

Junction 3: Barons Court Junction

5.2.4 The 2036 do-something multi-modal scenario has been optimised using the same cycle times as in the do-minimum model to allow for a reasonable comparison of scenarios. The 2036 do-something multi-modal results are identical to the do-minimum scenario because there are no proposed changes made at this junction. The junction is over saturated with a PRC of -27.7% and -9.8% for the AM and PM peak period. The junction would need additional northbound capacity in order to function effectively, although as discussed in Chapter 4, this is very challenging to achieve.

Table 32 AM Do-Something Multi-Modal 2036 model – Barons Court Junction

			AM 2036 DM			AM 2036 DS - Multimodal Option		
Item	**Lane Description**	**Mvt**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**
1_1	A4055 Cogan Spur SB	Left	39.8%	2.8	5.3	39.8%	2.8	5.3
1/2+1/3	A4055 Cogan Spur SB	Ahead + Ahead	82.5 : 82.5%	72.2 (72.2:72.2)	19.6	82.5 : 82.5%	72.2 (72.2:72.2)	19.6
1_4	A4055 Cogan Spur SB	Right	55.0%	99.2	4.2	55.0%	99.2	4.2
2/2+2/1	A4160 Windsor Rd	Ahead + Left	85.8 : 85.8%	40.4 (44.8:32.0)	19.4	85.8 : 85.8%	40.4 (44.8:32.0)	19.4
2/3+2/4	A4160 Windsor Rd	Right + Right	107.2 : 107.2%	197.9 (197.9:197.9)	71.7	107.2 : 107.2%	197.9 (197.9:197.9)	71.7
3/2+3/1	A4055 Barry Rd NB	Ahead + Left	98.9 : 98.9%	105.2 (122.0:79.4)	34.5	98.9 : 98.9%	105.2 (122.0:79.4)	34.5
3_3	A4055 Barry Rd NB	Ahead	94.6%	105.8	28.3	94.6%	105.8	28.3
3_4	A4055 Barry Rd NB	Right	34.5%	90.1	2.5	34.5%	90.1	2.5
4_1	Penarth Rd	Left	8.9%	2	0.8	8.9%	2	0.8
4/2+4/3	Penarth Rd	Ahead + Right	99.3 : 114.9%	262.3 (123.2:382.2)	29.8	99.3 : 114.9%	262.3 (123.2:382.2)	29.8
PRC Over All Lanes (%):			-27.7			-27.7		
Total Delay Over All Lanes(pcuHr):			139.82			139.82		
Cycle Time:			165			165		

Table 33 PM Do-Something Multi-Modal 2036 Model – Barons Court Junction

			PM 2036 DM			PM 2036 DS - Multimodal Option		
Item	**Lane Description**	**Mvt**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**	**Deg Sat (%)**	**Av. Delay Per PCU (s/pcu)**	**Mean Max Queue (pcu)**
1_1	A4055 Cogan Spur SB	Left	55.6%	3.9	9.5	55.6%	3.9	9.5
1/2+1/3	A4055 Cogan Spur SB	Ahead + Ahead	97.6 : 97.6%	102.1 (102.1:102.1)	30.9	97.6 : 97.6%	102.1 (102.1:102.1)	30.9
1_4	A4055 Cogan Spur SB	Right	39.6%	79.5	2.9	39.6%	79.5	2.9
2/2+2/1	A4160 Windsor Rd	Ahead + Left	95.7 : 95.7%	95.1 (104.2:82.0)	23.6	95.7 : 95.7%	95.1 (104.2:82.0)	23.6
2/3+2/4	A4160 Windsor Rd	Right + Right	87.6 : 87.6%	71.8 (71.8:71.8)	15.3	87.6 : 87.6%	71.8 (71.8:71.8)	15.3
3/2+3/1	A4055 Barry Rd NB	Ahead + Left	81.0 : 81.0%	44.9 (60.5:19.5)	17.6	81.0 : 81.0%	44.9 (60.5:19.5)	17.6
3_3	A4055 Barry Rd NB	Ahead	73.6%	60.2	16.5	73.6%	60.2	16.5
3_4	A4055 Barry Rd NB	Right	81.0%	114.3	7.4	81.0%	114.3	7.4
4_1	Penarth Rd	Left	10.1%	2.2	0.8	10.1%	2.2	0.8
4/2+4/3	Penarth Rd	Ahead + Right	98.8 : 98.8%	114.6 (115.0:114.2)	27.3	98.8 : 98.8%	114.6 (115.0:114.2)	27.3
PRC Over All Lanes (%):			-9.8			-9.8		
Total Delay Over All Lanes(pcuHr):			95.01			95.01		
Cycle Time:			145			145		

5.3 Network Assessment

5.3.1 A maximum journey time improvement of 19 seconds was observed during the AM peak on the northbound and southbound direction with an increase of up to 28 seconds observed during the PM peak as shown in Table 34. A journey time improvement of 259 seconds for buses was observed on Section 3 during the AM peak due to the introduction of the bus lane. We were unable to assess the journey time improvement for the PM peak period because no buses were observed in the base. The introduction of a bus lane is therefore shown to improve the performance of buses in the northbound direction while maintaining a similar level of performance for all road users.

5.3.2 **The modelling of the multi-modal option has shown that the existing congestion issues have not been addressed with all junctions performing above the required level of DOS.**

5.3.3 The results of the latent demand confirm that the multi-modal option has capacity issues. It was observed that 328 and 32 vehicles could not enter the network during the AM and PM peak period has shown in Table 36. These values confirm the capacity issues experienced at the Barons Court Junction.

Table 34 Do-Something 2036 Journey Time Results Table

		AM Peak Model			PM Peak Model			
Route Nb	Direction	DM 2036 (s)	DS 2036 multimodal (s)	Difference (s)	DM 2036 (s)	DS 2036 multimodal (s)	Difference (s)	
1	NB	1010	992	-19	452	479	28	Lights
2	SB	344	343	-1	670	697	27	
1	NB	1032	1021	-11	505	529	24	Heavies
2	SB	363	353	-10	717	714	-3	

Table 35 Do-Something 2036 Bus Journey Time Results Table

		AM Peak Period			PM Peak Period			
Section Nb	Direction	DM 2036 (s)	DS 2036 multimodal (s)	Difference (s)	DM 2036 (s)	DS 2036 multimodal (s)	Difference (s)	
Section 1	NB	508	529	21	297	350	53	Buses
Section 2	NB	6	9	2	4	4	0	
Section 3	NB	441	182	-259	-	114	-	
Section 4	SB	75	89	14	60	71	11	
Section 5	SB	89	76	-13	103	131	28	
Section 6	SB	20	19	-2	17	19	2	
Section 7	SB	176	170	-6	527	510	-17	

Table 36 - Latent Demand Multi-modal Model

	Latent Demand (Veh)	
Scenario	AM Peak	PM Peak
Base Model	39	0
DM 2036 model	586	110
DS 2036 multimodal	328	32

6 Conclusions

6.1.1 The results of the modelling have shown that the base model and the do-minimum scenario were congested across the network with a degree of saturation greater than 90% at the Barons Court junction, the Merrie Harrier junction and the A4055 Cardiff Road/ Murch Road junction. The base model is representative of the congestion on site and the model can be used for performance evaluation purposes.

Bypass option (Green Alignment)

6.1.2 The introduction of the bypass option (Green alignment) has improved the performance of the A4055 Cardiff Road/ Murch Road junction because vehicles travelling through Dinas Powys are anticipated to use the bypass. The modelling of the proposed layout at the Merrie Harrier junction has shown internal queueing between the signalised junction and the roundabout in the northbound direction. This issue can only be resolved if a two lanes approach northbound can be introduced. This solution would require the acquisition of third-party land around the Merrie Harrier junction to accommodate the additional carriageway space that would be needed.

6.1.3 The Vissim model has also shown that the improvements made at the Merrie Harrier junction would release traffic onto the Barons Court junction creating long queues on the A4055 in the northbound direction. Further improvements at the Barons court junction would need to be considered to improve the capacity of the junction. However, improvements would be very challenging to achieve, with widening of the Cogan Spur likely to be required to provide for three northbound lanes. In order to fully understand the future network capacity issues, further assessment is needed at the Barons Court junction as well as additional junctions outside of the model area, including the A4232/ A4055 Cardiff Road roundabout. **Overall this option does not perform at a satisfactory level with a degree of saturation at key junctions performing above the recommended level. This is not due to the bypass but is related to the issues at Barons Court.**

Multi-Modal Option

6.1.4 The introduction of the bus lane between the Merrie Harrier and Barons Court junctions for the multi-modal option had an insignificant impact on the journey time of light and heavy vehicles. However, it could improve the journey time of buses travelling in a northbound direction during the AM peak by up to 259 seconds (although this is for a low frequency of buses).

Appendix A: LinSig Calibration / Validation Data (Electronic Version Only)

a) Calibration – Timing Sheets
b) Calibration – Signal Timings Observations
c) Validation – Queue Length Comparison Table

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Administration

General Specifications

Customer Name: VALE OF GLAMORGAN
Intersection/ General Description: MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)
Controller: ● New ○ Modification
Area Specifications/ Customer Drawings: STS69362
Specification Section:
Contract/Tender Ref:
Quotation No.:
Works Order No.:

Customer Order No.:
Controller/ Serial Number:
S.T.S. /EM Number: E69362 Issue: 9
Equipment Installation by:
Slot Cutting by:
Civil Works by:
Customer's Engineer: COLIN HILL
Telephone Number: 02920 673063

Signal Company Use Only

Signal Engineer: P M ROUSE
(IF Prom Label as >) Prom Number: 16277 Prom Variant: 362
Configuration Check Value: 49 C4 93 6E

Controller Options

Hardware: ST900 ELV
Firmware Type and Issue: PB801 ISS 5
Other Options

ST900/ST750 Series Cabinet Options

Cabinet/Rack: Cabinet
Kit Type Options: ● UK-Std ○ Non-UK ○ Small Non-UK ○
Cabinet/Rack Variant: Grey
Cuckoo Options: None
Gemini Fitted: ☑

Mains Supply: 240 Volts 50 Hz
Peak Lamp Current: 1 Amps
Average Lamp Power: 1 Watts
Total Average Power: 1 Watts
Dimming Voltage: 27.5
Answer Issue: 0
Edit Issue: 31
Date Created: 13/04/07

Power feed fuse rating: requires 30 Amp minimum for controller, 15 Amp minimum for pelican/lightly loaded controller

---

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Streams, Stages, Phases Control

Select Object to Add/Delete/Insert

Streams

○ Current Number of Streams: 1

Phases

○ Current Total Number of Phases: 14
● Number of Real Phases: 12
○ Number of Dummy Phases: 2

Stages

○ Current Number of stages (inc. ALL-RED stages): 7

Switched Signs

○ Number of Switched Signs: 0

Action

Add At
Delete At

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Facilities/Modes Enabled and Mode Priority Levels

Facilities

☑ Manual Control
☐ Manual Step On Mode
☑ CLF (Base Time)
☐ CLF (non-Base Time)
☑ UTC Facility
☐ Hurry Call Mode
☐ Priority
☐ Emergency Vehicles

12 Starting Intergreen

☐ Part Time
☑ Master Time Clock
☑ RED Lamp Monitoring
☑ Lamp Monitoring
☐ Linked Fixed Time
☑ FT To Current MAX
☐ Speed Measurement
☐ Download To Level 3

☐ London IMU
☑ Extend All Red
☐
☐ Ripple Change
☐ Non-UK

☑ Pelican/Puffin/Toucan Facilities
☐ Standalone Manual
☐ Holiday Clock
☐ Fail to Part Time
☑ Serial MOVA
☑
☐ Free-Standing OTU
☐ Integral OTU

Mode Priority

PRIORITY	1	2	3	4	5	6	7	8	9	10	11
Part Time	○	○	○	○	○	○	○	○	○	○	○
Emergency Vehicle	○	○	○	○	○	○	○	○	○	○	○
Hurry Call	○	○	○	○	○	○	○	○	○	○	○
Selected Man Cntrl	●	○	○	○	○	○	○	○	○	○	○
UTC	○	○	●	○	○	○	○	○	○	○	○
Manual Step On	○	○	○	○	○	○	○	○	○	○	○
Selected FT or VA or CLF	○	●	○	○	○	○	○	○	○	○	○
Cableless Link (CLF)	○	○	○	●	○	○	○	○	○	○	○
Priority Vehicle	○	○	○	○	○	○	○	○	○	○	○
Vehicle Actuated	○	○	○	○	●	○	○	○	○	○	○
Fixed Time	○	○	○	○	○	●	○	○	○	○	○

Configuration Complexity

○ Low ○ Medium ○ High ● Maximum

standardPB801.8df
Default PROM data file

Correspondence Monitoring to inc.

☑ Reds ☑ Ambers
☑ Switched Signs ☐ Ignore Reds and Ambers during Fail to Part Time

Flash Rate (ms)

400 Off 400 On

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Phases in Stages

Phases

In Stages	A	B	C	D	E	F	G	H	I	J	K	L	M	N
0														🟥
1		🟥	🟥	🟥			🟥							
2		🟥		🟥			🟥					🟥		
3			🟥			🟥			🟥					
4			🟥			🟥		🟥			🟥			
5	🟥				🟥	🟥		🟥		🟥				
6		🟥			🟥		🟥			🟥			🟥	

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Stages in Streams

Stream Data

	0	1	2	3	4	5	6	7
Phase or Stage to revert to in absence of demands/extensions	1							
Startup Stage	1							
Part-Time switch off stage								
Standalone Pedestrian	☐	☐	☐	☐	☐	☐	☐	☐

NB : For a Stand-Alone Stream, the reversion must be to All Red stage or Traffic stage/phase to meet the relevant standard or specification.

Stages

In Stream	0	1	2	3	4	5	6
0	🟥	🟥	🟥	🟥	🟥	🟥	🟥

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Phase Type and Conditions

Phase Type and Conditions

● Phases A to P ○ Manual Output Allocation ☑

Phase	Title	Type	App. Type	Term. Type	Assoc. Phase	No. of Drive Outputs "R"	"A"	"G"
A	PEDESTRIAN	1 - UK Far Side Pedestrian	0	0 -		1	1	3
B	BARRY ROAD N/B INNER	0 - UK Traffic	0	0 -		1	1	1
C	BARRY ROAD S/B INNER	0 - UK Traffic	0	0 -		1	1	1
D	BARRY ROAD N/B	0 - UK Traffic	0	0 -		1	1	1
E	L.H.G.A into REDLANDS RD	2 - UK GreenArrow	0	1 -	C	1	1	1
F	AHEAD ARROW UP PENLAN RD	2 - UK GreenArrow	0	1 -	B	1	1	1
G	BARRY ROAD S/B	0 - UK Traffic	0	0 -		1	1	1
H	LLANDOUGH ROAD RIGHT TURN	0 - UK Traffic	0	0 -		1	1	1
I	BUS EXIT	0 - UK Traffic	0	0 -		1	1	1
J	REDLANDS ROAD	0 - UK Traffic	0	0 -		1	1	1
K	LLANDOUGH ROAD	0 - UK Traffic	0	0 -		1	1	1
L	BARRY ROAD NORTHBOUND RIGHT TURN	2 - UK GreenArrow	1	2 -	D	1	1	1
M	DUMMY IN STAGE SIX	2 - UK GreenArrow	0	0 -				
N	ALL RED DUMMY	2 - UK GreenArrow	0	0 -				

1) App Types: 0 = Always Appears, 1 = Appears if dem'd prior to interstage, 2 = If dem'd, 3 = If dem'd before end of window time
2) Term Types: 0 = Term's at end of stage, 1 = Term's when Assoc phase gains R.O.W, 2 = Term's when Assoc phase loses R.O.W.
3) The H/W Fail Flash fields are for information only on all but ST900ELV Controllers. For other controllers, physical switches or links (etc.) select which aspects flash and these need to be set up manually.

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Opposing and Conflicting Phases

Select Stream(s) To Configure
○ All ○ 0 ○ ○ ○ ○ ○ ○ ○

Initialise

☑ Amber Conflict Monitoring

To Phase

From Phase

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
A	■	Co	o	o	o	o	Co	o	Co	o	Co	o	o	o
B	Co	■	o	o	o	o	o	Co	Co	o	Co	o	o	o
C	o	o	■	o	o	o	o	o	o	Co	o	Co	o	o
D	o	o	o	■	o	o	o	o	o	Co	o	o	o	o
E	o	o	o	o	■	o	o	o	o	o	o	Co	o	o
F	o	o	o	o	o	■	o	o	o	o	o	o	o	o
G	Co	o	o	o	o	o	■	Co	Co	o	Co	o	o	o
H	o	Co	o	o	o	o	Co	■	Co	o	o	o	o	o
I	Co	Co	o	o	o	o	Co	Co	■	o	Co	o	o	o
J	o	o	Co	Co	o	o	o	o	o	■	o	Co	o	o
K	Co	Co	o	o	o	o	Co	o	Co	o	■	o	o	o
L	o	o	Co	o	Co	o	o	o	o	Co	o	■	o	o
M	o	o	o	o	o	o	o	o	o	o	o	o	■	o
N	o	o	o	o	o	o	o	o	o	o	o	o	o	■

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Phase Minimums, Maximums, Extensions, Ped. Leaving periods

Phase Minimums, Maximums, Extensions, Ped. Leaving periods

● Phases A to P ○

Phase	Min Green	Min Ped Clr	Extensions	Maximums A	B	C	D	E	F	G	H	Pre-timed
A	9	3	0.0	0	0	0	0	0	0	0	0	☐
B	7	0	0.0	20	20	20	20	0	0	0	0	☐
C	7	0	0.0	20	20	20	20	0	0	0	0	☐
D	7	0	0.0	30	36	49	36	0	0	0	0	☐
E	4	0	0.0	0	0	0	0	0	0	0	0	☐
F	4	0	0.0	20	20	20	20	0	0	0	0	☐
G	7	0	0.0	30	36	49	36	0	0	0	0	☐
H	7	0	0.0	30	30	30	30	0	0	0	0	☐
I	7	0	0.0	10	8	8	8	0	0	0	0	☐
J	7	0	0.0	30	30	30	30	0	0	0	0	☐
K	7	0	0.0	30	30	30	30	0	0	0	0	☐
L	5	0	0.0	0	0	0	0	0	0	0	0	☐
M	7	0	0.0	20	30	43	30	0	0	0	0	☐
N	3	0	0.0	0	0	0	0	0	0	0	0	☐
												☐
												☐

NB: For Standalone Streams see Help for use of Max. Sets.

Works Order :
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Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Phase Intergreen Times

Select Stream(s) To Configure

○ All ○ 0 ○ ○ ○ ○ ○ ○ ○

NB: On a Stand Alone Pelican/Toucan/Puffin Stream the Intergreens between Pedestrian and Traffic Phases are controlled by the timings (PBT, PIT, CMX, CDY, CRD and PAR), therefore 0 should be entered for the appropriate intergreen times in grid below

To Phase

From Phase

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
A	■	0					0		0		0			3
B	10	■						7	7		7			3
C			■							6		5	6	3
D				■						6			6	3
E					■							5		3
F						■								3
G	6						■	5	5		5			3
H		5					5	■	5					3
I	8	5					5	5	■		5			3
J			5	5						■		5		3
K	7	5					5		5		■			3
L			5		5					5		■		3
M			5	5									■	3
N	2	2	2	2	2	2	2	2	2	2	2	2	2	■

Works Order :
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Handset Intergreen Limits

HIGH 199

Copy Intergreen Values

To Phase

From Phase

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
A	■													3
B	5	■						5	5		5			3
C			■							5		5	5	3
D				■						5			5	3
E					■							5		3
F						■								3
G	5						■	5	5		5			3
H		5					5	■	5					3
I	5	5					5	5	■		5			3
J			5	5						■		5		3
K	5	5					5		5		■			3
L			5		5					5		■		3
M			5	5									■	3
N	2	2	2	2	2	2	2	2	2	2	2	2	2	■

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Phase Timing Handset Ranges

Phase Timing Handset Ranges

Initialise Min Green Limits

	Min. Green			Min. Green	
Phase	Min.	Max.	Phase	Min.	Max.
A	3	255	Q		
B	3	255	R		
C	3	255	S		
D	3	255	T		
E	3	255	U		
F	3	255	V		
G	3	255	W		
H	3	255	X		
I	3	255	Y		
J	3	255	Z		
K	3	255	A2		
L	3	255	B2		
M	3	255	C2		
N	3	255	D2		
O			E2		
P			F2		

	Min.	Max.
Max. Green	0	255
Vehicle Extension	0.0	10.0
Phase Delay	0	30
Starting I/G	4	12
Min Ped Clr (PBT)	0	12
Traffic Phase Leaving	3.0	3.0
Traffic Phase Red/Amber	2	2

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Phase - VA Demand and Extend Definitions

VA Demand and Extend Definitions

● Phases A to P ○

Demands: For Unlatched demands preceed the name with a #.
Conditioning MUST be used to specify unlatched demands.

	Demands				Extensions			
Phase								
A	PEDA13	PEDA14						
B	BX3	FX4			BX3	FX4		
C	CX9	CX10			CX9	CX10		
D	DX2				DX2			
E								
F					FX4			
G	GX7	GX8			GX7	GX8		
H	HX13	#HSL15			HX13	HSL15		
I	#ISL16				ISL16			
J	JX18	JX19	JSL20	JSL21	JX18	JX19	JSL20	JSL21
K	KX12	KSL14			KX12	KSL14		
L	#CCL24				CCL23	CCL24		
M								
N								

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Phase Internal/Revertive Demands

Phase Internal/Revertive Demands

Start-up Vehicle Responsive Demands

A	B	C	D	E	F	G	H	I	J	K	L	M	N		
☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Demands Inserted When Leaving Manual and Fixed Time Modes

A	B	C	D	E	F	G	H	I	J	K	L	M	N		
☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Unlatched Demands that Start Max Timers

A	B	C	D	E	F	G	H	I	J	K	L	M	N		
☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Revertive Phase Demands

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
			D			G	H		J	K					

Q	R	S	T	U	V	W	X	Y	Z	A2	B2	C2	D2	E2	F2

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Phase - OnCrossing and Kerbside Detector Definitions

On Crossing and Kerbside Input Definitions

● Phases A to P ○

Phase	On Crossing				Kerbside			
A	ONCA13	ONCA14			KBSA13	KBSA14		
B								
C								
D								
E								
F								
G								
H								
I								
J								
K								
L								
M								
N								

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Stream - Pelican/Puffin/Toucan Times

Stream - Pelican/Puffin/Toucan Times

Pedestrian Enable VA Mode (PEV)

Streams

0	1	2	3	4	5	6	7

Pedestrian All Red Times (Vehicle to Pedestrian)

Streams	0	1	2	3	4	5	6	7
(PARn 0) VA Gap Change								
(PAR n 1) VA Max Change								
(PAR n 2) FVP Change								
(PAR n 3) UTC Change								
(PAR n 4) Local Link Change								

Handset Range Limits

Min	Max
0	0

Pelican Intergreen times

	Min	Max
(PIT n 0) Veh Red/Ped Flash Green	0	0
(PIT n 1) Veh Flash Amber/Ped Flash Green	0	0
(PIT n 2) Veh Flash Amber/Ped red	0	0
(PIT n 3) Veh Flash Amber/Ped Red Quiescent	0	0

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Phase - Pelican Puffin and Toucan Times

Phase - Pelican Puffin and Toucan Times

● Phases A to P ○

Phase	PDD Ped Dem Del	PDX Demand Holc	CMX Ped Clearance Maximum	CDY 0 Clearance Delay Gap Chng	CDY 1 Clearance Delay Max Chng	CRD Clearance Minimum Red	
A	1	2.0	9	0	0	0	
B	0	0.0	0	0	0	0	☐
C	0	0.0	0	0	0	0	
D	0	0.0	0	0	0	0	☐
E	0	0.0	0	0	0	0	
F	0	0.0	0	0	0	0	
G	0	0.0	0	0	0	0	
H	0	0.0	0	0	0	0	
I	0	0.0	0	0	0	0	
J	0	0.0	0	0	0	0	
K	0	0.0	0	0	0	0	
L	0	0.0	0	0	0	0	
M	0	0.0	0	0	0	0	
N	0	0.0	0	0	0	0	

Handset Range Limits

	MIN	MAX
Pedestrian Demand delay PDD	0	4
Pedestrian Demand Hold PDX	0.0	4.0
Pedestrian Clearance CMX	0	20
Pedestrian Clearance Delays CDY 0 and CDY1	0	3
Pedestrian Clearance Delay (Red) CRD	0	0

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IO and Link - Pelican/Puffin/Toucan Times

I/O and Link - Pelican/Puffin/Toucan Times

Streams	0	1	2	3	4	5	6	7
Computer Control								
PV								
Window Time UIE								
Local Link								
PV1								
Link Delay Time LKD								
Link Window Time LKW								
Link Override Time LKO								

Kerbside Mat Test Output ☐

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Pelican, Puffin, Toucan Pushbutton/Kerbside Associations

Pelican, Puffin, Toucan Pushbutton and Kerbside Detector Pair Associations

	Phase	Demand	KBS		Phase	Demand	KBS		Phase	Demand	KBS		Phase	Demand	KBS
0	A	PEDA13	KBSA13	16				32				48			
1	A	PEDA14	KBSA14	17				33				49			
2				18				34				50			
3				19				35				51			
4				20				36				52			
5				21				37				53			
6				22				38				54			
7				23				39				55			
8				24				40				56			
9				25				41				57			
10				26				42				58			
11				27				43				59			
12				28				44				60			
13				29				45				61			
14				30				46				62			
15				31				47				63			

Note: Any association pushed off the screen will have any previous association blanked

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Stage - Prohibited, Alternative, Ignored Moves

Stage - Prohibited, Alternative, Ignored Moves

Sets
● 1
○ 2
○ 3
○ 4

Modes	Restrictions ApplyTo	No Restrictions
Urban Traffic Control	●	○
Cableless Linking	●	○
Vehicle Actuated	●	○
	○	○
Fixed Time	●	○

Modes	Restrictions ApplyTo	No Restrictions
Manual	●	○
	○	○
	○	○
	○	○

To Stage

From Stage	0	1	2	3	4	5	6
0	■						
1		■					
2		0	■				
3	1			■			
4	1				■		
5	1		1	1	1	■	
6	1		1			1	■

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Stage Internal Demands / Ped. Window Times

Stage Internal Demands / Ped. Window Times

Start-up Vehicle Responsive Demands

0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Demands Inserted When Leaving Manual and Fixed Time Modes

0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Unlatched Demands that Start Maximum Timers

0 ☑ 1 ☑ 2 ☑ 3 ☑ 4 ☑ 5 ☑ 6 ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Window Times

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0	0	0									

16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

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Phase delays

Phase delays

● Phase Delays 0-29 ○ Phase Delays 30-59 ○ Phase Delays 60-89 ○ Phase Delays 90-119

No.	Delay Phase	On Change from Stage	To Stage	By (X) Seconds	No.	Delay Phase	On Change from Stage	To Stage	By (X) Seconds
0	B	1	3	8	15				0
1	B	2	3	8	16				0
2	B	1	4	8	17				0
3				0	18				0
4	C	1	2	0	19				0
5	G	1	2	0	20				0
6	C	1	5	5	21				0
7	C	4	6	7	22				0
8				0	23				0
9				0	24				0
10				0	25				0
11				0	26				0
12				0	27				0
13				0	28				0
14				0	29				0

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Fixed Time

Fixed Time

Stage Moves & Times (Not Fixed Time to Current Max)

Current Stage	0	1	2	3	4	5	6	7
Next Stage								
Time								
Current Stage	8	9	10	11	12	13	14	15
Next Stage								
Time								
Current Stage	16	17	18	19	20	21	22	23
Next Stage								
Time								
Current Stage	24	25	26	27	28	29	30	31
Next Stage								
Time								

Phases Demanded and Extended under Fixed Time to Current Max.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Demand	☐	☑	☑	☑	☑	☑	☑	☑	☐	☑	☑	☑	☐	☐	☐	☐
Extend	☐	☑	☑	☑	☑	☑	☑	☑	☐	☑	☑	☑	☐	☐	☐	☐

	Q	R	S	T	U	V	W	X	Y	Z	A2	B2	C2	D2	E2	F2
Demand	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Extend	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Works Order :
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Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

CLF - Base Time

CLF - Base Time

Controller Base Date: XX/XX/XX

Controller Base Time: 02:00:00

Plan Offset

	Minutes	Seconds		Minutes	Seconds
Plan 0	0	0	Plan 8	0	0
Plan 1	0	0	Plan 9	0	0
Plan 2	0	0	Plan 10	0	0
Plan 3	0	0	Plan 11	0	0
Plan 4	0	0	Plan 12	0	0
Plan 5	0	0	Plan 13	0	0
Plan 6	0	0	Plan 14	0	0
Plan 7	0	0	Plan 15	0	0

Handset Range Limits

	Minutes	Seconds
Min	0	0
Max	255	59

Works Order :
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UTC General Data

UTC General Data

Type of UTC

● 106 ○ 316

Integral OTU Address

2 Number of Control Words

2 Number of Reply Words

☐ Controller to respond to TC bit.

☐ Introduction of UTC to be disabled by Priority Mode

Non UTC RTC synchronisation input name

RTC Synchronisation Times

Clock Synchronise Time (UTC TS input)

Day	Time
Saturday	00:00:00

Clock Confirm Time (UTC RT output)

Day	Time
Saturday	00:00:00

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

UTC Control and Reply Data Format

UTC Control and Reply Data Format

Control Words

	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8
Word 1	F1	F2	F3	F4	F5	F6	F7	
Word 2								
Word 3								
Word 4								

Reply Words

	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8
Word 1	G1	G2	G3	G4	G5	G6	G7	PB
Word 2	PC	PD	PF	PG	PH	PJ		
Word 3								
Word 4								
Word 5								
Word 6								
Word 7								
Word 8								
Word 9								
Word 10								
Word 11								
Word 12								
Word 13								
Word 14								

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

UTC Stage and Modes Data Definitions

UTC Stage and Modes Data Definitions

Stage	Force Bit	Green Confirm Bit	Demand Confirm Bit	Stage	Force Bit	Green Confirm Bit	Demand Confirm Bit
0				16			
1	F1	G1		17			
2	F2	G2		18			
3	F3	G3		19			
4	F4	G4		20			
5	F5	G5		21			
6	F6	G6		22			
7				23			
8				24			
9				25			
10				26			
11				27			
12				28			
13				29			
14				30			
15				31			

Mode Data Definitions

Manual Mode Operative:
☐ G1/G2 ☐ RR ☐

Manual Mode Selected:
☐ G1/G2 ☐ RR ☐

No Lamp Power, or Lamps Off due to RLM

☐ G1/G2 ☐ ☐

Detector Fault:
☐ ☐ ☐ DF

Normal NOT selected on the Manual Panel:
☐ G1/G2 ☐ RR ☐

RR Button Selected:
☐ G1/G2 ☐ RR ☐

If UTC Reply Confirms are required for a Controller Fault (CF) OR for separate MC and RR replies, Conditioning must be used.

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Serial MOVA

Serial MOVA

1	DIN1	2	DX2	3	BX3	4	FX4	5	GIN5	6	GIN6	7	GX7	8	GX8
9	CX9	10	CX10	11	HIN11	12	KX12	13	HX13	14	KSL14	15		16	
17	JIN17	18	JX18	19	JX19	20	JSL20	21	JSL21	22		23		24	
25		26		27		28		29		30		31		32	
33		34		35		36		37		38		39		40	
41		42		43		44		45		46		47		48	
49		50		51		52		53		54		55		56	
57		58		59		60		61		62		63		64	

Note - only 32 detectors available on MOVA 4.0

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

MTC - Time Switch Parameters

MTC - Time Switch Parameters

	Type	Event		Type	Event
0	Alternate Max	MAXSETB	16	No Action	
1	Alternate Max	MAXSETC	17	No Action	
2	Alternate Max	MAXSETD	18	No Action	
3	Alternate DFM	ALTDFMB	19	No Action	
4	Alternate DFM	ALTDFMC	20	No Action	
5	Alternate DFM	ALTDFMD	21	No Action	
6	Conditioning	MTCF0	22	No Action	
7	No Action		23	No Action	
8	No Action		24	No Action	
9	No Action		25	No Action	
10	No Action		26	No Action	
11	No Action		27	No Action	
12	No Action		28	No Action	
13	No Action		29	No Action	
14	No Action		30	No Action	
15	No Action		31	No Action	

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

MTC - Time Switch Parameters Array

Parameters

Events

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
MAXSETB		🟥																														
MAXSETC			🟥																													
MAXSETD				🟥																												
ALTDFMB																																
ALTDFMC																																
ALTDFMD																																
MTCF0																																
UnUsed																																
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Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Master Time Clock - Day Type

Master Time Clock - Day Type

No.	Mon	Tue	Wed	Thu	Fri	Sat	Sun
0	☐	☐	☐	☐	☐	☑	☐
1	☐	☐	☐	☐	☐	☐	☑
2	☑	☐	☐	☐	☐	☐	☐
3	☐	☑	☐	☐	☐	☐	☐
4	☐	☐	☑	☐	☐	☐	☐
5	☐	☐	☐	☑	☐	☐	☐
6	☐	☐	☐	☐	☑	☐	☐
7	☑	☑	☑	☑	☑	☑	☑
8	☑	☑	☑	☑	☑	☑	☐
9	☑	☑	☑	☑	☑	☐	☐
10	☐	☐	☐	☐	☐	☐	☐
11	☐	☐	☐	☐	☐	☐	☐
12	☐	☐	☐	☐	☐	☐	☐
13	☐	☐	☐	☐	☐	☐	☐
14	☐	☐	☐	☐	☐	☐	☐
15	☐	☐	☐	☐	☐	☐	☐

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Master Time Clock - Time Table

Master Time Clock - Time Table

View Time Table settings
● 0-15 ○ 16-31 ○ 32-47 ○ 48-63

Number	Day Type	Time	Introduce Function Required	Function Number	Plan/ Parameter
0	9	07:00:00	INTRODUCE MAXSETA	2	0
1	9	09:30:00	INTRODUCE MAXSETB	2	1
2	9	15:00:00	INTRODUCE MAXSETC	2	2
3	9	19:00:00	INTRODUCE MAXSETD	2	3
4	0	09:00:00	INTRODUCE MAXSETB	2	1
5	0	19:00:00	INTRODUCE MAXSETD	2	3
6	1	09:00:00	INTRODUCE MAXSETB	2	1
7	1	19:00:00	INTRODUCE MAXSETD	2	3
8	7	07:30:00	SWITCH ON AUDIO	3	6
9	7	22:00:00	SWITCH OFF AUDIO	4	6
10	0			0	0
11	0			0	0
12	0			0	0
13	0			0	0
14	0			0	0
15	0			0	0

Function Numbers:

0 = Isolate From CLF

1 = Introduce a CLF Plan

2 = Introduce a Parameter
(Combination of event switches

3 = Selects an Individual
event switch to be set

4 = Selects an Individual
event switch to be
cleared.

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

LMU - General

LMU - General

Lamp Monitoring - LMU Voltage

○ ● 48
○ ○

Red Lamp Monitoring

Max Red Bulb Wattage

First Red Lamp Fault Speed: 0

☐ RLF2 Cancels RLM additional Intergreens

☐ RLF2 Only Cleared by RFL = 1

☐ RLF1 Only Cleared by RFL = 1

RLM Additional Intergreen Handset Limits

Minimum	Maximum
0	10

Streams with Phase BlackOut on RLF2

☐ 0 ☐ ☐ ☐ ☐ ☐ ☐ ☐

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Integral Onboard LMU Sensors

Integral LMU On-board Sensors for ELV Controllers

Number of LS cards fitted	HPU Connection
2	1

Sensor Configuration For LSLS 1 (Cabinet 1)

Phase	Aspect	Sensor #	Sensor Type	Load Type		Phase	Aspect	Sensor #	Sensor Type	Load Type	
A	Red	1	R,G	3: STC LED Nearside In	○	F	Red	7	As Seq.	1: STC Helios ELV	○
A	Amber	2	Wait	2: STC LED Demand In	○	F	Amber	7	As Seq.	1: STC Helios ELV	○
A	Green	1	R,G	3: STC LED Nearside In	○	F	Green	7	As Seq.	1: STC Helios ELV	○
A	Green	1	R,G	3: STC LED Nearside In	○	G	Red	8	As Seq.	1: STC Helios ELV	○
B	Red	3	As Seq.	1: STC Helios ELV	○	G	Amber	8	As Seq.	1: STC Helios ELV	○
B	Amber	3	As Seq.	1: STC Helios ELV	○	G	Green	8	As Seq.	1: STC Helios ELV	○
B	Green	3	As Seq.	1: STC Helios ELV	○	H	Red	9	As Seq.	1: STC Helios ELV	○
C	Red	4	As Seq.	1: STC Helios ELV	○	H	Amber	9	As Seq.	1: STC Helios ELV	○
C	Amber	4	As Seq.	1: STC Helios ELV	○	H	Green	9	As Seq.	1: STC Helios ELV	○
C	Green	4	As Seq.	1: STC Helios ELV	○	I	Red	10	As Seq.	1: STC Helios ELV	○
D	Red	5	As Seq.	1: STC Helios ELV	○	I	Amber	10	As Seq.	1: STC Helios ELV	○
D	Amber	5	As Seq.	1: STC Helios ELV	○	I	Green	10	As Seq.	1: STC Helios ELV	○
D	Green	5	As Seq.	1: STC Helios ELV	○	J	Red	11	As Seq.	1: STC Helios ELV	○
E	Red	6	As Seq.	1: STC Helios ELV	○	J	Amber	11	As Seq.	1: STC Helios ELV	○
E	Amber	6	As Seq.	1: STC Helios ELV	○	J	Green	11	As Seq.	1: STC Helios ELV	○
E	Green	6	As Seq.	1: STC Helios ELV	○	K	Red	12	As Seq.	1: STC Helios ELV	○

Note : A (*) character next to a sensor number indicates that the sensor would also be available on the External sensors screen. Please be sure

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Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Integral Onboard LMU Sensors

Integral LMU On-board Sensors for ELV Controllers

Number of LS cards fitted	HPU Connection
2	1

Sensor Configuration For LSLS 2 (Cabinet 1)

Phase	Aspect	Sensor #	Sensor Type	Load Type		Phase	Aspect	Sensor #	Sensor Type	Load Type	
K	Amber	12	As Seq.	1: STC Helios ELV	○	N/A	N/A		N/A	N/A	○
K	Green	12	As Seq.	1: STC Helios ELV	○	N/A	N/A		N/A	N/A	○
L	Red	13	As Seq.	1: STC Helios ELV	○	N/A	N/A		N/A	N/A	○
L	Amber	13	As Seq.	1: STC Helios ELV	○	N/A	N/A		N/A	N/A	○
L	Green	13	As Seq.	1: STC Helios ELV	○	N/A	N/A		N/A	N/A	○
A	Green	14	R,G	1: STC Helios ELV	○	N/A	N/A		N/A	N/A	○
N/A	N/A		N/A	N/A	○	N/A	N/A		N/A	N/A	○
N/A	N/A		N/A	N/A	○	N/A	N/A		N/A	N/A	○
N/A	N/A		N/A	N/A	○	N/A	N/A		N/A	N/A	○
N/A	N/A		N/A	N/A	○	N/A	N/A		N/A	N/A	○
N/A	N/A		N/A	N/A	○	N/A	N/A		N/A	N/A	○
N/A	N/A		N/A	N/A	○	N/A	N/A		N/A	N/A	○
N/A	N/A		N/A	N/A	○	N/A	N/A		N/A	N/A	○
N/A	N/A		N/A	N/A	○	N/A	N/A		N/A	N/A	○
N/A	N/A		N/A	N/A	○	N/A	N/A		N/A	N/A	○
N/A	N/A		N/A	N/A	○	N/A	N/A		N/A	N/A	○

Note : A (*) character next to a sensor number indicates that the sensor would also be available on the External sensors screen. Please be sure

Works Order :
EM Number : E69362
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Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Integral External LMU Sensors

Integral LMU External Sensors for Reg Signs (ELV Controllers)

External Sensors (1)

Sensor	Load Type
48	4: STC ELV Regulatory Sign
47	4: STC ELV Regulatory Sign
46	4: STC ELV Regulatory Sign
45	4: STC ELV Regulatory Sign

External Sensors (4)

Sensor Load Type

External Sensors (2)

Sensor	Load Type
44	4: STC ELV Regulatory Sign
43	4: STC ELV Regulatory Sign
42	4: STC ELV Regulatory Sign
41	4: STC ELV Regulatory Sign

External Sensors (5)

Sensor Load Type

External Sensors (3)

Sensor Load Type

External Sensors (6)

Sensor Load Type

Note: Sensors which have been used as Onboard sensors will not be available h

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Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

RLM Additional Intergreens

Phases Delayed

Phases with RLF1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
A	■													
B		■												
C			■											
D				■										
E					■									
F						■								
G							■							
H								■						
I									■					
J										■				
K											■			
L												■		
M													■	
N														■

Works Order :
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Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

RLM Phase Inhibits

Phases Inhibited/Blacked-out

Phases with RLF2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
A														
B	🟥													
C														
D														
E														
F														
G	🟥													
H														
I	🟥													
J														
K	🟥													
L														
M														
N														

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Manual Panel

Manual Panel

Stage Buttons and LEDs

Button No.	Title	Called Stage for Stream 0	1	2	3	4	5	6	7
0	ALL RED	0							
1	BARRY ROAD	1							
2	BARRY ROAD RIGHT TURN	2							
3	BUS EXIT	3							
4	LLANDOUGH ROAD	4							
5	LLANDOUGH ROAD AHEAD ONLY _PEDESTRIANS	5							
6	REDLANDS ROAD	6							
7									

General LEDs

	AUX 1	AUX 2	AUX 3	AUX 4 (Hurry Call)	AUX 5 (Higher Priority)
Conditioned	☐	☐	☐	☐	☑

Manual Mode Enable

● Always
○ When Handset Plugged in (Note 1)
○ When 'MND' Command Entered

Note 1:
For this to operate
Special Conditioning
is required.

General Buttons

	None	SW1	SW2	SW3
Momentary		☐	☐	☐
Dim Override	●	○	○	○
RR	●	○	○	○

Manual Signals On

○ Immediate Signals On
● As Start-Up

Mode Select Switches Disabled

☐ VA ☐ Fixed Time ☐ CLF

Extend All Red - General

Extend All Red - General

Modes Supporting All Red Extensions

	Auto Extend to Max.
Manual	☐
CLF	☐
UTC	☐
Hurry Call	☐
Priority	☐
Emergency Veh.	☐
V.A.,CLF,UTC,Pri	☐
Fixed Time	☐
Part Time	☐
Manual Step On	☐

All Red Timings

Stream	0	1	2	3	4	5	6	7
Extension Time	0.0							
MaxTime	0							

Detectors Associated with All Red Extension Units

Unit	Associated Detectors							
1								
2								
3								
4								
5								
6								
7								

The association between detectors and extension units must be performed in special conditioning.

Extend All Red - Stage To Stage Moves

To Stage

From Stage

	0	1	2	3	4	5	6
0	■						
1		■					
2			■				
3				■			
4					■		
5						■	
6							■

Works Order :
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Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Extend All Red - Independent Intergreens

Phase not effected by hold

Phase Terminating

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
A	■													
B		■												
C			■											
D				■										
E					■									
F						■								
G							■							
H								■						
I									■					
J										■				
K											■			
L												■		
M													■	
N														■

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Special Conditioning

```
; MANUAL PANEL
; ============

(MODE0 EQL<6>)=MIL17                                    ; MOVA MODE ACTIVE LIGHTS HIGHER PRIORITY L.E.D.

; MOVA PHASE CONFIRMS
; ===================

NOT(PHASEB)=PB                                          ; PHASE OVERLAPS TOP MOVA
NOT(PHASEC)=PC
NOT(PHASED)=PD
NOT(PHASEF)=PF
NOT(PHASEG)=PG
NOT(PHASEH)=PH
NOT(PHASEJ)=PJ
; MOVA WAIT CONFIRMS
; ==================

PRSLMPAA.NOT(LMUINHA)=+MOVADET22                        ; PED WAIT CONFIRM TO MOVADET22

; CALL CANCEL CC OUTPUTS TO MOVA
; ==============================

CCTO0=MOVADET23                                         ; CC LOOP ACTIVE AFTER CALL DELAY OUTPUT MOVADET23
CCTO1=MOVADET16
CCTO2=MOVADET24                                         ; CC LOOP ACTIVE AFTER CALL DELAY OUTPUT MOVADET24

; MOVA CRB
; ========

IFT (PRSLMPRB+PRSLMPAB+PRSLMPGB) THN
    RUN<94>
END
IFT NOT(MODE0 EQL<6>).NOT(CNDTMA95).SSNRM THN           ; NOT IN MOVA MODE AND IN NORMAL RUN TIMER
    RUN<95>
END

IFT CNDTER95+((PRVMOD0 EQL<6>).NOT(MODE0 EQL<6>)) THN
    LOD<10> 1SCRTCH0
    TRUE=2SCRT1
END                                                     ; START A 2 SEC INTERNAL TIMER FOR CRB TOGGLE

NOT(1SCRTST0 EQL<0>)=.2SCRT1

IFT (1SCRTST0 GRT<0>) THN
    DEC 1SCRTCH0
END

SSNRM.(NOT(2SCRT1)+(MODE0 EQL<6>)).CNDTMA94=MOVACRB     ; WHEN TIMER TERMINATES TOGGLE CRB
; STAGE 2
; =======
NOT(STAGE2):::::=.EXOB
               *=.EXCB
               *=.EXOD
               *=.EXCD
               *=.EXOG
               *=.EXCG
```

Special Conditioning

```
; TIMETABLED AUDIO OUTPUTS
; ========================

LMPON.PHASEA.MTCF0.CFE0=AUDIO1                              ; AUDIOS SWITCHED ON WHEN PED PHASE A APPEARS _
;                                                           ; MTCF0 FLAG SET, PLUS IF CFE0 IS ENABLED (IE CFE0=1)
TRUE=+UCST1                                                 ; ALWAY DEMAND STAGE 1
; STAGE PREVENTS
; ==============

(MODE0 EQL<2>).NOT(UCPHA+LCPHA+UNLPUFA+LCST5+UCST5)=PRVST5
                                                            ; STAGE 5 PREVENTED UNLESS THERE IS A DEMAND FOR PHASE 5



; STOPLINE LOOP OUTPUTS TO MOVA
; =============================

CCTO3+(PHASEH.HSL15)=MOVADET15                              ; HSL15 OR PHASEH _HSL15 OUTPUT TO MOVADET15

; DIN1 TO EXTEND
; ==============

DIN1_EXT.NOT(CFE1):=+EXOD
                  *=+EXCD

; DETECTOR TOGGLE
; ===============

IFT PHASED.DIN1.NOT(CNDTMA1) THN                            ; IF PHASE D IS AT GREEN AND THE DIN1 IS ACTIVE
    RUN<1>                                                  ; RUN THE PULSE RATE TIMER,
END
IFT  CNDTER1 THN                                            ; PULSE RATE TIMER TERMINATED RUN PULSE OUTPUT TIMER
    RUN<0>
END                                                         ; TOGGLE OUTPUT IS ENABLED IF CFE2=1
PHASED.CNDTMA0.CFE2=+MOVADET2                               ; PHASE D AT GREEN AND TIMER 2 ACTIVE SET MOVADET2
```

Special Conditioning

```
; PEDLINK OUTPUT TO NEW JUNCTION AT BUS GATE
; ============================================

LMPON.PHASEC.NOT(CFE4)=PEDLINK                  ; LAMPS ON AND PHASE C AT GREEN SETS OUTPUT "PEDLINK"
                                                ; DISABLED BY SETTING CFE4=1
```

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Special Conditioning Timers

Special Conditioning Timers

Timers
● 0-31 ○ 32-63 ○ 64-95

No	Value	Min	Max	200ms	Description	No	Value	Min	Max	200ms	Description
0	0.6	0	31.8	☑	X TOGGLE TIMER	16		0	255	☐	
1	2.0	0	31.8	☑	X TOGGLE PULSE RATE	17		0	255	☐	
2		0	255	☐		18		0	255	☐	
3		0	255	☐		19		0	255	☐	
4		0	255	☐		20		0	255	☐	
5		0	255	☐		21		0	255	☐	
6		0	255	☐		22		0	255	☐	
7		0	255	☐		23		0	255	☐	
8		0	255	☐		24		0	255	☐	
9		0	255	☐		25		0	255	☐	
10		0	255	☐		26		0	255	☐	
11		0	255	☐		27		0	255	☐	
12		0	255	☐		28		0	255	☐	
13		0	255	☐		29		0	255	☐	
14		0	255	☐		30		0	255	☐	
15		0	255	☐		31		0	255	☐	

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Special Conditioning Timers

Special Conditioning Timers

Timers
○ 0-31 ○ 32-63 ● 64-95

No	Value	Min	Max	200ms	Description	No	Value	Min	Max	200ms	Description
64		0	255	☐		80		0	255	☐	
65		0	255	☐		81		0	255	☐	
66		0	255	☐		82		0	255	☐	
67		0	255	☐		83		0	255	☐	
68		0	255	☐		84		0	255	☐	
69		0	255	☐		85		0	255	☐	
70		0	255	☐		86		0	255	☐	
71		0	255	☐		87		0	255	☐	
72		0	255	☐		88		0	255	☐	
73		0	255	☐		89		0	255	☐	
74		0	255	☐		90		0	255	☐	
75		0	255	☐		91		0	255	☐	
76		0	255	☐		92		0	255	☐	
77		0	255	☐		93		0	255	☐	
78		0	255	☐		94	1	1	5	☐	MIN LAMPS OFF TIMER
79		0	255	☐		95	120	0	255	☐	MOVA CRB TOGGLE BIT

Works Order :
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Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Special Instructions

E69362

Card Type	Rack Posn	Addr.	Port	Type	Line	Term Posn
Intelligent Backplane 16/0	Rack	01	0	I	000 - 007	2 LT1
Intelligent Backplane 16/0	Rack	01	1	I	008 - 015	2 LT1
Intelligent Backplane 16/0	Rack	02	2	I	016 - 023	2 LT2
Intelligent Backplane 16/0	Rack	02	3	I	024 - 031	2 LT2
Serial IO 24/4	1 I/O1	03	4	I	032 - 039	1 I/O1
Serial IO 24/4	1 I/O1	03	5	I	040 - 047	1 I/O1
Serial IO 24/4	1 I/O1	03	6	I	048 - 055	1 I/O1
Serial IO 24/4	1 I/O1	03	7	O	056 - 059	1 I/O1
CPU	A					

Works Order :
EM Number : E69362
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Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Special Instructions

ST900 ELV CONTROLLER ITEMS LIST SHEET 1 (*I*L*)

ITEM	DRAWING NUMBER	DESCRIPTION	QTY	TOT	REMARKS
1					
2	667/1/32900/020	ST900 ELV Cabinet UK 20A 1 LSLS - Grey	1		
3	667/1/32900/040	ST900 ELV Cabinet UK 40A 1 LSLS - Grey			
4	667/1/32900/021	ST900 ELV Cabinet UK 20A 1 LSLS - Black			
5	667/1/32900/041	ST900 ELV Cabinet UK 40A 1 LSLS - Black			
6					
7					
8					
9	667/1/32943/001	ELV Lamp switch (LSLS) kit	1		
10	667/1/32960/000	ELV Lamp switch (LSLS) backplane kit	1		
11	667/1/32995/002	ST900 I/O card kit (4 outputs)	1		
12	667/1/32995/001	ST900 I/O card kit (16 outputs)			
13					
14					
15					
16	667/1/27004/000	Integral TC12 OTU kit			
17	667/1/27005/000	SDE Facility kit			
18	667/1/32910/000	ST900 Intelligent detector backplane kit	2		
19	667/1/33002/000	ELV detector 6U rack expansion kit			
20	667/1/33074/000	ST900 ELV 24 V detector supply Kit (6A)			
21	667/1/20690/001	19" Detector Rack			
22					
23	667/1/32985/000	ELV 20A to 40A upgrade kit			
24					
25					
26	667/1/33070/000	ELV Regulatory Sign expansion kit			
27	667/1/32950/000	ELV Audible supply kit			
28	667/1/27117/000	300mA RCD kit			
29					
30					
31	667/1/32900/000	Expansion cabinet kit			
32	667/1/33072/000	Cabinet mounted cut-out connection kit			
33					
34					
35					
36	667/1/27056/001	Manual Panel Full kit			
37	667/1/27110/000	Manual Panel RS232 kit			
38					
39					
40	667/1/16277/362	Configuration Eprom (Issue 9. 0)	1		

Note 1:
Please refer to special instruction pages for additional information on items marked with an '*'.

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Special Instructions

ST900 ELV CONTROLLER ITEMS LIST SHEET 2 (*I*L*)

ITEM	DRAWING NUMBER	DESCRIPTION	QTY	TOT	REMARKS
41					
42	667/1/32900/920	ST900 ELV cuckoo Kit - T200			
43	667/1/32900/921	ST900 ELV cuckoo Kit - T400			
44	667/1/32900/922	ST900 ELV cuckoo Kit - T800			
45	667/1/32900/923	ST900 ELV cuckoo Kit - Microsense			
46	667/1/32900/925	ST900 ELV cuckoo Kit - Peek			
47					
48					
49					
50					
51					
52	667/1/33073/000	ST900 Isolator locking kit			
53	667/2/20234/000	Screw Lock Key			
54					
55					
56	667/1/27104/000	ST800 / ST900 DFM Lens Kit			
57	667/1/21150/002	ST800 / ST900 Gas Plinth			
58	667/2/27096/000	ST800 / ST900 Mounting Stool			
59					
60					
61					
62	667/1/26271/000	Telephone Kit (Lightning protection)			
63	667/1/27118/000	Surge Arrester (Lightning protection)			
64					
65					
66					
67	667/1/32900/120	ST900 ELV Cabinet Export 20A 1 LSLS - Grey			
68	667/1/32900/140	ST900 ELV Cabinet Export 40A 1 LSLS - Grey			
69	667/1/32900/121	ST900 ELV Cabinet Export 20A 1 LSLS - Black			
70	667/1/32900/141	ST900 ELV Cabinet Export 40A 1 LSLS - Black			
71					
72					
73	667/1/32900/900	ST900 ELV export rack Kit			
74	667/1/32945/000	ST900 ELV additional LSLS rack wiring kit			
75					
76	667/1/27007/000	IRM Facility			
77					
78					
79					
80					

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Special Instructions

******PLEASE NOTE ********

ALL OF THE CAMERA INPUT'S HAVE BEEN INVERTED

THIS INCLUDES THE VECHICLE MVD'S, KERBSIDES AND ONCROSSINGS, YOU WILL NEED TO MAKE SURE THE INSTALLER IS AWARE OF THIS SO THE CORRECT OUTPUT WIRING FROM THE MVD'S IS CONNECTED.

THIS IS TO MAKE SURE THE INPUT GOES ACTIVE OR P.D. IF ANY OF THE MVD'S ARE DISCONNECTED.

THE DIAGRAM BELOW SHOWS THE LINKING BETWEEN THE CONTROLLERS

```
 BUSGATE                                        MERRIE HARRIER
 EPR089                                              E69362
 ======                                              ======

1I/O1 0 BUSOFF ----------------------------> BUSOFF 1I/O1 8

1I/O1 1 BUSLF1 ----------------------------> BUSLF1 1I/O1 9

1I/O1 2 BUSLF  ----------------------------> BUSLF  1I/O1 10

1I/O1 3 BUSCF  ----------------------------> BUSCF  1I/O1 11


1I/O16  PEDLINK <--------------------------- PEDLINK 1I/O 1
```

Works Order :
EM Number : E69362
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Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Call Cancel

Call Cancel

Unit No.	Input Name	Call Delay	Cancel Delay	Phase Demanded (Unlatched Demand)
0	CCL23	5	1	
1	ISL16	90	0	I
2	CCL24	5	1	L
3	HSL15	3	0	H
4		0	0	
5		0	0	
6		0	0	
7		0	0	

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Input/Output

Input/Output

☐ Enable Signal Required Check boxes

☐ Manual Allocation

Port Number & Type

Port: 0

○ Inputs ○ Outputs

● Inputs & Outputs

Card Type & Address

Intelligent Backplane 16/0
Card Address: 1

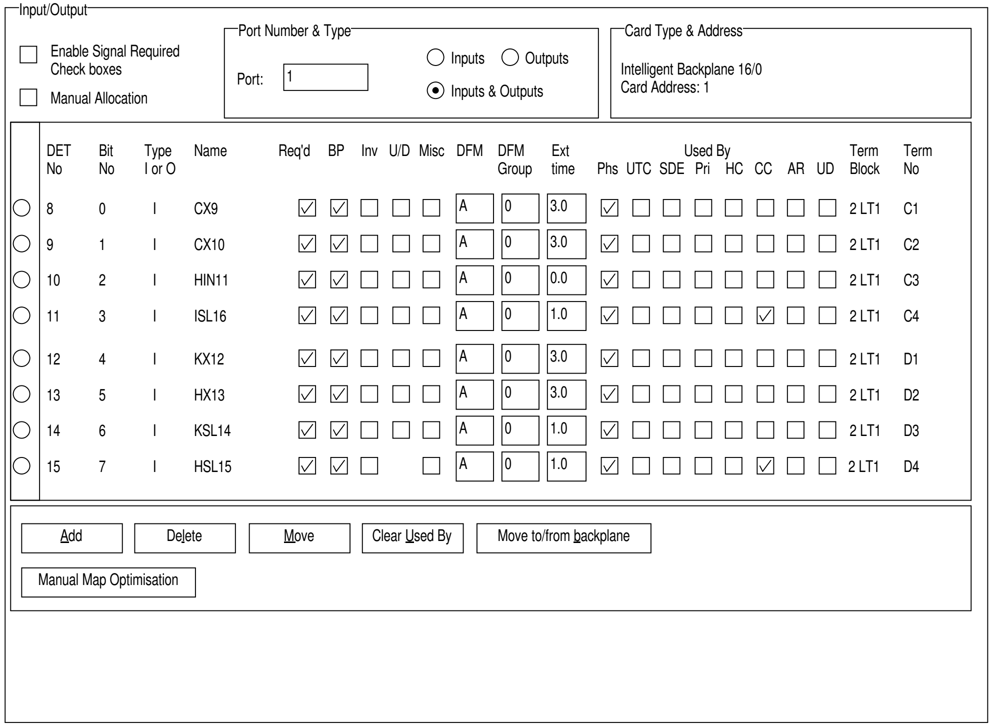
	DET No	Bit No	Type I or O	Name	Req'd	BP	Inv	U/D	Misc	DFM	DFM Group	Ext time	Used By Phs	UTC	SDE	Pri	HC	CC	AR	UD	Term Block	Term No
○	0	0	I	DIN1	☑	☑	☐	☐	☐	A	0	3.0	☑	☐	☐	☐	☐	☐	☐	☐	2 LT1	A1
○	1	1	I	DX2	☑	☑	☐	☐	☐	A	0	3.0	☑	☐	☐	☐	☐	☐	☐	☐	2 LT1	A2
○	2	2	I	BX3	☑	☑	☐	☐	☐	A	0	3.0	☑	☐	☐	☐	☐	☐	☐	☐	2 LT1	A3
○	3	3	I	FX4	☑	☑	☐	☐	☐	A	0	3.0	☑	☐	☐	☐	☐	☐	☐	☐	2 LT1	A4
○	4	4	I	GIN5	☑	☑	☐	☐	☐	A	0	0.0	☑	☐	☐	☐	☐	☐	☐	☐	2 LT1	B1
○	5	5	I	GIN6	☑	☑	☐	☐	☐	A	0	0.0	☑	☐	☐	☐	☐	☐	☐	☐	2 LT1	B2
○	6	6	I	GX7	☑	☑	☐	☐	☐	A	0	4.0	☑	☐	☐	☐	☐	☐	☐	☐	2 LT1	B3
○	7	7	I	GX8	☑	☑	☐		☐	A	0	4.0	☑	☐	☐	☐	☐	☐	☐	☐	2 LT1	B4

Add Delete Move Clear Used By Move to/from backplane

Manual Map Optimisation

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Input/Output



Input/Output

☐ Enable Signal Required Check boxes
☐ Manual Allocation

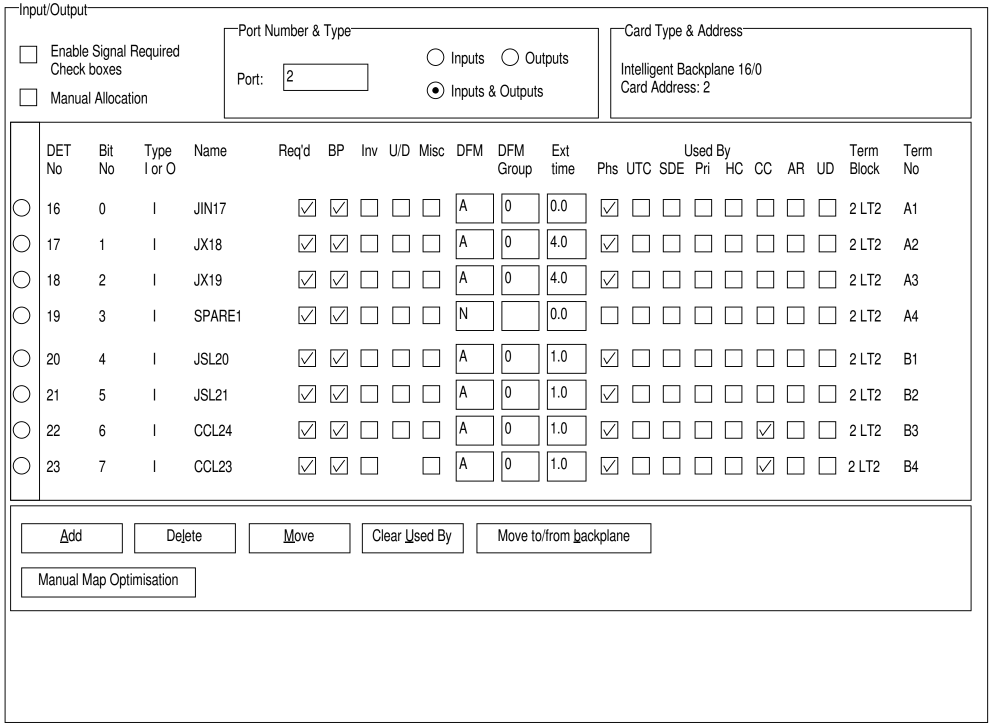
Port Number & Type
Port: 1
○ Inputs ○ Outputs
● Inputs & Outputs

Card Type & Address
Intelligent Backplane 16/0
Card Address: 1

	DET No	Bit No	Type I or O	Name	Req'd	BP	Inv	U/D	Misc	DFM	DFM Group	Ext time	Used By Phs	UTC	SDE	Pri	HC	CC	AR	UD	Term Block	Term No
○	8	0	I	CX9	☑	☑	☐	☐	☐	A	0	3.0	☑	☐	☐	☐	☐	☐	☐	☐	2 LT1	C1
○	9	1	I	CX10	☑	☑	☐	☐	☐	A	0	3.0	☑	☐	☐	☐	☐	☐	☐	☐	2 LT1	C2
○	10	2	I	HIN11	☑	☑	☐	☐	☐	A	0	0.0	☑	☐	☐	☐	☐	☐	☐	☐	2 LT1	C3
○	11	3	I	ISL16	☑	☑	☐	☐	☐	A	0	1.0	☑	☐	☐	☐	☐	☑	☐	☐	2 LT1	C4
○	12	4	I	KX12	☑	☑	☐	☐	☐	A	0	3.0	☑	☐	☐	☐	☐	☐	☐	☐	2 LT1	D1
○	13	5	I	HX13	☑	☑	☐	☐	☐	A	0	3.0	☑	☐	☐	☐	☐	☐	☐	☐	2 LT1	D2
○	14	6	I	KSL14	☑	☑	☐	☐	☐	A	0	1.0	☑	☐	☐	☐	☐	☐	☐	☐	2 LT1	D3
○	15	7	I	HSL15	☑	☑	☐		☐	A	0	1.0	☑	☐	☐	☐	☐	☑	☐	☐	2 LT1	D4

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Input/Output



Input/Output

☐ Enable Signal Required Check boxes
☐ Manual Allocation

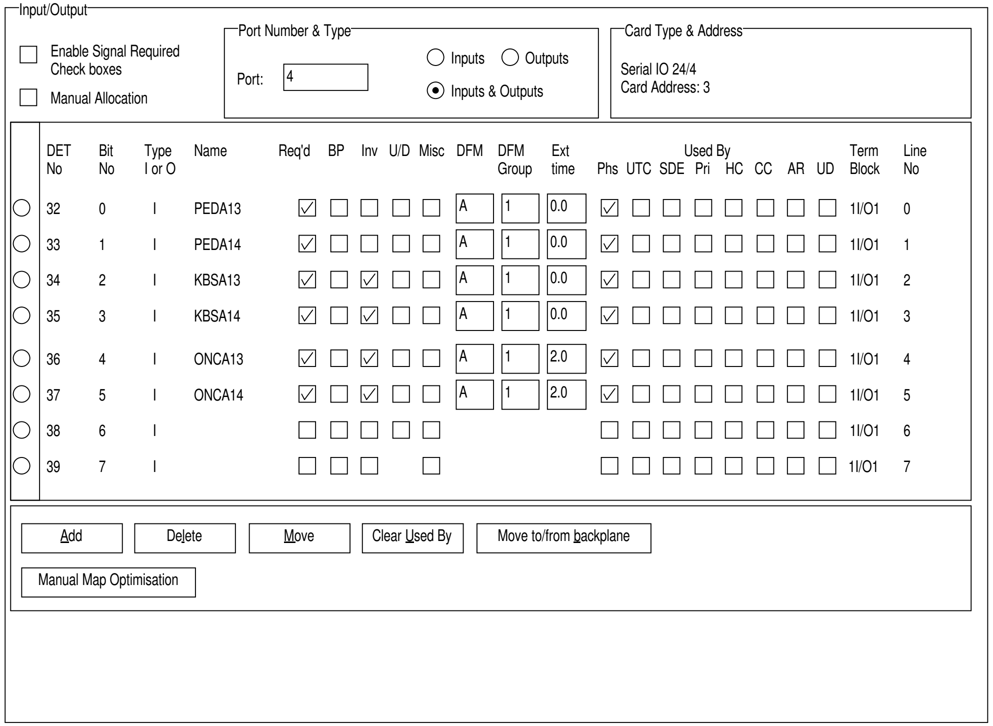
Port Number & Type
Port: 2
○ Inputs ○ Outputs
● Inputs & Outputs

Card Type & Address
Intelligent Backplane 16/0
Card Address: 2

	DET No	Bit No	Type I or O	Name	Req'd	BP	Inv	U/D	Misc	DFM	DFM Group	Ext time	Used By Phs	UTC	SDE	Pri	HC	CC	AR	UD	Term Block	Term No
○	16	0	I	JIN17	☑	☑	☐	☐	☐	A	0	0.0	☑	☐	☐	☐	☐	☐	☐	☐	2 LT2	A1
○	17	1	I	JX18	☑	☑	☐	☐	☐	A	0	4.0	☑	☐	☐	☐	☐	☐	☐	☐	2 LT2	A2
○	18	2	I	JX19	☑	☑	☐	☐	☐	A	0	4.0	☑	☐	☐	☐	☐	☐	☐	☐	2 LT2	A3
○	19	3	I	SPARE1	☑	☑	☐	☐	☐	N		0.0	☐	☐	☐	☐	☐	☐	☐	☐	2 LT2	A4
○	20	4	I	JSL20	☑	☑	☐	☐	☐	A	0	1.0	☑	☐	☐	☐	☐	☐	☐	☐	2 LT2	B1
○	21	5	I	JSL21	☑	☑	☐	☐	☐	A	0	1.0	☑	☐	☐	☐	☐	☐	☐	☐	2 LT2	B2
○	22	6	I	CCL24	☑	☑	☐	☐	☐	A	0	1.0	☑	☐	☐	☐	☐	☑	☐	☐	2 LT2	B3
○	23	7	I	CCL23	☑	☑	☐		☐	A	0	1.0	☑	☐	☐	☐	☐	☑	☐	☐	2 LT2	B4

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Input/Output



Input/Output

☐ Enable Signal Required Check boxes
☐ Manual Allocation

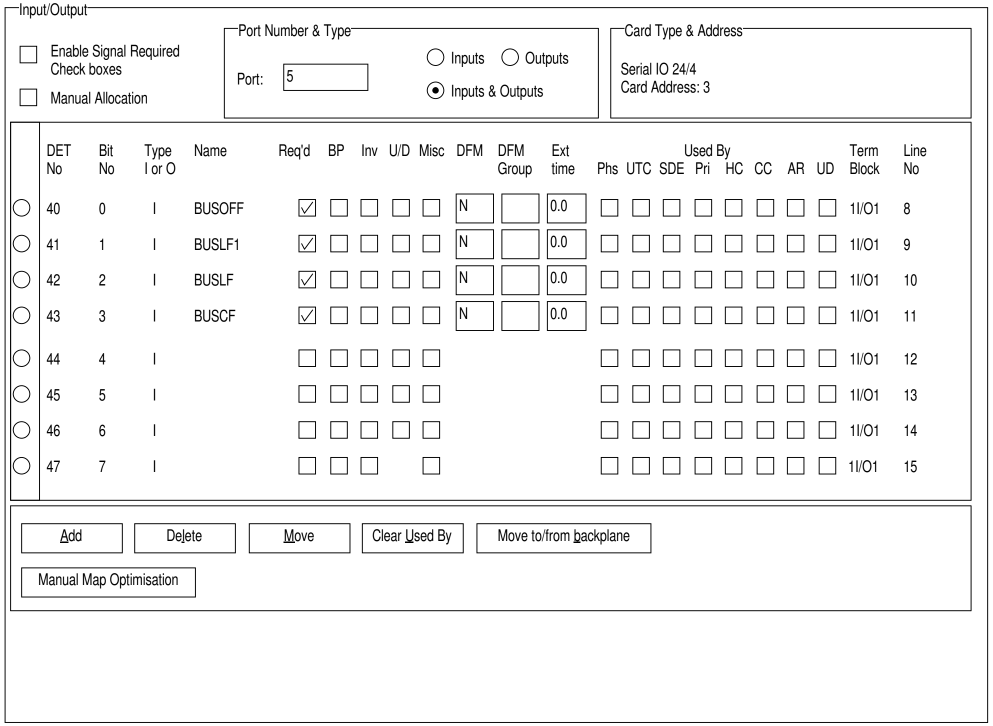
Port Number & Type
Port: 4
○ Inputs ○ Outputs
● Inputs & Outputs

Card Type & Address
Serial IO 24/4
Card Address: 3

	DET No	Bit No	Type I or O	Name	Req'd	BP	Inv	U/D	Misc	DFM	DFM Group	Ext time	Used By								Term Block	Line No
													Phs	UTC	SDE	Pri	HC	CC	AR	UD		
○	32	0	I	PEDA13	☑	☐	☐	☐	☐	A	1	0.0	☑	☐	☐	☐	☐	☐	☐	☐	1I/O1	0
○	33	1	I	PEDA14	☑	☐	☐	☐	☐	A	1	0.0	☑	☐	☐	☐	☐	☐	☐	☐	1I/O1	1
○	34	2	I	KBSA13	☑	☐	☑	☐	☐	A	1	0.0	☑	☐	☐	☐	☐	☐	☐	☐	1I/O1	2
○	35	3	I	KBSA14	☑	☐	☑	☐	☐	A	1	0.0	☑	☐	☐	☐	☐	☐	☐	☐	1I/O1	3
○	36	4	I	ONCA13	☑	☐	☑	☐	☐	A	1	2.0	☑	☐	☐	☐	☐	☐	☐	☐	1I/O1	4
○	37	5	I	ONCA14	☑	☐	☑	☐	☐	A	1	2.0	☑	☐	☐	☐	☐	☐	☐	☐	1I/O1	5
○	38	6	I		☐	☐	☐	☐	☐				☐	☐	☐	☐	☐	☐	☐	☐	1I/O1	6
○	39	7	I		☐	☐	☐		☐				☐	☐	☐	☐	☐	☐	☐	☐	1I/O1	7

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Input/Output



Input/Output

☐ Enable Signal Required Check boxes
☐ Manual Allocation

Port Number & Type
Port: 5
○ Inputs ○ Outputs
● Inputs & Outputs

Card Type & Address
Serial IO 24/4
Card Address: 3

	DET No	Bit No	Type I or O	Name	Req'd	BP	Inv	U/D	Misc	DFM	DFM Group	Ext time	Used By								Term Block	Line No
													Phs	UTC	SDE	Pri	HC	CC	AR	UD		
○	40	0	I	BUSOFF	☑	☐	☐	☐	☐	N		0.0	☐	☐	☐	☐	☐	☐	☐	☐	1I/O1	8
○	41	1	I	BUSLF1	☑	☐	☐	☐	☐	N		0.0	☐	☐	☐	☐	☐	☐	☐	☐	1I/O1	9
○	42	2	I	BUSLF	☑	☐	☐	☐	☐	N		0.0	☐	☐	☐	☐	☐	☐	☐	☐	1I/O1	10
○	43	3	I	BUSCF	☑	☐	☐	☐	☐	N		0.0	☐	☐	☐	☐	☐	☐	☐	☐	1I/O1	11
○	44	4	I		☐	☐	☐	☐	☐				☐	☐	☐	☐	☐	☐	☐	☐	1I/O1	12
○	45	5	I		☐	☐	☐	☐	☐				☐	☐	☐	☐	☐	☐	☐	☐	1I/O1	13
○	46	6	I		☐	☐	☐	☐	☐				☐	☐	☐	☐	☐	☐	☐	☐	1I/O1	14
○	47	7	I		☐	☐	☐		☐				☐	☐	☐	☐	☐	☐	☐	☐	1I/O1	15

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Input/Output

Input/Output

☐ Enable Signal Required Check boxes

☐ Manual Allocation

Port Number & Type

Port: 7

○ Inputs ○ Outputs

● Inputs & Outputs

Card Type & Address

Serial IO 24/4
Card Address: 3

	DET No	Bit No	Type I or O	Name	Req'd	BP	Inv	U/D	Misc	DFM	DFM Group	Ext time	Used By Phs	UTC	SDE	Pri	HC	CC	AR	UD	Term Block	Line No
○	56	0	O	AUDIO1	☑	☐	☐	☐	☐	N		0.0	☐	☐	☐	☐	☐	☐	☐	☐	1I/O1	0
○	57	1	O	PEDLINK	☑	☐	☐	☐	☐	N		0.0	☐	☐	☐	☐	☐	☐	☐	☐	1I/O1	1
○	58	2	O		☐	☐	☐	☐	☐				☐	☐	☐	☐	☐	☐	☐	☐	1I/O1	2
○	59	3	O		☐	☐	☐	☐	☐				☐	☐	☐	☐	☐	☐	☐	☐	1I/O1	3
○	60	4	O		☐	☐	☐	☐	☐				☐	☐	☐	☐	☐	☐	☐	☐	1I/O1	4
○	61	5	O		☐	☐	☐	☐	☐				☐	☐	☐	☐	☐	☐	☐	☐	1I/O1	5
○	62	6	O		☐	☐	☐	☐	☐				☐	☐	☐	☐	☐	☐	☐	☐	1I/O1	6
○	63	7	O		☐	☐	☐		☐				☐	☐	☐	☐	☐	☐	☐	☐	1I/O1	7

Add | Delete | Move | Clear Used By | Move to/from backplane

Manual Map Optimisation

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Aspect Drives - ELV Controllers

Aspect Drives for ELV Controllers

☐ Card Reversed

HPU Connection 1

Aspect Drive Configuration For LSLS 1 of 2 cards (Cabinet 1)

Output	Phase	Aspect	Use	Output	Phase	Aspect	Use
32	A	Red	Phase	16	F	Red	Phase
31	A	Amber	Phase	15	F	Amber	Phase
30	A	Green	Phase	14	F	Green	Phase
29	A	Green	Phase	13	G	Red	Phase
28	B	Red	Phase	12	G	Amber	Phase
27	B	Amber	Phase	11	G	Green	Phase
26	B	Green	Phase	10	H	Red	Phase
25	C	Red	Phase	9	H	Amber	Phase
24	C	Amber	Phase	8	H	Green	Phase
23	C	Green	Phase	7	I	Red	Phase
22	D	Red	Phase	6	I	Amber	Phase
21	D	Amber	Phase	5	I	Green	Phase
20	D	Green	Phase	4	J	Red	Phase
19	E	Red	Phase	3	J	Amber	Phase
18	E	Amber	Phase	2	J	Green	Phase
17	E	Green	Phase	1	K	Red	Phase

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

Aspect Drives - ELV Controllers

Aspect Drives for ELV Controllers

☐ Card Reversed

HPU Connection: 1

Aspect Drive Configuration For LSLS 2 of 2 cards (Cabinet 1)

Output	Phase	Aspect	Use	Output	Phase	Aspect	Use
32	K	Amber	Phase	16	N/A	N/A	N/A
31	K	Green	Phase	15	N/A	N/A	N/A
30	L	Red	Phase	14	N/A	N/A	N/A
29	L	Amber	Phase	13	N/A	N/A	N/A
28	L	Green	Phase	12	N/A	N/A	N/A
27	A	Green	Phase	11	N/A	N/A	N/A
26	N/A	N/A	N/A	10	N/A	N/A	N/A
25	N/A	N/A	N/A	9	N/A	N/A	N/A
24	N/A	N/A	N/A	8	N/A	N/A	N/A
23	N/A	N/A	N/A	7	N/A	N/A	N/A
22	N/A	N/A	N/A	6	N/A	N/A	N/A
21	N/A	N/A	N/A	5	N/A	N/A	N/A
20	N/A	N/A	N/A	4	N/A	N/A	N/A
19	N/A	N/A	N/A	3	N/A	N/A	N/A
18	N/A	N/A	N/A	2	N/A	N/A	N/A
17	N/A	N/A	N/A	1	N/A	N/A	N/A

Works Order :
EM Number : E69362
Engineer : P M ROUSE
Intersection : MERRIER HARRIER JUNCTION, PENARTH/ BARRY RD / REDLANDS RD(FAR SIDE PED)

I/O - Group DFM Timings

I/O - Group DFM Timings

Input Group	State	SET A	SET B	SET C	SET D
Group 0	Active (Mins)	30	30	30	30
	InActive (Hrs)	18	18	18	18
Group 1	Active (Mins)	30	30	30	30
	InActive (Hrs)	72	72	72	72
Group 2	Active (Mins)	30	30	30	30
	InActive (Hrs)	18	18	18	18
Group 3	Active (Mins)	30	30	30	30
	InActive (Hrs)	18	18	18	18
Group 4	Active (Mins)	30	30	30	30
	InActive (Hrs)	18	18	18	18
Group 5	Active (Mins)	30	30	30	30
	InActive (Hrs)	18	18	18	18
Group 6	Active (Mins)	30	30	30	30
	InActive (Hrs)	18	18	18	18
Group 7	Active (Mins)	30	30	30	30
	InActive (Hrs)	18	18	18	18

Note - 255 or blank disables DFM monitoring of that state (active or inactive) during that timeset (

Handset Limiting Values

State	Min	Max
Active (Mins)	0	255
InActive (Hrs)	0	255

Index

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Administration

01009

General Specifications

Customer Name: VALE OF GLAMORGAN

Intersection/ General Description: Windsor Rd / Penarth Rd
Vale of Glamorgan
J40521

Customer Order No:

Controller/ Serial Number:

S T S /EM Number: E69175 Issue: 3

Controller: ● New ○ Modification

Equipment Installation by:

Area Specifications/ Customer Drawings:

Slot Cutting by:

Specification Section:

Civil Works by:

Contract/Tender Ref:

Customer's Engineer: COLIN HILL

Quotation No.:

Telephone Number: 02920

Works Order No.:

Signal Company Use Only

Signal Engineer: P M ROUSE

(IF Prom Label as >) Prom Number: 16277 Prom Variant: 175

Configuration Check Value: C2 0 DC EE

Controller Options

Hardware: T800 Firmware Type and Issue: PB800 ISS 25 Other Options: KTD LO

ST900/ST750 Series Cabinet Options

Cabinet/Rack Kit Type Options ○ ○ ○ ○

Cabinet/Rack Variant Cuckoo Options ☐

ly 240 Volts 50 Hz

ent 25 Amps Dimming Voltage 160 Answer Issue 0 Date Created 30/10/06

4500 Watts

5562 Watts Low Inrush Trar ☐ Edit Issue 10

es 30 Amp minimum for controller, 15 Amp minimum for pelican/lightly loaded controller

Form Ref: 1.1

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth [illegible] Vale of Glamorgan J40521

Streams, Stages, Phases Control

Select Object to Add/Delete/Insert

Streams

○ Current Number of Streams: 5

Phases

○ Current Total Number of Phases: 27

● Number of Real Phases: 22

○ Number of Dummy Phases: 5

Stages

○ Current Number of stages (inc. ALL-RED stages): 18

Switched Signs

○ Number of Switched Signs: 0

Action

Add At Delete At

Last Modified 24/05/13, Issue 3.0.10

Form Ref: 1.2

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Facilities/Modes Enabled and Mode Priority Levels

Facilities

- ☑ Manual Control
- ☐ Manual Step On Mode
- ☑ CLF (Base Time)
- ☐ CLF (non-Base Time)
- ☑ UTC Facility
- ☐ Hurry Call Mode
- ☐ Priority
- ☐ Emergency Vehicles

- ☐ Part Time
- ☑ Master Time Clock
- ☑ RED Lamp Monitoring
- ☑ Lamp Monitoring
- ☐ Linked Fixed Time
- ☑ FT To Current MAX
- ☑ Speed Measurement
- ☐ Download To Level 3

- ☐ London IMU
- ☐ Extend All Red
- ☐ Fail To Hardware Flashing
- ☐ Ripple Change
- ☐ Non-UK

- ☑ Pelican/Puffin/Toucan Facilities
- ☐ Standalone Manual
- ☐ Holiday Clock
- ☐ Fail to Part Time
- ☑ Serial MOVA
- ☑
- ☐
- ☑ Integral OTU

10 Starting Intergreen

Mode Priority

PRIORITY	1	2	3	4	5	6	7	8	9	10	11
Part Time	○	○	○	○	○	○	○	○	○	○	○
Emergency Vehicle	○	○	○	○	○	○	○	○	○	○	○
Hurry Call	○	○	○	○	○	○	○	○	○	○	○
Selected Man Cntrl	●	○	○	○	○	○	○	○	○	○	○
UTC	○	○	●	○	○	○	○	○	○	○	○
Manual Step On	○	○	○	○	○	○	○	○	○	○	○
Selected FT or VA or CLF	○	●	○	○	○	○	○	○	○	○	○
Cableless Link (CLF)	○	○	○	●	○	○	○	○	○	○	○
Priority Vehicle	○	○	○	○	○	○	○	○	○	○	○
Vehicle Actuated	○	○	○	○	●	○	○	○	○	○	○
Fixed Time	○	○	○	○	○	●	○	○	○	○	○

Configuration Complexity

○ Low ○ Medium ○ High ● Maximum

standard 8DF
Default PROM data file

Correspondence Monitoring to inc

- ☑ Reds
- ☐ Switched Signs
- ☑ Ambers
- ☐ Ignore Reds and Ambers during Fail to Part Time

Flash Rate (ms)

400 Off 400 On

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Phases in Stages

Phases

In Stages

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A2
0																											
1	🟥	🟥								🟥				🟥									🟥				
2			🟥	🟥			🟥			🟥	🟥			🟥										🟥			
3						🟥	🟥	🟥		🟥		🟥	🟥												🟥		
4					🟥			🟥	🟥		🟥	🟥		🟥												🟥	
5						🟥	🟥	🟥		🟥		🟥	🟥														🟥
6																											
7															🟥												
8																🟥											
9																											
10																	🟥										
11																		🟥									
12																											
13																			🟥								
14																				🟥							
15																											
16																					🟥						
17																						🟥					

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Stages in Streams

Stream Data

	0	1	2	3	4	5	6	7
Phase or Stage to revert to in absence of demands/extensions	1	7	10	13	16			
Startup Stage	1	7	10	13	16			
Part-Time switch off stage								
Standalone Pedestrian	☐	☐	☐	☐	☐	☐	☐	☐

NB For a Stand-Alone Stream, the reversion must be to All Red stage or Traffic stage/phase to meet the relevant standard or specification

Stages

In Stream	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
0	🟥	🟥	🟥	🟥	🟥	🟥												
1							🟥	🟥	🟥									
2										🟥	🟥	🟥						
3													🟥	🟥	🟥			
4																🟥	🟥	🟥

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Phase Type and Conditions

Phase Type and Conditions

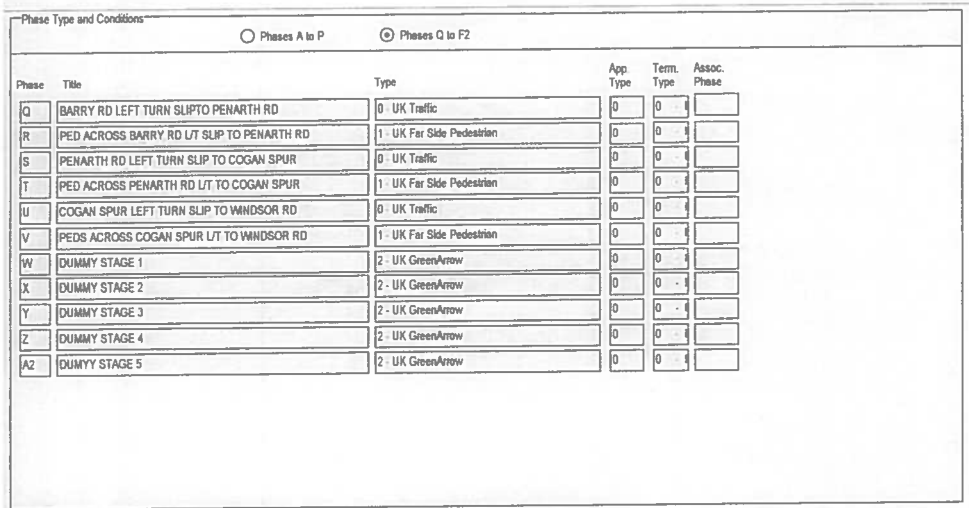
● Phases A to P ○ Phases Q to F2

Phase	Title	Type	App Type	Term. Type	Assoc Phase
A	BARRY RD	0 - UK Traffic	0	0 -	
B	COGAN SPUR	0 - UK Traffic	0	0 -	
C	BARRY RD R/T	0 - UK Traffic	0	0 -	
D	COGAN SPUR R/T	0 - UK Traffic	0	0 -	
E	PENARTH ROAD	0 - UK Traffic	0	0 -	
F	WINDSOR RD	0 - UK Traffic	0	0 -	
G	PED ACROSS BARRY RD S/W	1 - UK Far Side Pedestrian	0	0 -	
H	PED ACROSS BARRY RD N/E	1 - UK Far Side Pedestrian	0	0 -	
I	PED ACROSS PENARTH EXIT	1 - UK Far Side Pedestrian	0	0 -	
J	PED ACROSS PENARTH ENTRY	1 - UK Far Side Pedestrian	0	0 -	
K	PEDS ACROSS COGAN SPUR EAST BOUND	1 - UK Far Side Pedestrian	0	0 -	
L	PEDS ACROSS COGAN SPUR WEST BOUND	1 - UK Far Side Pedestrian	0	0 -	
M	PEDS ACROSS WINDSOR RD SOUTH BOUND	1 - UK Far Side Pedestrian	0	0 -	
N	PEDS ACROSS WINDSOR RD NORTH BOUND	1 - UK Far Side Pedestrian	0	0 -	
O	WINDSOR RD LEFT TURN SLIP TO BARRY RD (W)	0 - UK Traffic	0	0 -	
P	PEDS ACROSS L/T SLIP TO BARRY RD (W)	1 - UK Far Side Pedestrian	0	0 -	

1) App Types: 0 = Always Appears, 1 = Appears if dem'd prior to interstage, 2 = If dem'd, 3 = If dem'd before end of window time
2) Term Types: 0 = Term's at end of stage, 1 = Term's when Assoc phase gains R O W, 2 = Term's when Assoc phase loses R O W
3) The H/W Fail Flash fields are for information only on all but ST900ELV Controllers. For other controllers, physical switches or links (etc) select which aspects flash and these need to be set up manually

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Phase Type and Conditions



Phase Type and Conditions

○ Phases A to P ● Phases Q to F2

Phase	Title	Type	App. Type	Term. Type	Assoc. Phase
Q	BARRY RD LEFT TURN SLIPTO PENARTH RD	0 - UK Traffic	0	0	
R	PED ACROSS BARRY RD L/T SLIP TO PENARTH RD	1 - UK Far Side Pedestrian	0	0	
S	PENARTH RD LEFT TURN SLIP TO COGAN SPUR	0 - UK Traffic	0	0	
T	PED ACROSS PENARTH RD L/T TO COGAN SPUR	1 - UK Far Side Pedestrian	0	0	
U	COGAN SPUR LEFT TURN SLIP TO WINDSOR RD	0 - UK Traffic	0	0	
V	PEDS ACROSS COGAN SPUR L/T TO WINDSOR RD	1 - UK Far Side Pedestrian	0	0	
W	DUMMY STAGE 1	2 - UK GreenArrow	0	0	
X	DUMMY STAGE 2	2 - UK GreenArrow	0	0	
Y	DUMMY STAGE 3	2 - UK GreenArrow	0	0	
Z	DUMMY STAGE 4	2 - UK GreenArrow	0	0	
A2	DUMYY STAGE 5	2 - UK GreenArrow	0	0	

1) App Types. 0 = Always Appears, 1 = Appears if dem'd prior to interstage, 2 = If dem'd, 3 = If dem'd before end of window time
2) Term Types. 0 = Term's at end of stage, 1 = Term's when Assoc phase gains R.O.W, 2 = Term's when Assoc phase loses R.O.W.
3) The H/W Fail Flash fields are for information only on all but ST900ELV Controllers. For other controllers, physical switches or links (etc.) select which aspects flash and these need to be set up manually

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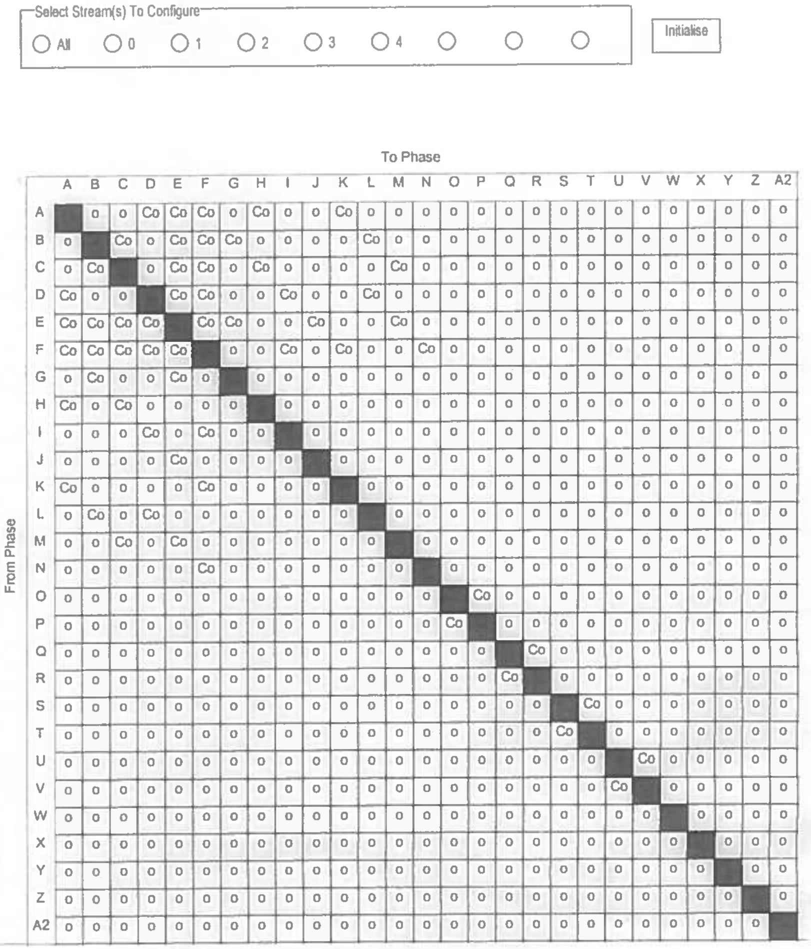
Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Opposing and Conflicting Phases



Select Stream(s) To Configure

○ All ○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ ○ ○

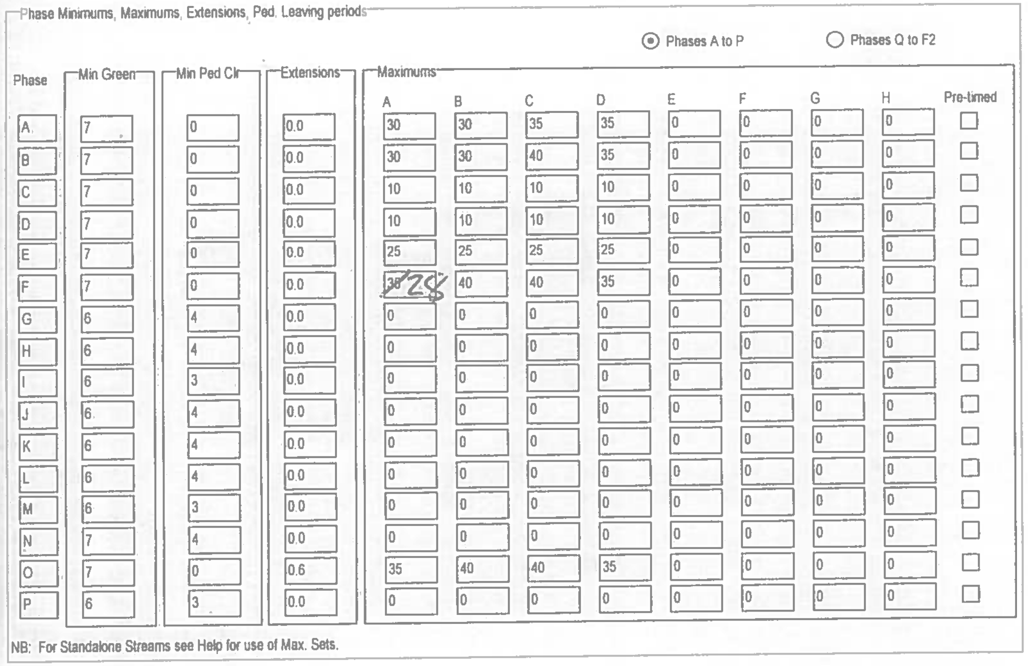
To Phase

From Phase

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A2
A	■	o	o	Co	Co	Co	o	Co	o	o	Co	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
B	o	■	Co	o	Co	Co	Co	o	o	o	o	Co	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
C	o	Co	■	o	Co	Co	o	Co	o	o	o	o	Co	o	o	o	o	o	o	o	o	o	o	o	o	o	o
D	Co	o	o	■	Co	Co	o	o	Co	o	o	Co	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
E	Co	Co	Co	Co	■	Co	Co	o	o	Co	o	o	Co	o	o	o	o	o	o	o	o	o	o	o	o	o	o
F	Co	Co	Co	Co	Co	■	o	o	Co	o	Co	o	o	Co	o	o	o	o	o	o	o	o	o	o	o	o	o
G	o	Co	o	o	Co	o	■	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
H	Co	o	Co	o	o	o	o	■	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
I	o	o	o	Co	o	Co	o	o	■	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
J	o	o	o	o	Co	o	o	o	o	■	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
K	Co	o	o	o	o	Co	o	o	o	o	■	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
L	o	Co	o	Co	o	o	o	o	o	o	o	■	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
M	o	o	Co	o	Co	o	o	o	o	o	o	o	■	o	o	o	o	o	o	o	o	o	o	o	o	o	o
N	o	o	o	o	o	Co	o	o	o	o	o	o	o	■	o	o	o	o	o	o	o	o	o	o	o	o	o
O	o	o	o	o	o	o	o	o	o	o	o	o	o	o	■	Co	o	o	o	o	o	o	o	o	o	o	o
P	o	o	o	o	o	o	o	o	o	o	o	o	o	o	Co	■	o	o	o	o	o	o	o	o	o	o	o
Q	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	■	Co	o	o	o	o	o	o	o	o	o
R	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	Co	■	o	o	o	o	o	o	o	o	o
S	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	■	Co	o	o	o	o	o	o	o
T	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	Co	■	o	o	o	o	o	o	o
U	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	■	Co	o	o	o	o	o
V	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	Co	■	o	o	o	o	o
W	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	■	o	o	o	o
X	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	■	o	o	o
Y	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	■	o	o
Z	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	■	o
A2	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	■

Works Order :
M Number : E69175
ngineer : P M ROUSE
ntersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Phase Minimums, Maximums, Extensions, Ped. Leaving periods



Phase Minimums, Maximums, Extensions, Ped. Leaving periods

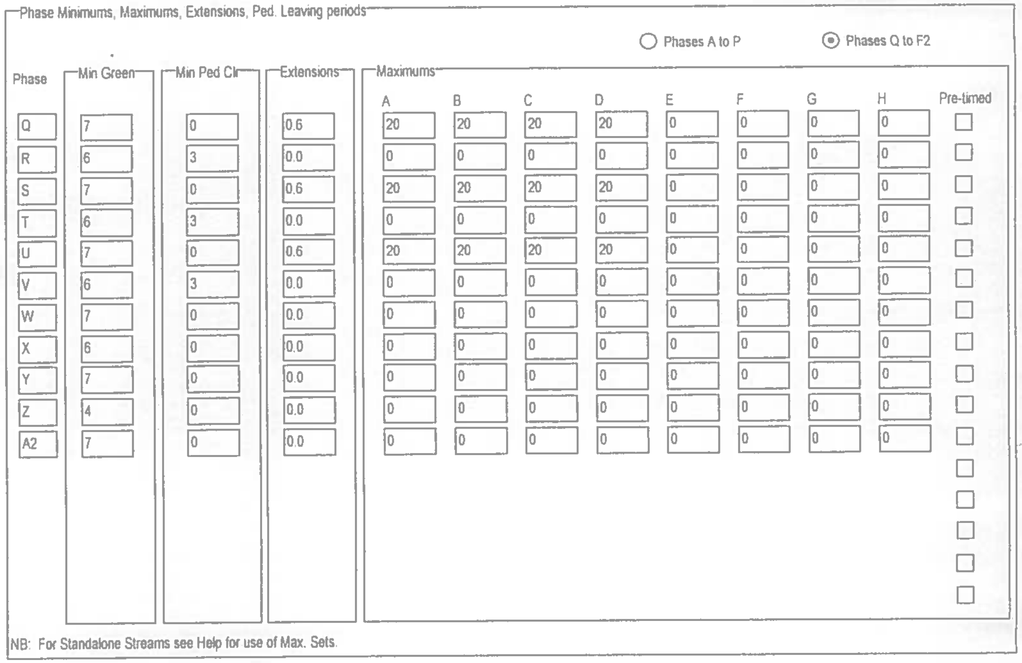
● Phases A to P ○ Phases Q to F2

Phase	Min Green	Min Ped Clr	Extensions	Maximums A	B	C	D	E	F	G	H	Pre-timed
A	7	0	0.0	30	30	35	35	0	0	0	0	☐
B	7	0	0.0	30	30	40	35	0	0	0	0	☐
C	7	0	0.0	10	10	10	10	0	0	0	0	☐
D	7	0	0.0	10	10	10	10	0	0	0	0	☐
E	7	0	0.0	25	25	25	25	0	0	0	0	☐
F	7	0	0.0	~~38~~ 28	40	40	35	0	0	0	0	☐
G	6	4	0.0	0	0	0	0	0	0	0	0	☐
H	6	4	0.0	0	0	0	0	0	0	0	0	☐
I	6	3	0.0	0	0	0	0	0	0	0	0	☐
J	6	4	0.0	0	0	0	0	0	0	0	0	☐
K	6	4	0.0	0	0	0	0	0	0	0	0	☐
L	6	4	0.0	0	0	0	0	0	0	0	0	☐
M	6	3	0.0	0	0	0	0	0	0	0	0	☐
N	7	4	0.0	0	0	0	0	0	0	0	0	☐
O	7	0	0.6	35	40	40	35	0	0	0	0	☐
P	6	3	0.0	0	0	0	0	0	0	0	0	☐

NB: For Standalone Streams see Help for use of Max. Sets.

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Phase Minimums, Maximums, Extensions, Ped. Leaving periods



Phase Minimums, Maximums, Extensions, Ped. Leaving periods

○ Phases A to P ● Phases Q to F2

Phase	Min Green	Min Ped Clr	Extensions	Maximums A	B	C	D	E	F	G	H	Pre-timed
Q	7	0	0.6	20	20	20	20	0	0	0	0	☐
R	6	3	0.0	0	0	0	0	0	0	0	0	☐
S	7	0	0.6	20	20	20	20	0	0	0	0	☐
T	6	3	0.0	0	0	0	0	0	0	0	0	☐
U	7	0	0.6	20	20	20	20	0	0	0	0	☐
V	6	3	0.0	0	0	0	0	0	0	0	0	☐
W	7	0	0.0	0	0	0	0	0	0	0	0	☐
X	6	0	0.0	0	0	0	0	0	0	0	0	☐
Y	7	0	0.0	0	0	0	0	0	0	0	0	☐
Z	4	0	0.0	0	0	0	0	0	0	0	0	☐
A2	7	0	0.0	0	0	0	0	0	0	0	0	☐
												☐
												☐
												☐
												☐
												☐

NB: For Standalone Streams see Help for use of Max. Sets.

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Phase Intergreen Times

Select Stream(s) To Configure

○ All ○ 0 ○ 1 ○ 2 ○ 3 ○ 4 ○ ○ ○

NB: On a Stand Alone Pelican/Toucan/Puffin Stream the Intergreens between Pedestrian and Traffic Phases are controlled by the timings (PBT, PIT, CMX, CDY, CRD and PAR), therefore 0 should be entered for the appropriate intergreen times in grid below

To Phase

From Phase

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A2
A	■			7	8	7		7			11																
B		■	7		7	9	11					7															
C		5	■		5	5		5					9														
D	5			■	5	5			10			5															
E	5	6	6	6	■	7	10			6			10														
F	6	5	5	5	7	■			10		9			5													
G		5			5		■																				
H	10		10					■																			
I				5		5			■																		
J					8					■																	
K	5					5					■																
L		10		10								■															
M			5		5								■														
N						11								■													
O															■	5											
P															7	■											
Q																	■	5									
R																	6	■									
S																			■	5							
T																			6	■							
U																					■	5					
V																					6	■					
W																							■	11	11	11	5
X																							5	■	11	10	5
Y																							10	10	■	10	
Z																							10	10	11	■	5
A2																							5	5		5	■

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Handset Intergreen Limits

HIGH 199

Copy Intergreen Values

To Phase

From Phase

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A2
A	■			5	5	5		5			5																
B		■	5		5	5	5					5															
C		5	■		5	5		5					5														
D	5			■	5	5			5			5															
E	5	5	5	5	■	5	5			5			5														
F	5	5	5	5	5	■			5		5			5													
G		5			5		■																				
H	5		5					■																			
I				5		5			■																		
J					5					■																	
K	5					5					■																
L		5		5								■															
M			5		5								■														
N						5								■													
O															■	5											
P															5	■											
Q																	■	5									
R																	5	■									
S																			■	5							
T																			5	■							
U																					■	5					
V																					5	■					
W																							■	5	5	5	5
X																							5	■	5	5	5
Y																							5	5	■	5	
Z																							5	5	5	■	5
A2																							5	5		5	■

Works Order :
EM Number : E69175
Engineer : P M ROUSE
ntersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Phase Timing Handset Ranges

Phase Timing Handset Ranges

Initialise Min Green Limits

Phase	Min. Green Min.	Min. Green Max.	Phase	Min. Green Min.	Min. Green Max.
A	3	255	Q	3	255
B	3	255	R	3	255
C	3	255	S	3	255
D	3	255	T	3	255
E	3	255	U	3	255
F	3	255	V	3	255
G	3	255	W	3	255
H	3	255	X	3	255
I	3	255	Y	3	255
J	3	255	Z	3	255
K	3	255	A2	3	255
L	3	255	B2		
M	3	255	C2		
N	3	255	D2		
O	3	255	E2		
P	3	255	F2		

	Min.	Max.
Max. Green	0	255
Vehicle Extension	0.0	10.0
Phase Delay	0	30
Starting I/G	4	12
Min Ped Clr (PBT)	0	12
Traffic Phase Leaving	3.0	3.0
Traffic Phase Red/Amber	2	2

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Phase - VA Demand and Extend Definitions

VA Demand and Extend Definitions

● Phases A to P ○ Phases Q to F2

Demands

For Unlatched demands preceed the name with a #
Conditioning MUST be used to specify unlatched demands.

Phase	Demands				Extensions			
A	AX2	ASL3			AX2	ASL3		
B	BX8	BSL9			BX8	BSL9		
C	CX5	CSL6			CX5	CSL6		
D	DOUT10	DSL11			DOUT10	DSL11		
E	EX13	ESL14	EX16		EX13	ESL14	EX16	
F	FX18	FSL19	FX21	FSL22	FX18	FSL19	FX21	FSL22
G	PBG							
H	PBH							
I	PBI							
J	PBJ							
K	PBK							
L	PBL							
M	PBM							
N	PBN							
O	MVDO25				MVDO25			
P	PBP							

Works Order :
EM Number : E69175
Engineer : P M ROUSE
ntersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Phase - VA Demand and Extend Definitions

VA Demand and Extend Definitions

○ Phases A to P ● Phases Q to F2

For Unlatched demands preceed the name with a #
Conditioning MUST be used to specify unlatched demands.

Phase	Demands				Extensions			
Q	MVDQ3				MVDQ3			
R	PBR							
S	MVDS10				MVDS10			
T	PBT							
U	MVDU18				MVDU18			
V	PBV							
W								
X								
Y								
Z								
A2								

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Form Ref: 2.4 (2)

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Phase Internal/Revertive Demands

Phase Internal/Revertive Demands

Start-up Vehicle Responsive Demands

A ☑ B ☑ C ☑ D ☑ E ☑ F ☑ G ☑ H ☑ I ☑ J ☑ K ☑ L ☑ M ☑ N ☑ O ☑ P ☑
Q ☑ R ☑ S ☑ T ☑ U ☑ V ☑ W ☐ X ☐ Y ☐ Z ☐ A2 ☐ ☐ ☐ ☐ ☐ ☐

Demands Inserted When Leaving Manual and Fixed Time Modes

A ☑ B ☑ C ☑ D ☑ E ☑ F ☑ G ☑ H ☑ I ☑ J ☑ K ☑ L ☑ M ☑ N ☑ O ☑ P ☑
Q ☑ R ☑ S ☑ T ☑ U ☑ V ☑ W ☐ X ☐ Y ☐ Z ☐ A2 ☐ ☐ ☐ ☐ ☐ ☐

Unlatched Demands that Start Max Timers

A ☑ B ☑ C ☑ D ☑ E ☑ F ☑ G ☑ H ☑ I ☑ J ☑ K ☑ L ☑ M ☑ N ☑ O ☑ P ☑
Q ☑ R ☑ S ☑ T ☑ U ☑ V ☑ W ☑ X ☑ Y ☑ Z ☑ A2 ☑ ☐ ☐ ☐ ☐ ☐

Revertive Phase Demands

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
A	B	C	D	E	F									O	
Q	R	S	T	U	V	W	X	Y	Z	A2	B2	C2	D2	E2	F2
P		S		U											

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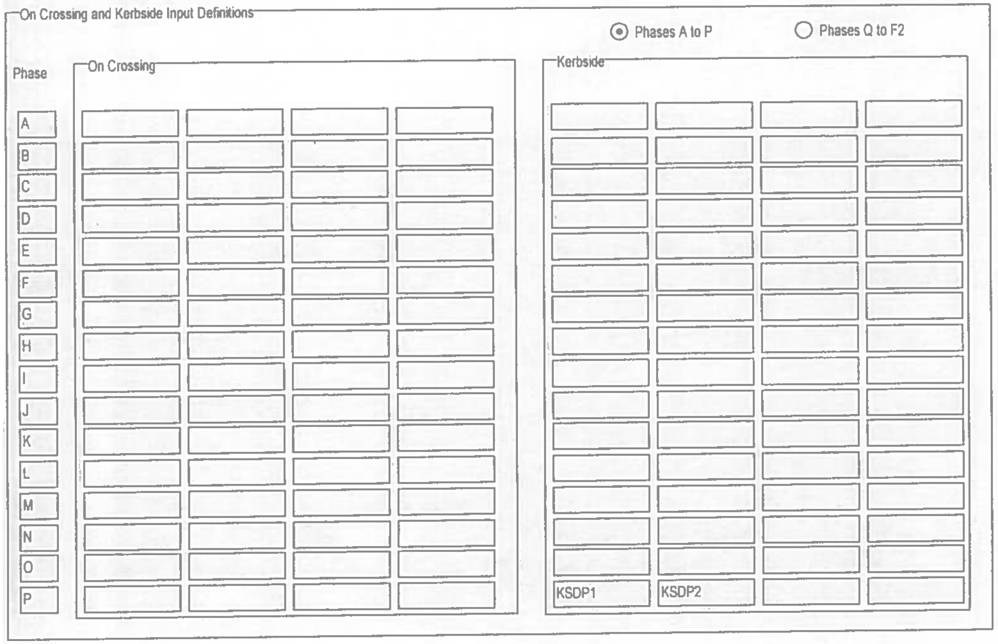
Form Ref: 2.5

Vorks Order :
M Number : E69175
ngineer : P M ROUSE
ntersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Phase - OnCrossing and Kerbside Detector Definitions



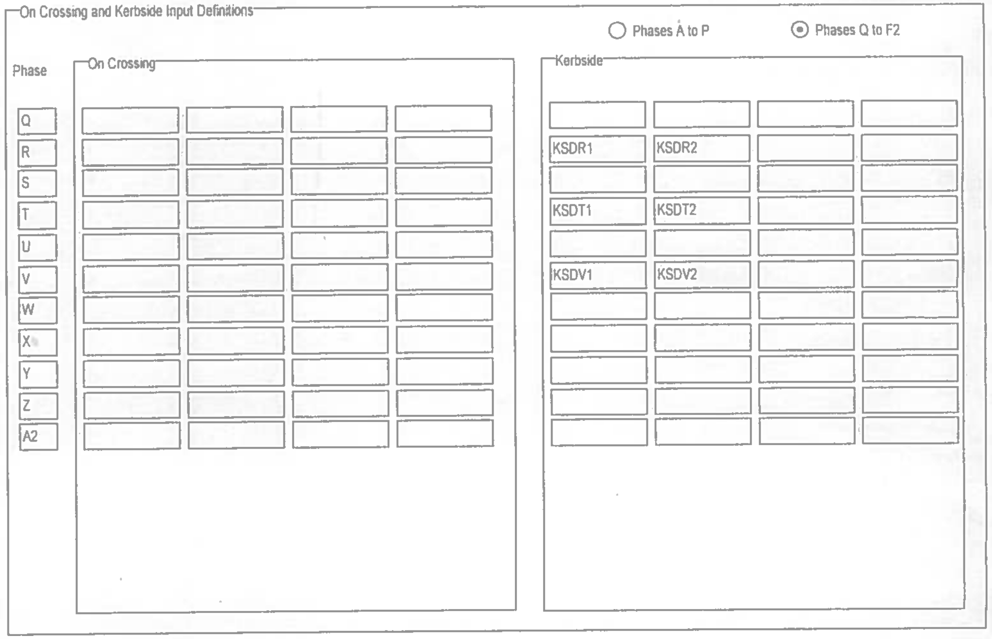
On Crossing and Kerbside Input Definitions

● Phases A to P ○ Phases Q to F2

Phase	On Crossing				Kerbside			
A								
B								
C								
D								
E								
F								
G								
H								
I								
J								
K								
L								
M								
N								
O								
P					KSDP1	KSDP2		

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Phase - OnCrossing and Kerbside Detector Definitions



On Crossing and Kerbside Input Definitions

○ Phases A to P ● Phases Q to F2

Phase	On Crossing				Kerbside			
Q								
R					KSDR1	KSDR2		
S								
T					KSDT1	KSDT2		
U								
V					KSDV1	KSDV2		
W								
X								
Y								
Z								
A2								

orks Order :
M Number : E69175
ngineer : P M ROUSE
tersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Stream - Pelican/Puffin/Toucan Times

Stream - Pelican/Puffin/Toucan Times

Pedestrian Enable VA Mode (PEV)

Streams

0	1	2	3	4	5	6	7

Pedestrian All Red Times (Vehicle to Pedestrian)

Streams	0	1	2	3	4	5	6	7
(PARn 0) VA Gap Change								
(PAR n 1) VA Max Change								
(PAR n 2) FVP Change								
(PAR n 3) UTC Change								
(PAR n 4) Local Link Change								

Handset Range Limits

Min	Max
0	0

Pelican Intergreen times

	Min	Max
(PIT n 0) Veh Red/Ped Flash Green	0	0
(PIT n 1) Veh Flash Amber/Ped Flash Green	0	0
(PIT n 2) Veh Flash Amber/Ped red	0	0
(PIT n 3) Veh Flash Amber/Ped Red Quiescent	0	0

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Form Ref: 2.6.2

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Phase - Pelican Puffin and Toucan Times

Phase - Pelican Puffin and Toucan Times

● Phases A to P ○ Phases Q to F2

Phase	PDD Ped Dem Del:	PDX Demand Hold	CMX Ped Clearance Maximum	CDY 0 Clearance Delay Gap Chng	CDY 1 Clearance Delay Max Chng	CRD Clearance Minimum Red	
A	0	0.0	0	0	0	0	
B	0	0.0	0	0	0	0	☐
C	0	0.0	0	0	0	0	
D	0	0.0	0	0	0	0	☐
E	0	0.0	0	0	0	0	
F	0	0.0	0	0	0	0	
G	0	0.0	0	0	0	0	
H	0	0.0	0	0	0	0	
I	0	0.0	0	0	0	0	
J	0	0.0	0	0	0	0	
K	0	0.0	0	0	0	0	
L	0	0.0	0	0	0	0	
M	0	0.0	0	0	0	0	
N	0	0.0	0	0	0	0	
O	0	0.0	0	0	0	0	
P	0	2.0	0	0	0	0	

Handset Range Limits

	MIN	MAX
Pedestrian Demand delay PDD	0	0
Pedestrian Demand Hold PDX	0.0	6.0
Pedestrian Clearance CMX	0	0
Pedestrian Clearance Delays CDY 0 and CDY1	0	0
Pedestrian Clearance Delay (Red) CRD	0	0

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Form Ref: 2.6.3 (1)

orks Order :
M Number : E69175
ngineer : P M ROUSE
tersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Phase - Pelican Puffin and Toucan Times

Phase - Pelican Puffin and Toucan Times

○ Phases A to P ● Phases Q to F2

Phase	PDD Ped Dem Del	PDX Demand Hold	CMX Ped Clearance Maximum	CDY 0 Clearance Delay Gap Chng	CDY 1 Clearance Delay Max Chng	CRD Clearance Minimum Red	
Q	0	0.0	0	0	0	0	
R	0	2.0	0	0	0	0	☐
S	0	0.0	0	0	0	0	
T	0	2.0	0	0	0	0	☐
U	0	0.0	0	0	0	0	
V	0	2.0	0	0	0	0	
W	0	0.0	0	0	0	0	
X	0	0.0	0	0	0	0	
Y	0	0.0	0	0	0	0	
Z	0	0.0	0	0	0	0	
A2	0	0.0	0	0	0	0	

Handset Range Limits

	MIN	MAX
Pedestrian Demand delay PDD	0	0
Pedestrian Demand Hold PDX	0.0	6.0
Pedestrian Clearance CMX	0	0
Pedestrian Clearance Delays CDY 0 and CDY1	0	0
Pedestrian Clearance Delay (Red) CRD	0	0

Form Ref: 2.6.3 (2)

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

IO and Link - Pelican/Puffin/Toucan Times

I/O and Link - Pelican/Puffin/Toucan Times

Streams	0	1	2	3	4	5	6	7
Computer Control								
PV								
Window Time UIE								
Local Link								
PV1								
Link Delay Time LKD								
Link Window Time LKW								
Link Override Time LKO								

Kerbside Mat Test Output

Form Ref: 2.6.4

orks Order :
Number : E69175
gineer : P M ROUSE
tersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Stage - Prohibited, Alternative, Ignored Moves

Stage - Prohibited, Alternative, Ignored Moves

Sets
- ● 1
- ○ 2
- ○ 3
- ○ 4

Modes	Restrictions ApplyTo	No Restrictions
Urban Traffic Control	●	○
Cableless Linking	●	○
Vehicle Actuated	●	○
	○	○
Fixed Time	●	○

Modes	Restrictions ApplyTo	No Restrictions
Manual	○	●
	○	○
	○	○
	○	○

To Stage

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
0	■																	
1		■																
2			■															
3				■		X												
4					■													
5				X		■												
6							■											
7								■										
8									■									
9										■								
10											■							
11												■						
12													■					
13														■				
14															■			
15																■		
16																	■	
17																		■

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Stage Internal Demands / Ped. Window Times

Stage Internal Demands / Ped. Window Times

Start-up Vehicle Responsive Demands

0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐	11 ☐	12 ☐	13 ☐	14 ☐	15 ☐
16 ☐	17 ☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Demands Inserted When Leaving Manual and Fixed Time Modes

0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐	11 ☐	12 ☐	13 ☐	14 ☐	15 ☐
16 ☐	17 ☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Unlatched Demands that Start Maximum Timers

0 ☑	1 ☑	2 ☑	3 ☑	4 ☑	5 ☑	6 ☑	7 ☑	8 ☑	9 ☑	10 ☑	11 ☑	12 ☑	13 ☑	14 ☑	15 ☑
16 ☑	17 ☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Window Times

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0	0														

Vorks Order :
EM Number : E69175
ngineer : P M ROUSE
ntersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Phase delays

Phase delays

● Phase Delays 0-29 ○ Phase Delays 30-59 ○ Phase Delays 60-89 ○ Phase Delays 90-119

No.	Delay Phase	On Change from Stage	To Stage	By (X) Seconds	No.	Delay Phase	On Change from Stage	To Stage	By (X) Seconds
0	F	3	1	2	15				0
1	F	3	2	1	16				0
2	E	4	1	2	17				0
3	C	2	3	2	18				0
4	D	2	3	2	19				0
5	F	5	1	2	20				0
6	F	5	2	1	21				0
7				0	22				0
8				0	23				0
9				0	24				0
10				0	25				0
11				0	26				0
12				0	27				0
13				0	28				0
14				0	29				0

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Fixed Time

Fixed Time

Stage Moves & Times (Not Fixed Time to Current Max)

Current Stage	0	1	2	3	4	5	6	7
Next Stage								
Time								
Current Stage	8	9	10	11	12	13	14	15
Next Stage								
Time								
Current Stage	16	17	18	19	20	21	22	23
Next Stage								
Time								
Current Stage	24	25	26	27	28	29	30	31
Next Stage								
Time								

Phases Demanded and Extended under Fixed Time to Current Max

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Demand	☑	☑	☑	☑	☑	☑	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐
Extend	☑	☑	☑	☑	☑	☑	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐
	Q	R	S	T	U	V	W	X	Y	Z	A2	B2	C2	D2	E2	F2
Demand	☑	☐	☑	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Extend	☑	☐	☑	☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

/orks Order :
M Number : E69175
ngineer : P M ROUSE
tersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

CLF - Plan(s)

CLF - Plan(s)

Plan No: 1

Copy from

Plan Specifics

Influence Set: 1

Copy from

Entry Point (secs): 255

Exit Point (secs): 255

Cycle Time (secs): 115

Group Offset Handset Range

Min: 0

Max.: 255

Group/Influence

Group No.	Group Offset	Group Influence	Related Stage	Group No.	Group Offset	Group Influence	Related Stage
0	0	1	1	16			
1	45	1	2	17			
2	63	1	3	18			
3	95	1	4	19			
4				20			
5				21			
6				22			
7				23			
8				24			
9				25			
10				26			
11				27			
12				28			
13				29			
14				30			
15				31			

CLF Influences
0 = Go To VA
1 = Immediate move
2 = Demand dependen
3 = Hold
4 = Prevent Except To
5 = Add Immediate move
6 = Add Demand Dependent Move
7 = Ignore
8 = Stand Alone Inhibited
9 = Stand Alone Ped Allowed

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Form Ref: 4.2.1 (1)

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

CLF - Plan(s)

CLF - Plan(s)

Plan No: 2

Copy from

Plan Specifics

Influence Set: 2

Copy from

Entry Point (secs): 255

Exit Point (secs): 255

Cycle Time (secs): 112

Group Offset Handset Range

Min.: 0

Max.: 255

Group/Influence

Group No.	Group Offset	Group Influence	Related Stage	Group No.	Group Offset	Group Influence	Related Stage
0	0	1	1	16			
1	46	1	2	17			
2	71	1	3	18			
3	88	1	4	19			
4				20			
5				21			
6				22			
7				23			
8				24			
9				25			
10				26			
11				27			
12				28			
13				29			
14				30			
15				31			

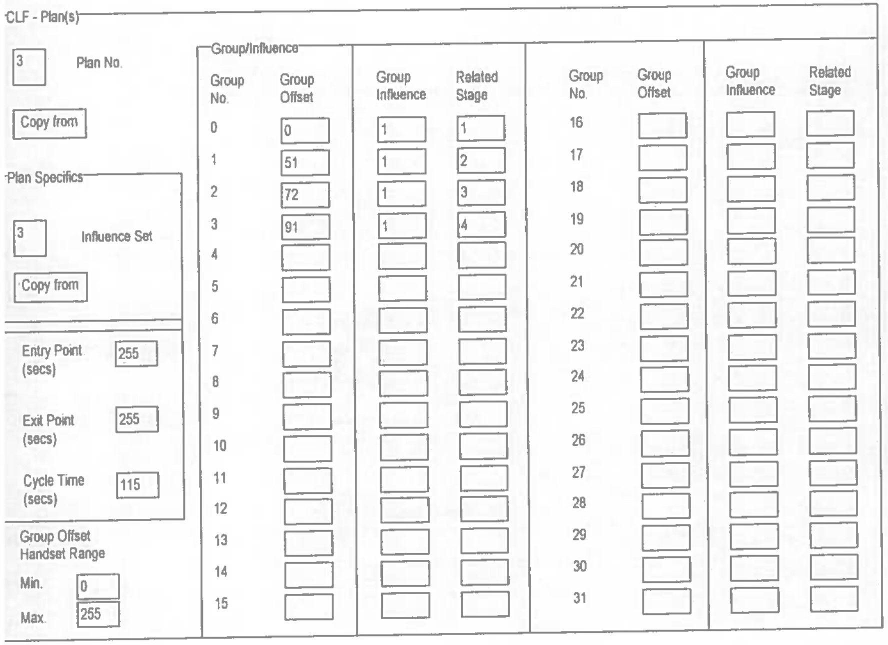
CLF Influences
0 = Go To VA
1 = Immediate move
2 = Demand dependen
3 = Hold
4 = Prevent Except To
5 = Add Immediate move
6 = Add Demand Dependent Move
7 = Ignore
8 = Stand Alone Inhibited
9 = Stand Alone Ped Allowed

Last Modified 24/05/13, Issue 3.0.10

Form Ref: 4.2.1 (2)

rks Order :
l Number : E69175
gineer : P M ROUSE
ersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

CLF - Plan(s)



CLF - Plan(s)

3 Plan No.

Copy from

Plan Specifics

3 Influence Set

Copy from

Entry Point (secs) 255

Exit Point (secs) 255

Cycle Time (secs) 115

Group Offset Handset Range

Min. 0

Max. 255

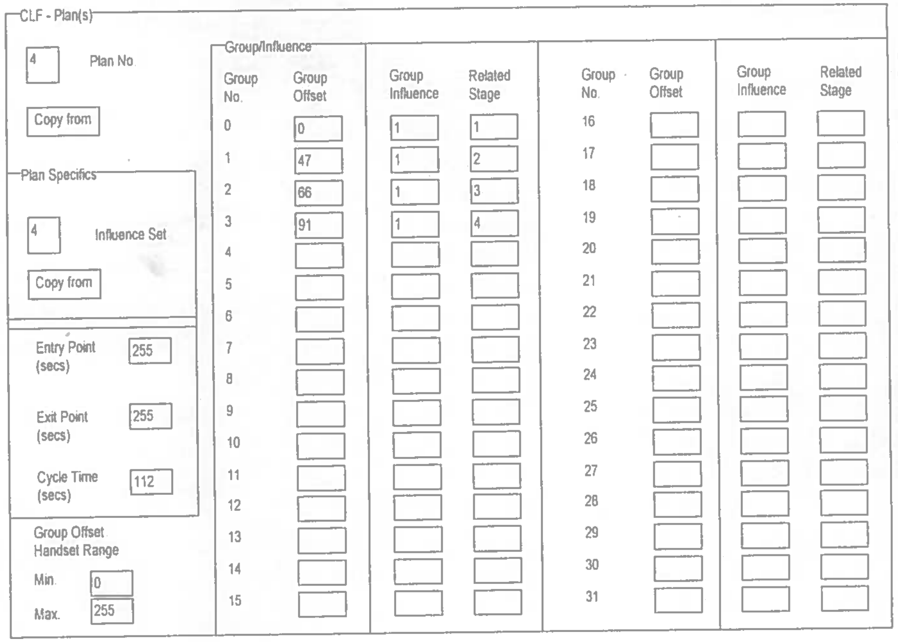
Group/Influence

Group No.	Group Offset	Group Influence	Related Stage	Group No.	Group Offset	Group Influence	Related Stage
0	0	1	1	16			
1	51	1	2	17			
2	72	1	3	18			
3	91	1	4	19			
4				20			
5				21			
6				22			
7				23			
8				24			
9				25			
10				26			
11				27			
12				28			
13				29			
14				30			
15				31			

CLF Influences
0 = Go To VA
1 = Immediate move
2 = Demand dependen
3 = Hold
4 = Prevent Except To
5 = Add Immediate move
6 = Add Demand Dependent Move
7 = Ignore
8 = Stand Alone Inhibited
9 = Stand Alone Ped Allowed

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

CLF - Plan(s)



CLF - Plan(s)

4 Plan No

Copy from

Plan Specifics

4 Influence Set

Copy from

Entry Point (secs) 255

Exit Point (secs) 255

Cycle Time (secs) 112

Group Offset Handset Range

Min. 0

Max. 255

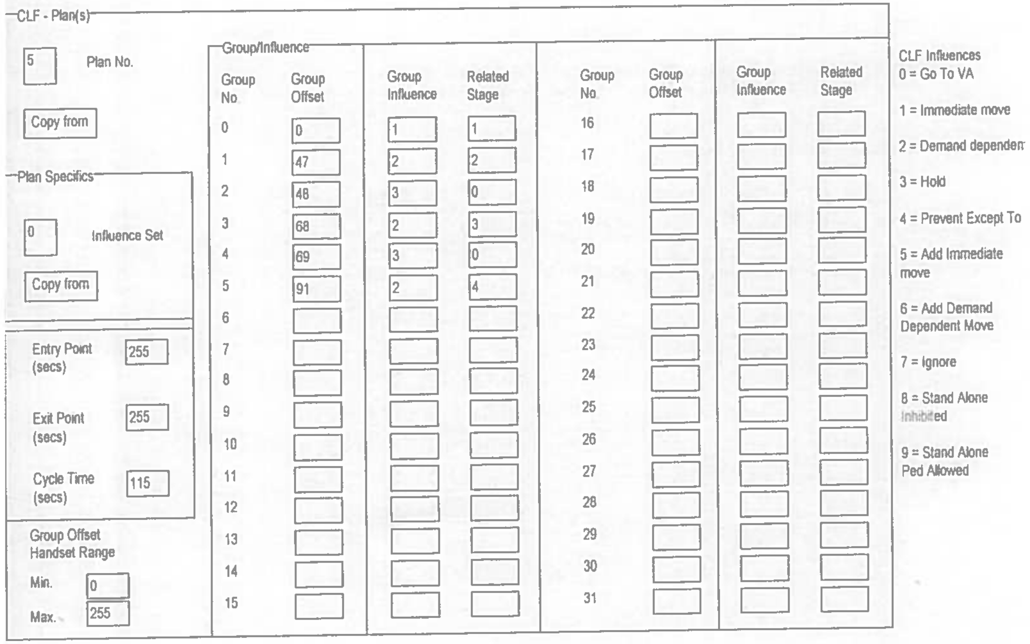
Group/Influence

Group No.	Group Offset	Group Influence	Related Stage	Group No.	Group Offset	Group Influence	Related Stage
0	0	1	1	16			
1	47	1	2	17			
2	66	1	3	18			
3	91	1	4	19			
4				20			
5				21			
6				22			
7				23			
8				24			
9				25			
10				26			
11				27			
12				28			
13				29			
14				30			
15				31			

CLF Influences
0 = Go To VA
1 = Immediate move
2 = Demand dependen
3 = Hold
4 = Prevent Except To
5 = Add Immediate move
6 = Add Demand Dependent Move
7 = Ignore
8 = Stand Alone Inhibited
9 = Stand Alone Ped Allowed

orks Order :
M Number : E69175
ngineer : P M ROUSE
itersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

CLF - Plan(s)



CLF - Plan(s)

Plan No.: 5

Copy from

Plan Specifics

Influence Set: 0

Copy from

Entry Point (secs): 255

Exit Point (secs): 255

Cycle Time (secs): 115

Group Offset Handset Range

Min.: 0

Max.: 255

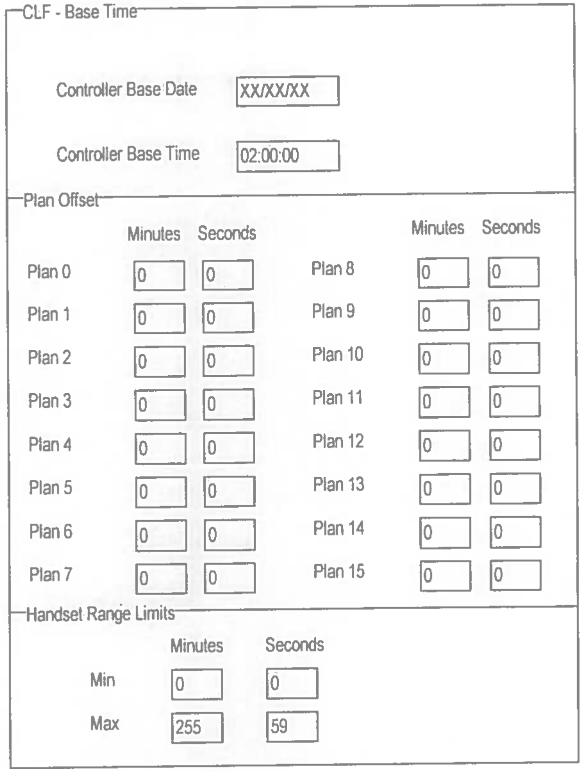
Group/Influence

Group No.	Group Offset	Group Influence	Related Stage	Group No.	Group Offset	Group Influence	Related Stage
0	0	1	1	16			
1	47	2	2	17			
2	48	3	0	18			
3	68	2	3	19			
4	69	3	0	20			
5	91	2	4	21			
6				22			
7				23			
8				24			
9				25			
10				26			
11				27			
12				28			
13				29			
14				30			
15				31			

CLF Influences
0 = Go To VA
1 = Immediate move
2 = Demand dependen
3 = Hold
4 = Prevent Except To
5 = Add Immediate move
6 = Add Demand Dependent Move
7 = Ignore
8 = Stand Alone Inhibited
9 = Stand Alone Ped Allowed

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

CLF - Base Time



CLF - Base Time

Controller Base Date: XX/XX/XX

Controller Base Time: 02:00:00

Plan Offset

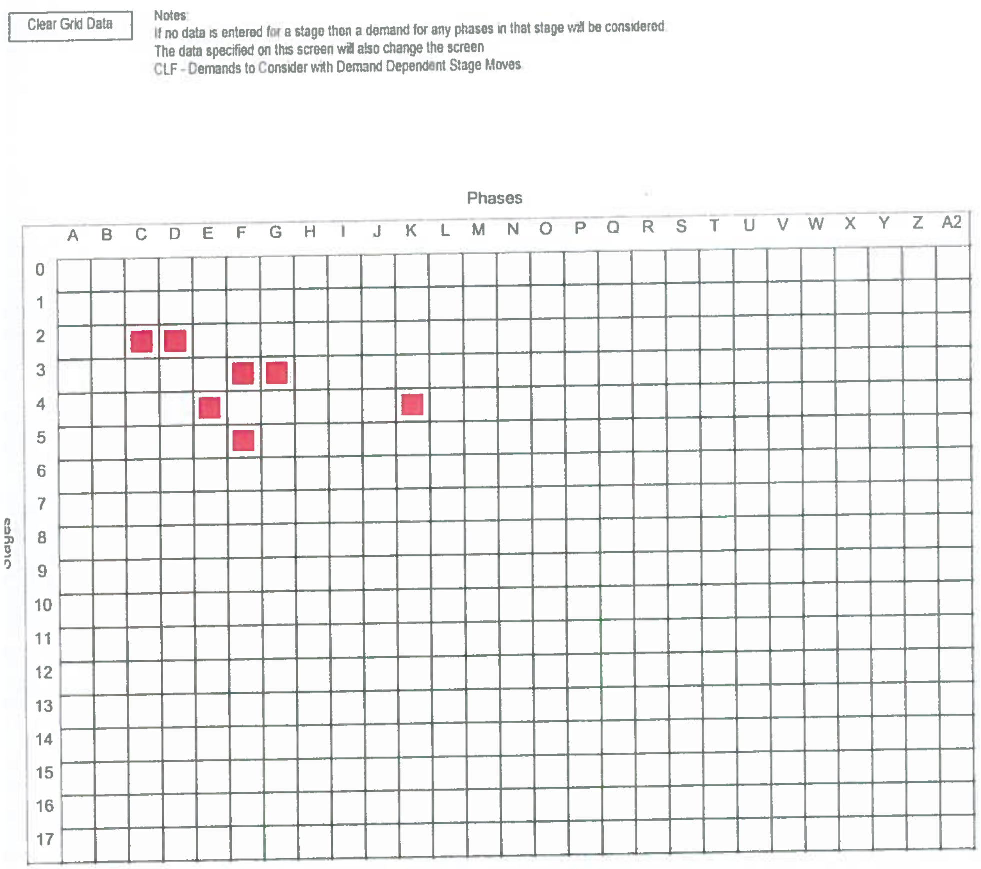
	Minutes	Seconds		Minutes	Seconds
Plan 0	0	0	Plan 8	0	0
Plan 1	0	0	Plan 9	0	0
Plan 2	0	0	Plan 10	0	0
Plan 3	0	0	Plan 11	0	0
Plan 4	0	0	Plan 12	0	0
Plan 5	0	0	Plan 13	0	0
Plan 6	0	0	Plan 14	0	0
Plan 7	0	0	Plan 15	0	0

Handset Range Limits

	Minutes	Seconds
Min	0	0
Max	255	59

orks Order :
/ Number : E69175
igineer : P M ROUSE
ersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

CLF - Demand Dependent Moves



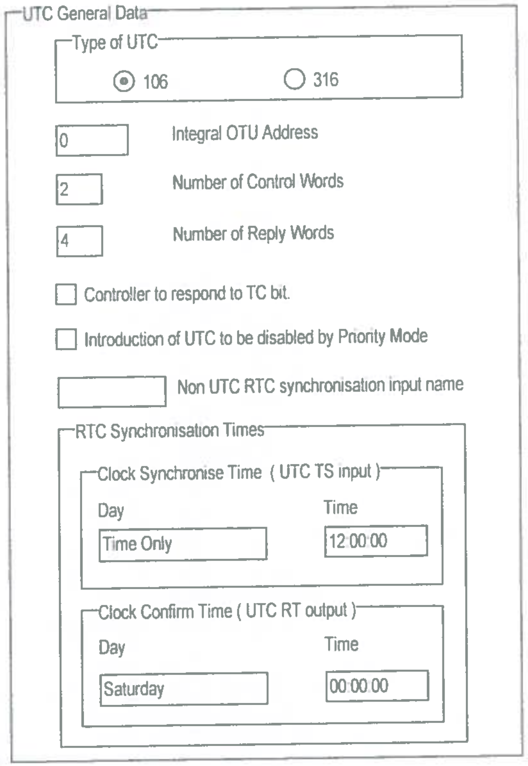
Notes:
If no data is entered for a stage then a demand for any phases in that stage will be considered
The data specified on this screen will also change the screen
CLF - Demands to Consider with Demand Dependent Stage Moves

Phases

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A2
0																											
1																											
2			🟥	🟥																							
3						🟥	🟥																				
4					🟥						🟥																
5						🟥																					
6																											
7																											
8																											
9																											
10																											
11																											
12																											
13																											
14																											
15																											
16																											
17																											

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

UTC General Data



UTC General Data

Type of UTC
● 106 ○ 316

0 Integral OTU Address
2 Number of Control Words
4 Number of Reply Words

☐ Controller to respond to TC bit.
☐ Introduction of UTC to be disabled by Priority Mode

Non UTC RTC synchronisation input name

RTC Synchronisation Times

Clock Synchronise Time (UTC TS input)
Day: Time Only
Time: 12:00:00

Clock Confirm Time (UTC RT output)
Day: Saturday
Time: 00:00:00

orks Order :
/ Number : E69175
gineer : P M ROUSE
ersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

UTC Control and Reply Data Format

UTC Control and Reply Data Format

Control Words

	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8
Word 1	F1	F2	F3	F4	F5	DX	D2	D3
Word 2	D4	D5	FM	TS	SO			
Word 3								
Word 4								

Reply Words

	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8
Word 1	G1	G2	G3	G4	G5	DF	SD2	SD3
Word 2	SD4	SD5	FC	CC	LE	LF1	LF2	LF3
Word 3	DM	DF1						
Word 4	SCOOTC				SCOOTD			
Word 5								
Word 6								
Word 7								
Word 8								
Word 9								
Word 10								
Word 11								
Word 12								
Word 13								
Word 14								

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

UTC Phase Demand and Extend Definitions

UTC Demand and Extend Definitions

● Phases A to P ○ Phases Q to F2

Demands

For Unlatched demands preceed the name with a #.
Conditioning MUST be used to specify unlatched demands.

Extensions

Phase	Demands				Extensions			
A	DX				DX			
B	DX				DX			
C	DX	D2			DX	D2		
D	DX	D2			DX	D2		
E	DX	D4			DX	D4		
F	DX	D3	#D5		DX	D3	D5	
G	DX	D3						
H	DX							
I	DX	D4						
J	DX							
K	DX	D4						
L	DX							
M	DX							
N	DX							
O								
P								

orks Order :
I Number : E69175
gineer : P M ROUSE
ersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

UTC Phase Demand and Extend Definitions

UTC Demand and Extend Definitions

○ Phases A to P ● Phases Q to F2

Demands

For Unlatched demands preceed the name with a #.
Conditioning MUST be used to specify unlatched demands.

hase	Demands				Extensions			
Q								
R								
S								
T								
U								
V								
W								
X								
Y								
Z								
A2								

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

UTC Stage and Modes Data Definitions

UTC Stage and Modes Data Definitions

Stage	Force Bit	Green Confirm Bit	Demand Confirm Bit	Stage	Force Bit	Green Confirm Bit	Demand Confirm Bit
0				16			
1	*SCRT1	G1		17			
2	*SCRT2	G2	SD2	18			
3	*SCRT3	G3	SD3	19			
4	*SCRT4	G4	SD4	20			
5	*SCRT5	G5	SD5	21			
6				22			
7				23			
8				24			
9				25			
10				26			
11				27			
12				28			
13				29			
14				30			
15				31			

Mode Data Definitions

Manual Mode Operative:
☑ G1/G2 ☐ RR ☐

Manual Mode Selected:
☑ G1/G2 ☐ RR ☐

No Lamp Power, or Lamps Off due to RLM o

☑ G1/G2 ☐ ☐

Detector Fault:
☐ ☐ ☐ DF

Normal NOT selected on the Manual Panel:
☑ G1/G2 ☐ RR ☐

RR Button Selected:
☐ G1/G2 ☐ RR ☐

If UTC Reply Confirms are required for a Controller Fault (CF) OR for separate MC and RR replies, Conditioning must be used.

'orks Order :
M Number : E69175
ngineer : P M ROUSE
tersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

UTC Demand Dependent Forces

Clear Grid Data

Notes:
If no data is entered for a stage then a demand for any phases in that stage will be considered
The data specified on this screen will also change the screen
CLF - Demands to Consider with Demand Dependent Stage Moves

Phases

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A2
0																											
1																											
2			🟥	🟥																							
3						🟥	🟥																				
4					🟥						🟥																
5						🟥																					
6																											
7																											
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13																											
14																											
15																											
16																											
17																											

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Serial MOVA

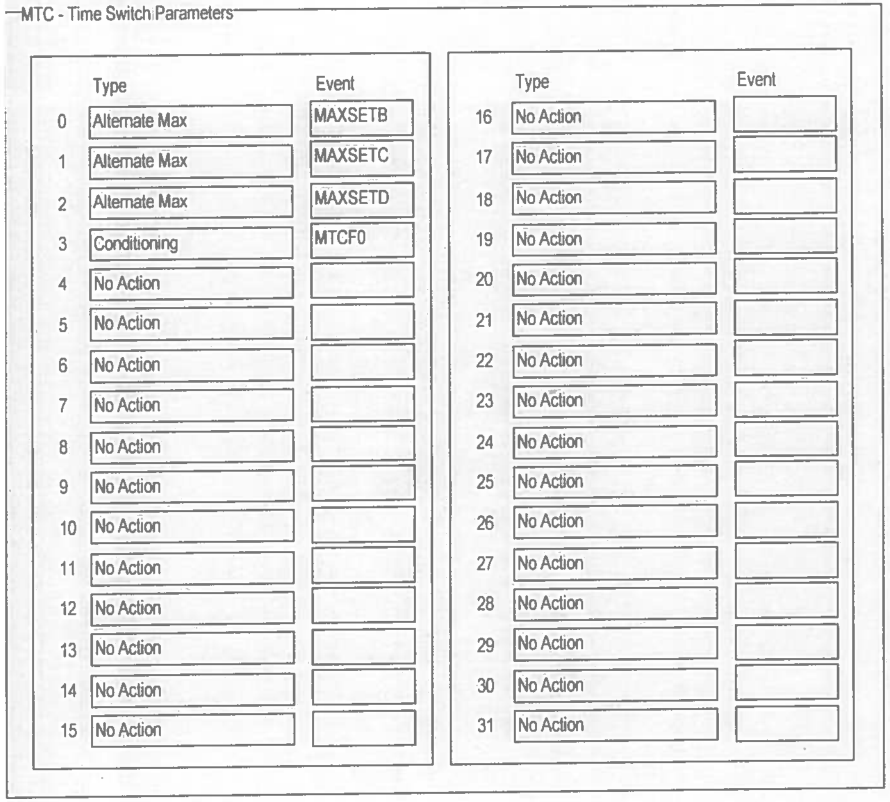
Serial MOVA

1	AIN1	2	AX2	3	ASL3	4	CIN4	5	CX5	6	CSL6	7	BIN7	8	BX8
9	BSL9	10	DOUT10	11	DSL11	12	EIN12	13	EX13	14	ESL14	15	EIN15	16	EX16
17	FIN17	18	FX18	19	FSL19	20		21	FX21	22	FSL22	23	OOUT23	24	
25		26		27		28		29		30		31		32	
33		34		35		36		37		38		39		40	
41		42		43		44		45		46		47		48	
49		50		51		52		53		54		55		56	
57		58		59		60		61		62		63		64	

Note - only 32 detectors available on MOVA 4 0

orks Order :
M Number : E69175
ngineer : P M ROUSE
tersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

MTC - Time Switch Parameters

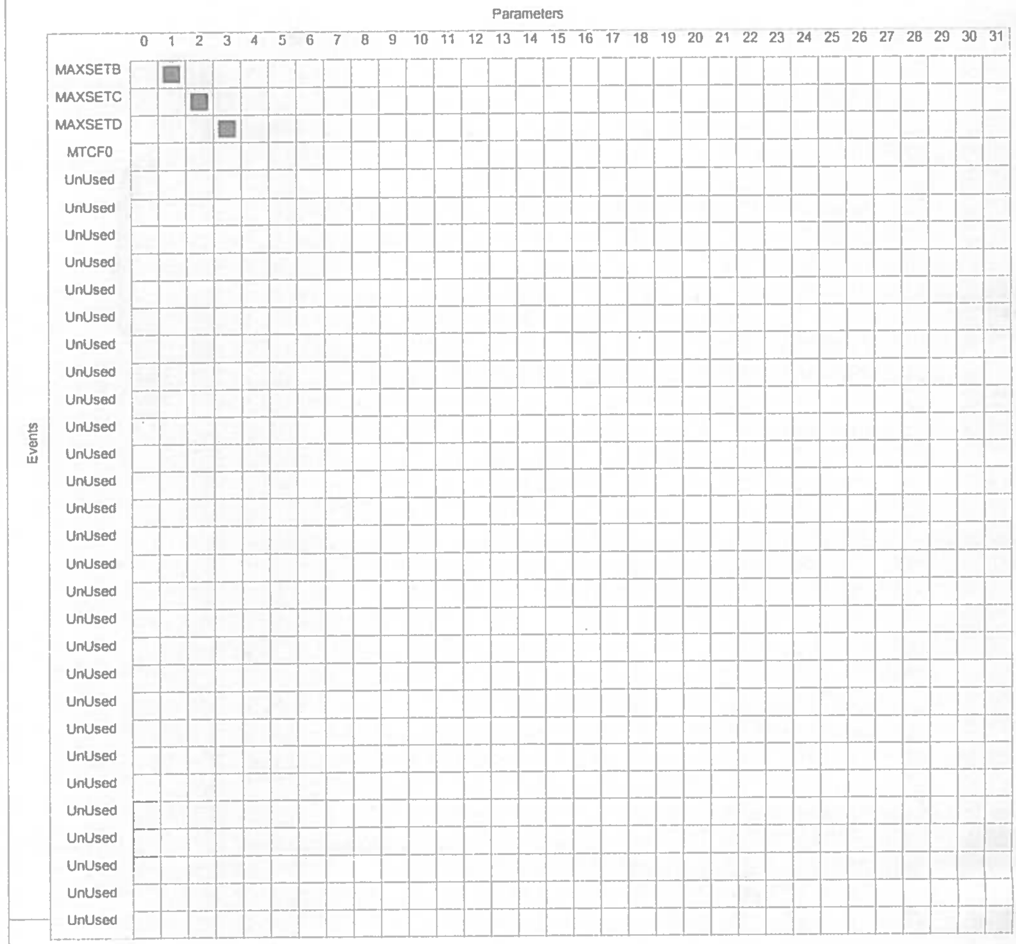


MTC - Time Switch Parameters

	Type	Event		Type	Event
0	Alternate Max	MAXSETB	16	No Action	
1	Alternate Max	MAXSETC	17	No Action	
2	Alternate Max	MAXSETD	18	No Action	
3	Conditioning	MTCF0	19	No Action	
4	No Action		20	No Action	
5	No Action		21	No Action	
6	No Action		22	No Action	
7	No Action		23	No Action	
8	No Action		24	No Action	
9	No Action		25	No Action	
10	No Action		26	No Action	
11	No Action		27	No Action	
12	No Action		28	No Action	
13	No Action		29	No Action	
14	No Action		30	No Action	
15	No Action		31	No Action	

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

MTC - Time Switch Parameters Array



Parameters

Events	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
MAXSETB		■																														
MAXSETC			■																													
MAXSETD				■																												
MTCF0																																
UnUsed																																
UnUsed																																
UnUsed																																
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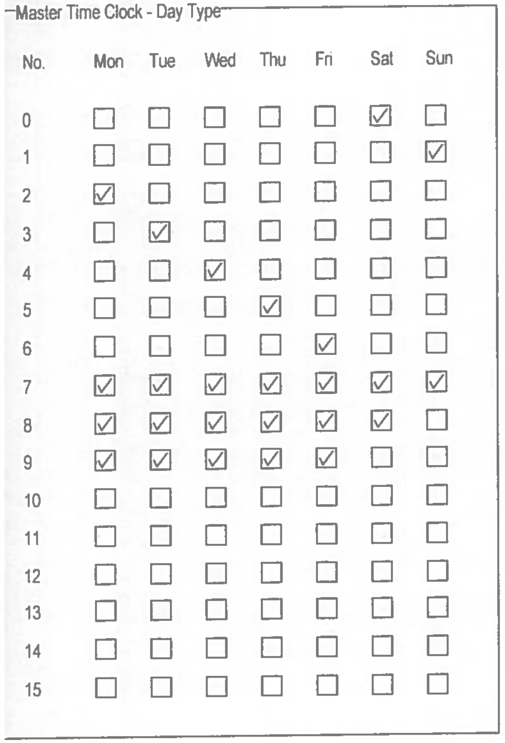
orks Order :
 Number : E69175
gineer : P M ROUSE
ersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Master Time Clock - Day Type



Master Time Clock - Day Type

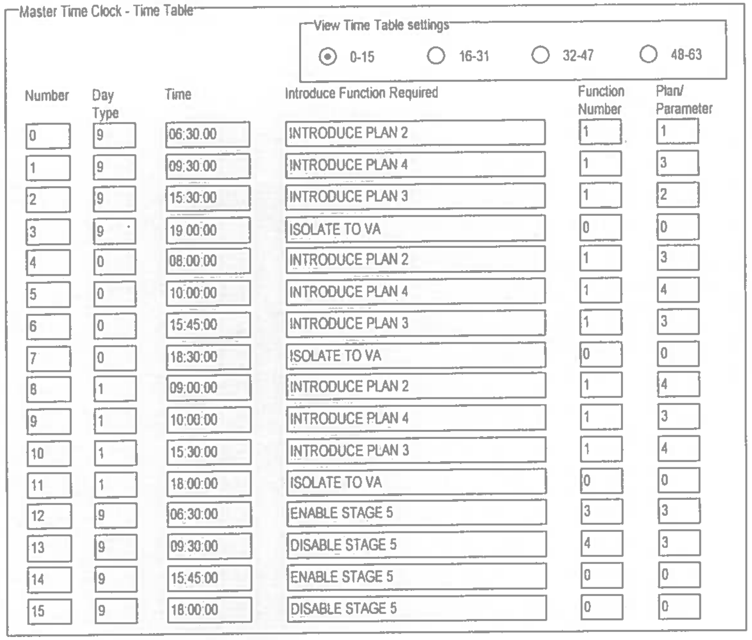
No.	Mon	Tue	Wed	Thu	Fri	Sat	Sun
0	☐	☐	☐	☐	☐	☑	☐
1	☐	☐	☐	☐	☐	☐	☑
2	☑	☐	☐	☐	☐	☐	☐
3	☐	☑	☐	☐	☐	☐	☐
4	☐	☐	☑	☐	☐	☐	☐
5	☐	☐	☐	☑	☐	☐	☐
6	☐	☐	☐	☐	☑	☐	☐
7	☑	☑	☑	☑	☑	☑	☑
8	☑	☑	☑	☑	☑	☑	☐
9	☑	☑	☑	☑	☑	☐	☐
10	☐	☐	☐	☐	☐	☐	☐
11	☐	☐	☐	☐	☐	☐	☐
12	☐	☐	☐	☐	☐	☐	☐
13	☐	☐	☐	☐	☐	☐	☐
14	☐	☐	☐	☐	☐	☐	☐
15	☐	☐	☐	☐	☐	☐	☐

ast Modified 24/05/13, Issue 3.0.10

Form Ref: 4.4.3

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Master Time Clock - Time Table



Master Time Clock - Time Table

View Time Table settings

● 0-15 ○ 16-31 ○ 32-47 ○ 48-63

Number	Day Type	Time	Introduce Function Required	Function Number	Plan/ Parameter
0	9	06:30.00	INTRODUCE PLAN 2	1	1
1	9	09:30:00	INTRODUCE PLAN 4	1	3
2	9	15:30:00	INTRODUCE PLAN 3	1	2
3	9	19 00:00	ISOLATE TO VA	0	0
4	0	08:00:00	INTRODUCE PLAN 2	1	3
5	0	10:00:00	INTRODUCE PLAN 4	1	4
6	0	15:45:00	INTRODUCE PLAN 3	1	3
7	0	18:30:00	ISOLATE TO VA	0	0
8	1	09:00:00	INTRODUCE PLAN 2	1	4
9	1	10:00:00	INTRODUCE PLAN 4	1	3
10	1	15:30:00	INTRODUCE PLAN 3	1	4
11	1	18:00:00	ISOLATE TO VA	0	0
12	9	06:30:00	ENABLE STAGE 5	3	3
13	9	09:30:00	DISABLE STAGE 5	4	3
14	9	15:45:00	ENABLE STAGE 5	0	0
15	9	18:00:00	DISABLE STAGE 5	0	0

Function Numbers:

0 = Isolate From CLF

1 = Introduce a CLF Plan

2 = Introduce a Parameter
(Combination of event switches)

3 = Selects an Individual
event switch to be set

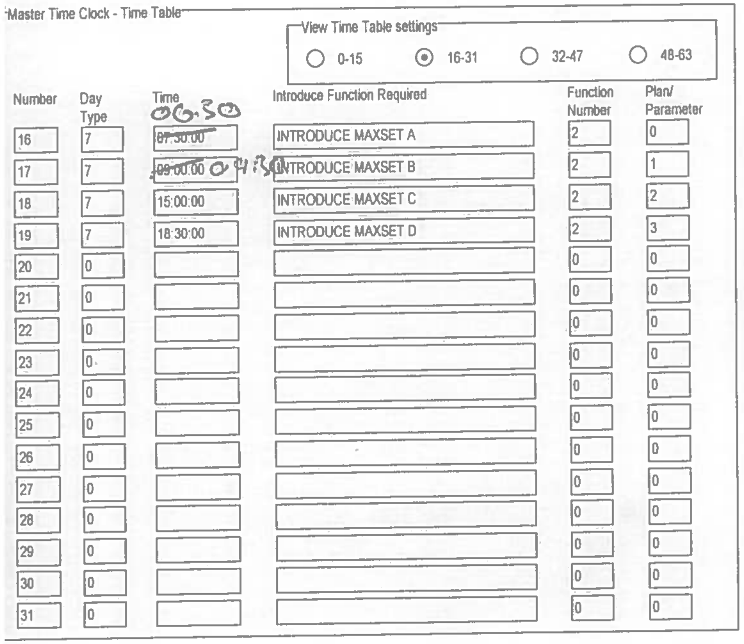
4 = Selects an Individual
event switch to be
cleared.

Last Modified 24/05/13, Issue 3.0.10

Form Ref: 4.4.4 (1)

orks Order :
Number : E69175
gineer : P M ROUSE
ersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Master Time Clock - Time Table



Master Time Clock - Time Table

View Time Table settings: ○ 0-15 ● 16-31 ○ 32-47 ○ 48-63

Number	Day Type	Time	Introduce Function Required	Function Number	Plan/ Parameter
16	7	06.30 ~~07:30:00~~	INTRODUCE MAXSET A	2	0
17	7	~~09:00:00~~ 04:30	INTRODUCE MAXSET B	2	1
18	7	15:00:00	INTRODUCE MAXSET C	2	2
19	7	18:30:00	INTRODUCE MAXSET D	2	3
20	0			0	0
21	0			0	0
22	0			0	0
23	0			0	0
24	0			0	0
25	0			0	0
26	0			0	0
27	0			0	0
28	0			0	0
29	0			0	0
30	0			0	0
31	0			0	0

Function Numbers:

0 = Isolate From CLF

1 = Introduce a CLF Plan

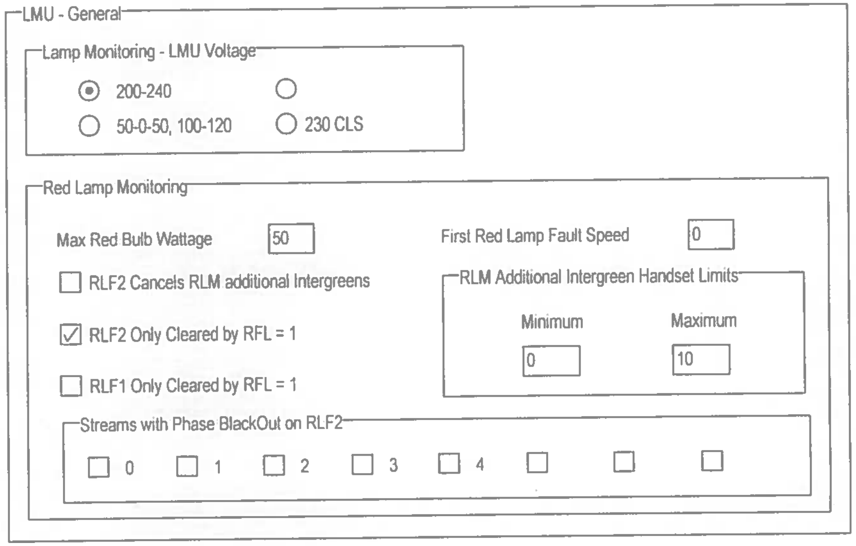
2 = Introduce a Parameter (Combination of event switches)

3 = Selects an Individual event switch to be set

4 = Selects an Individual event switch to be cleared.

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

LMU - General



LMU - General

Lamp Monitoring - LMU Voltage

● 200-240 ○
○ 50-0-50, 100-120 ○ 230 CLS

Red Lamp Monitoring

Max Red Bulb Wattage: 50

First Red Lamp Fault Speed: 0

☐ RLF2 Cancels RLM additional Intergreens

☑ RLF2 Only Cleared by RFL = 1

☐ RLF1 Only Cleared by RFL = 1

RLM Additional Intergreen Handset Limits

Minimum: 0
Maximum: 10

Streams with Phase BlackOut on RLF2

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ ☐ ☐

orks Order :
Number : E69175
gineer : P M ROUSE
ersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

LMU - Sensors

MU - Sensors

n-Board Sensors				On-Board Sensors				External Sensors			
ensor\ Phase	Sensor Type	Bulb Watts	NLM CLS	Sensor\ Phase	Sensor Type	Bulb Watts	NLM CLS	Sensor\ Pin	Drive	Sensor Type	Bulb Watts
\ A	As Seq.	40	☐	17 \ Q	As Seq.	40	☐	33 \ b14		None	7
\ B	As Seq.	40	☐	18 \ R	As Seq.	40	☐	34 \ z16		None	7
\ C	As Seq.	40	☐	19 \ S	As Seq.	40	☐	35 \ z14		None	7
\ D	As Seq.	40	☐	20 \ T	As Seq.	40	☐	36 \ z12		None	7
\ E	As Seq.	40	☐	21 \ U	As Seq.	40	☐	37 \ b14		None	7
\ F	As Seq.	40	☐	22 \ V	As Seq.	40	☐	38 \ z16		None	7
\ G	As Seq.	40	☐	23 \ W	As Seq.	40	☐	39 \ z14		None	7
\ H	As Seq.	40	☐	24 \ X	As Seq.	40	☐	40 \ z12		None	7
\ I	As Seq.	40	☐	25 \ Y			☐	41 \ b14		None	7
0 \ J	As Seq.	40	☐	26 \ Z			☐	42 \ z16		None	7
1 \ K	As Seq.	40	☐	27 \ A2			☐	43 \ z14		None	7
2 \ L	As Seq.	40	☐	28 \ B2			☐	44 \ z12		None	7
3 \ M	As Seq.	40	☐	29 \ C2			☐	45 \ b14			
4 \ N	As Seq.	40	☐	30 \ D2			☐	46 \ z16			
5 \ O	As Seq.	40	☐	31 \ E2			☐	47 \ z14			
6 \ P	As Seq.	40	☐	32 \ F2			☐	48 \ z12			

Works Order :
EM Number :.E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

RLM Additional Intergreens

Phases Delayed

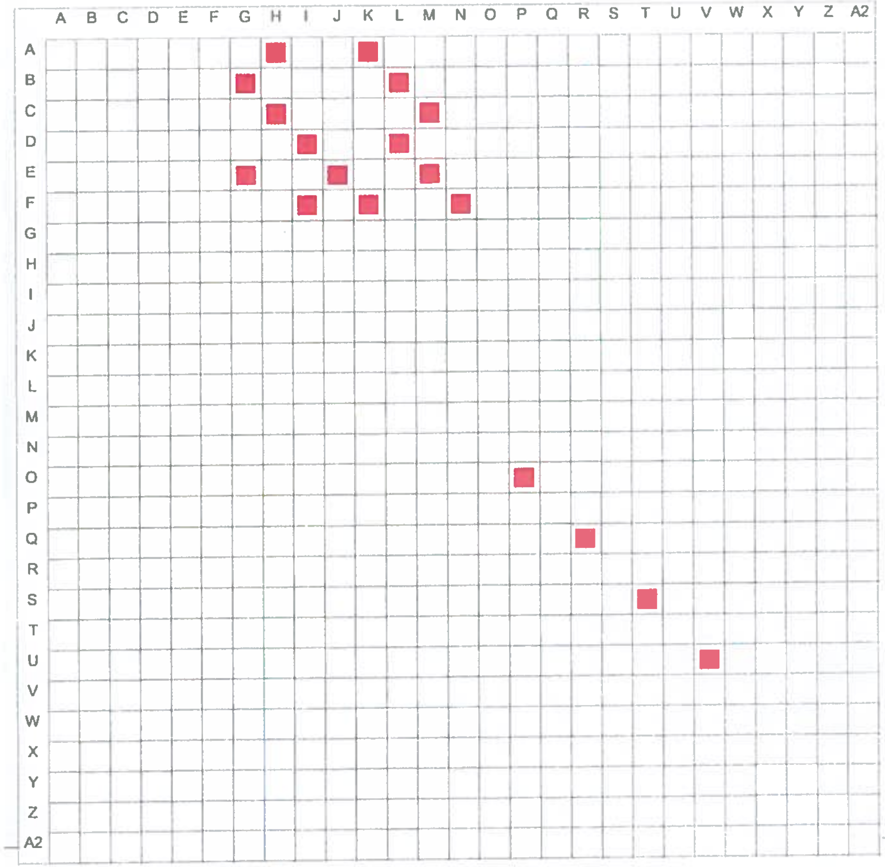
Phases with RLF1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A2
A	■																										
B		■																									
C			■																								
D				■																							
E					■																						
F						■																					
G							■																				
H								■																			
I									■																		
J										■																	
K											■																
L												■															
M													■														
N														■													
O															■												
P																■											
Q																	■										
R																		■									
S																			■								
T																				■							
U																					■						
V																						■					
W																							■				
X																								■			
Y																									■		
Z																										■	
A2																											■

rks Order :
Number : E69175
gineer : P M ROUSE
ersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

RLM Phase Inhibits

Phases Inhibited/Blacked-out



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A2
A								🟥			🟥																
B							🟥					🟥															
C								🟥					🟥														
D									🟥			🟥															
E							🟥			🟥			🟥														
F									🟥		🟥			🟥													
G																											
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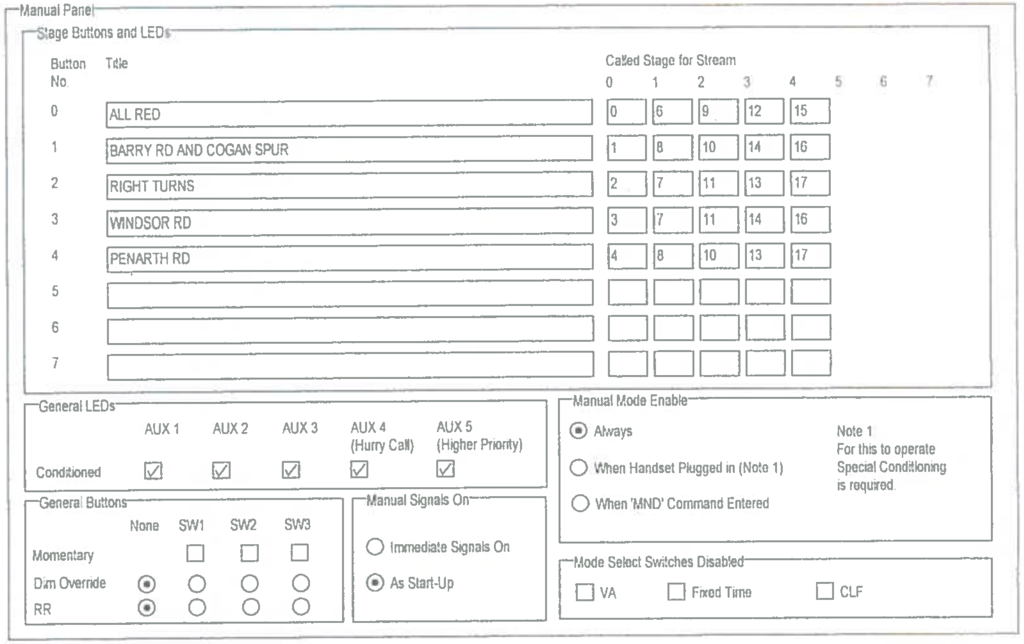
V																											
W																											
X																											
Y																											
Z																											
A2																											

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Manual Panel



Manual Panel

Stage Buttons and LEDs

Button No.	Title	Called Stage for Stream 0	1	2	3	4	5	6	7
0	ALL RED	0	6	9	12	15			
1	BARRY RD AND COGAN SPUR	1	8	10	14	16			
2	RIGHT TURNS	2	7	11	13	17			
3	WINDSOR RD	3	7	11	14	16			
4	PENARTH RD	4	8	10	13	17			
5									
6									
7									

General LEDs

	AUX 1	AUX 2	AUX 3	AUX 4 (Hurry Call)	AUX 5 (Higher Priority)
Conditioned	☑	☑	☑	☑	☑

Manual Mode Enable

● Always
○ When Handset Plugged in (Note 1)
○ When 'MND' Command Entered

Note 1
For this to operate Special Conditioning is required.

General Buttons

	None	SW1	SW2	SW3
Momentary		☐	☐	☐
Dim Override	●	○	○	○
RR	●	○	○	○

Manual Signals On

○ Immediate Signals On
● As Start-Up

Mode Select Switches Disabled

☐ VA ☐ Fixed Time ☐ CLF

orks Order :
I Number : E69175
gineer : P M ROUSE
ersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Speed Discrimination / Speed Assessment Equipment

Speed Discrimination / Speed Assessment Equipment

● SDE/SA Card

○ Internal SDE/SA

Equipment Type

● SDE ○ SA

Loop Spacing

○ 3.05m ● 3.66m

Note:
3.05m is Non-Standard

Number of Assessors: 0

Assessor Number	Assessor Input Name	Assessor Type *	Associated Phase
0			
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

Assessor Types:
1 = Double SDE
2 = Triple SDE Inner
3 = Triple SDE Outer
4 = Speed Assessment

Phase Terminated	Extra Intergreen	Curtailed VA Extensions to Force Extra IGN	Phase Terminated	Extra Intergreen	Curtailed VA Extensions to Force Extra IGN
A		☐	Q		☐
B		☐	R		☐
C		☐	S		☐
D		☐	T		☐
E		☐	U		☐
F		☐	V		☐
G		☐	W		☐
H		☐	X		☐
I		☐	Y		☐
J		☐	Z		☐
K		☐	A2		☐
L		☐	B2		☐
M		☐	C2		☐
N		☐	D2		☐
O		☐	E2		☐
P		☐	F2		☐

Works Order :
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Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

SDE - Gaining Phase Delays Affected

Gaining Phase Delays to be increased

Terminating Phases

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A2
A	■																										
B		■																									
C			■																								
D				■																							
E					■																						
F						■																					
G							■																				
H								■																			
I									■																		
J										■																	
K											■																
L												■															
M													■														
N														■													
O															■												
P																■											

rks Order :
Number : E69175
gineer : P M ROUSE
ersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Special Conditioning

```
MANUAL PANEL
------------

RT14=MIL23                                           ; LIGHT AUX 2 WHEN A DEMAND FOR STAGE 5 APPEARS
CF0=MIL05                                            ; LIGHT AUX 3 WHEN TIME OF DAY IS ACTIVE (STAGE 5 CAN RUN)
ODE0 EQL<6>).NOT(TIP97).(F1+F2+F3+F4)=MIL17          ; SITE UNDER UTC CONTROL LIGHT HIGHER PRIORITY LED
ODE0 EQL<6>).(MOVAF1+MOVAF2+MOVAF3+MOVAF4)=MIL22     ; SITE RUNNING UNDER MOVA CONTROL LIGHT AUX 1 LED
UTC AND MOVA CRB
----------------

T (PRSLMPRA+PRSLMPAA+PRSLMPRG) THN
  RUN<1>
D
T NOT(MODE0 EQL<6>).NOT(CNDTMA0).SSNRM THN            ; NOT IN MOVA MODE AND IN NORMAL RUN TIMER
  RUN<0>
D
T CNDTER0+((PRVMOD0 EQL<6>).NOT(MODE0 EQL<6>)) THN    ; START TIMER WHEN MOVA DROPS OFF OR TIMER TERMINATES
  LOD<10> 1SCRTCH0
  TRUE=SCRT15
                                                     ; START A 2 SEC INTERNAL TIMER FOR CRB TOGGLE
D
T(1SCRTST0 EQL<0>)=.SCRT15                           ; RESET SCRT BIT WHEN COUNT REACHES ZERO
T (1SCRTST0 GRT<0>) THN                              ; DECREMENT COUNT EVERY 200MS UNTIL ZERO
  DEC 1SCRTCH0
D
NRM.(NOT(2SCRT15)+(MODE0 EQL<6>)).NOT(NOT(TIP97).(F1+F2+F3+F4+F5)).CNDTMA1=MOVACRB
 WHEN TIMER TERMINATES TOGGLE CRB

MOVA AND UTC
------------
T NOT(TIP97).(F1+F2+F3+F4+F5) THN                     ; UTC ACTIVE USE UTC FORCE BITS
  F1=SCRT1
  F2=SCRT2
  F3=SCRT3
  F4=SCRT4
  F5=SCRT5
                                                      ; UTC NOT ACTIVE USE MOVA FORCE BITS
S
  MOVAF1=SCRT1
  MOVAF2=SCRT2
  MOVAF3=SCRT3
  MOVAF4=SCRT4
  MOVAF5=SCRT5
D
T(STAGE1)=MOVACON1                                    ; SEND STAGE CONFIRMS FOR MOVA
T(STAGE2)=MOVACON2
T(STAGE3)=MOVACON3
T(STAGE4)=MOVACON4
T(STAGE5)=MOVACON5
T(PHASEF)=MOVACON6

COMFIRMS FOR MOVA
----------------

SLMPAG.NOT(LMUINHG)=+MOVADET32
SLMPAH.NOT(LMUINHH)=+MOVADET31
SLMPAI.NOT(LMUINHI)=+MOVADET30
SLMPAJ.NOT(LMUINHJ)=+MOVADET29
SLMPAK.NOT(LMUINHK)=+MOVADET28
SLMPAL.NOT(LMUINHL)=+MOVADET27
SLMPAM.NOT(LMUINHM)=+MOVADET26
SLMPAN.NOT(LMUINHN)=+MOVADET25

T STAGE4.MTCF0 LCPHF.NOT(SCRT14) THN                   ; IN STAGE 4 + MASTER TIME TABLE 0 ACTIVE (MTCF0) +
  RUN<2>                                              ; A DEMAND FOR PHASE F STARTS TIMER
```

Works Order :
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Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Special Conditioning

```
END
STAGE4.MTCF0.LCPHF=SCRT14                                   ; BIT SET TO STOP REPULSE
CNDTMA2=MOVADET24                                           ; TIMER ACTIVE SETS MOVADET24


(MODE0 EQL<6>).(F1+F2+F3+F4+F5)=SCRT0                                               ; UTC ACTIVE FLAG
((MODE0 EQL<2>)+SCRT0).NOT(LCPHC+UCPHC+LCPHD+UCPHD+LCST2+UCST2)=PRVST2              ; IN VA OR UTC PREVENT STAGE 2
                                                                                    ; UNLESS A DEMAND FOR C OR D
((MODE0 EQL<2>)+SCRT0).NOT(LCPHF+UCPHF+LCPHG+UCPHG+LCPHH+LCPHL+LCPHM $
+LCST3+UCST3)=PRVST3                                                                ; IN VA OR UTC PREVENT STAGE 3
                                                                                    ; UNLESS A DEMAND FOR F G H L M
((MODE0 EQL<2>)+SCRT0).NOT(LCPHE+UCPHE+LCPHK+UCPHK+LCPHI+UCPHI+LCST4 $              ; IN VA OR UTC PREVENT STAGE 4
+UCST4)=PRVST4                                                                      ; UNLESS A DEMAND FOR E K I

((MODE0 EQL<2>)+SCRT0).NOT(MTCF0.LCPHF+UCPHF+LCST5+UCST5)=PRVST5                ; IN VA OR UTC PREVENT STAGE 5

                                                                                    ; UNLESS THE TIME OF DAY (MTCFO)
                                                                                    ; IS SET AND A DEMAND FOR F

;--------------------------------------------------------------------------------------
; U.T.C. REPLY BITS
; -----------------
;ANY LAMP FAIL REPLIES LF3.
NOT(FLF55)=LF3
;
; FIRST RED LAMP FAIL REPLIES LF1.
NOT(LMP1RED0+LMP2RED0+LMP1RED1+LMP2RED1+LMP1RED2+LMP2RED2+LMP1RED3+LMP2RED3+LMP1RED4+LMP2RED4)=LF1
;
; SECOND RED LAMP FAIL REPLIES LF2.
NOT(LMP2RED0+LMP2RED1+LMP2RED2+LMP2RED3+LMP2RED4)=LF2
;----------------------------------------------------------------------------------------
; U.T.C. REPLY BIT LE.
; -------------------
;
IFT LMPON.SWLMPS.NOT(FLF17) THN
LOD<0>1SCRTCH10
    TRUE=LE
        ELS
IFT (1SCRTST10 GRT<10>) THN
    FALSE=LE
        ELS
INC 1SCRTCH10
    END
        END
;NO CHANGE IN DIMMING OR TOO MANY CHANGES ALL IN 24 HOURS WILL SET REPLY DIMO
;REMEBER TO SET COND FLAGS 38 AND 39 ON FAULT LOG FLAGS SCREEN
IFT (FLFCOM) THN
FALSE=DM
ELS
TRUE=DM
END
;---------------------------------------------------------------------
```

rks Order :
l Number : E69175
gineer : P M ROUSE
ersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Special Conditioning

```
ADDITIONAL DETECTOR FUNCTIONS
-----------------------------
OT KBSACTP).(PBP)=+LCPHP                              ; PUSH BUTTONS ACTIVE WITHOUT KERBSIDES ACTIVE
OT KBSACTR).(PBR)=+LCPHR
OT KBSACTT).(PBT)=+LCPHT
OT KBSACTV).(PBV)=+LCPHV
                                                      ; SET COUNT TO ZERO AT START UP OR CFE CHANGED TO 1
T (MODE0 EQL<8>)+(CFE0.NOT(ROUGH5))+((RTCTOD EQL<0>).(RTCMIN EQL<0>).(RTCSEC EQL<0>).NOT(FLF27)) THN
  LOD<0>2SCRTCH0
D
T (PBP.NOT(ROUGH1)).NOT(KBSACTP) THN
  INC 2SCRTCH0                                        ; INCREMENT WHEN PBP IS PRESSED AND NO KBS
D
P=ROUGH1                                              ; PBP ACTIVE MAKES ROUGH1 ACTIVE
------------------------------------------------------------------------------------------------------
T (MODE0 EQL<8>)+(CFE0.NOT(ROUGH5))+((RTCTOD EQL<0>).(RTCMIN EQL<0>).(RTCSEC EQL<0>).NOT(FLF27)) THN
  LOD<0>2SCRTCH1
D
T (PBR.NOT(ROUGH2)).NOT(KBSACTR) THN
  INC 2SCRTCH1                                        ; INCREMENT WHEN PBR IS PRESSED AND NO KBS
D
R=ROUGH2                                              ; PBR ACTIVE MAKES ROUGH2 ACTIVE
---------------------------------------------------------------------------------------------------
T (MODE0 EQL<8>)+(CFE0.NOT(ROUGH5))+((RTCTOD EQL<0>).(RTCMIN EQL<0>).(RTCSEC EQL<0>).NOT(FLF27)) THN
  LOD<0>2SCRTCH2
D
T (PBT.NOT(ROUGH3)).NOT(KBSACTT) THN
  INC 2SCRTCH2                                         ; INCREMENT WHEN PBS IS PRESSED AND NO KBS
D
T=ROUGH3                                               ; PBT ACTIVE MAKES ROUGH3 ACTIVE
--------------------------------------------------------------------------------------------------
T (MODE0 EQL<8>)+(CFE0.NOT(ROUGH5))+((RTCTOD EQL<0>).(RTCMIN EQL<0>).(RTCSEC EQL<0>).NOT(FLF27)) THN
  LOD<0>2SCRTCH3
D
T (PBV.NOT(ROUGH4)).NOT(KBSACTV) THN
  INC 2SCRTCH3                                          ; INCREMENT WHEN PBV IS PRESSED AND NO KBS
D
V=ROUGH4                                                ; PBV ACTIVE MAKES ROUGH4 ACTIVE
DD WHAT IF GREATER THAN 10
---------------------------
T ((2SCRTST0 GRT<10>)+(2SCRTST1 GRT<10>)+(2SCRTST2 GRT<10>)+(2SCRTST3 GRT<10>)) THN     ; COUNT GREATER THAN 10 SET FLF 27
  TRUE=1CN1FLF
S
  FALSE=1CN1FLF                                         ; IF NOT SET GRETER THAN 10 THIS CLEARS THE FAULT
D
--------------------------------------------------------------------------------------------------
E0=ROUGH5                                               ; CFE0=1 SETS ROUGH5 ACTIVE _CLEARS THE COUNT SET
                                                        ; PLEASE SET CFE0=0 AFTER CLEARING THE COUNT

T(FLF27)=DF1
```

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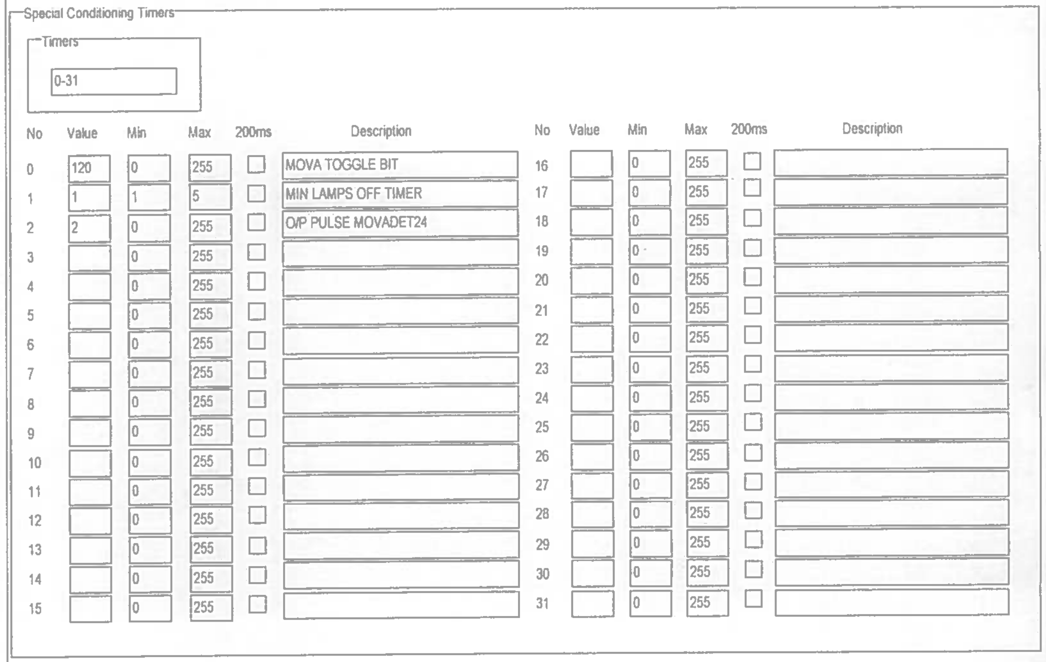
Special Conditioning Timers



Special Conditioning Timers

Timers

0-31

No	Value	Min	Max	200ms	Description	No	Value	Min	Max	200ms	Description
0	120	0	255	☐	MOVA TOGGLE BIT	16		0	255	☐	
1	1	1	5	☐	MIN LAMPS OFF TIMER	17		0	255	☐	
2	2	0	255	☐	O/P PULSE MOVADET24	18		0	255	☐	
3		0	255	☐		19		0	255	☐	
4		0	255	☐		20		0	255	☐	
5		0	255	☐		21		0	255	☐	
6		0	255	☐		22		0	255	☐	
7		0	255	☐		23		0	255	☐	
8		0	255	☐		24		0	255	☐	
9		0	255	☐		25		0	255	☐	
10		0	255	☐		26		0	255	☐	
11		0	255	☐		27		0	255	☐	
12		0	255	☐		28		0	255	☐	
13		0	255	☐		29		0	255	☐	
14		0	255	☐		30		0	255	☐	
15		0	255	☐		31		0	255	☐	

rks Order :
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ersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Fault Log Flags

Fault Log Flags

Fault No	Cond Flag	Act Flag	Fault No	Cond Flag	Act Flag	Fault No	Cond Flag	Act Flag	Fault No	Cond Flag	Act Flag
0	☐	☐	16	☐	☐	32	☐	☐	48	☐	☐
1	☐	☐	17	☐	☐	33	☐	☐	49	☐	☐
2	☐	☐	18	☐	☐	34	☐	☐	50	☐	☐
3	☐	☐	19	☐	☐	35	☐	☐	51	☐	☐
4	☐	☐	20	☐	☐	36	☐	☐	52	☐	☐
5	☐	☐	21	☐	☐	37	☐	☐	53	☐	☐
6	☐	☐	22	☐	☐	38	☑	☐	54	☐	☐
7	☐	☐	23	☐	☐	39	☑	☐	55	☐	☐
8	☐	☐	24	☐	☐	40	☐	☐	56	☐	☐
9	☐	☐	25	☐	☐	41	☐	☐	57	☐	☐
10	☐	☐	26	☐	☐	42	☐	☐	58	☐	☐
11	☐	☐	27	☐	☐	43	☐	☐	59	☐	☐
12	☐	☐	28	☐	☐	44	☐	☐	60	☐	☐
13	☐	☐	29	☐	☐	45	☐	☐	61	☐	☐
14	☐	☐	30	☐	☐	46	☐	☐	62	☐	☐
15	☐	☐	31	☐	☐	47	☐	☐	63	☐	☐

Note.

Cond Flag -
If a fault occurs which sets a

Act Flag -
If a fault occurs which sets a

switched OFF and secondly a t

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Special Instructions

```
TO SWITCH STAGE 5 OFF AND REMOVE SECOND GREEN TIME FORM CYCLE

PME=248
TTB 12=0 0

TO RE ENABLE STAGE 5

PME=248
TTB 12=3 3

IF SWITCHING STAGE 5 OFF ENSURE MAX TIME FOR PHASE F IS INCREASED TO 45

PME=248
MAXF=45
```

ɪrks Order :
ɪ Number : E69175
ɡineer : P M ROUSE
ersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Special Instructions

175

rd	Position	Skt	Port	Type I or O	Line	Cable	Block
	A	X3I	0	I	00 - 07	101	1TBG
	A	X3I	1	I	08 - 15		1TBH
	A	X3O	11	O	88 - 91	105	1TBX
	B	B	2	I	16 - 23	103	1TBJ
	B	E	4	O	32 - 39		1TBK
	B	C	3	I	24 - 31	103	1TBL
	B	D	5	O	40 - 47		1TBM
	F	B	6	I	48 - 55	104	1TBN
	F	B	7	I	56 - 63		1TBP
	F	C	8	I	64 - 71	104	1TBR
	F	C	9	I	72 - 79		1TBS

socket X3 on the CPU pcb is the double stacked one
= Inner (nearest the board)
= Outer

BSIDE MONITORING CONDITIONING
=============================

ANY OF THE KERBSIDES ARE NOT ACTIVE AND A PUSH BUTTON IS PRESSED A COUNT OF 1 IS SET, THIS COUNT
L INCREASE IF THE KERDSIDES REMAIN INACTIVE WHEN A PUSH BUTTON IS PRESSED, IF THE COUNT GOES
HER THAN 10 A FAULT WILL APPEAR IN THE LOG (FLF27=255 SCF1)

COUNT WILL BE RESET BACK TO ZERO AT MIDNIGHT EVERY DAY BUT IF A FAULT HAS APPEARED IN THE LOG DUE TO
COUNT BEING GREATER THAN 10 IT WILL NEED TO BE RESET BY THE BELOW COMMANDS.

0=1 THIS WILL RESET THE COUNT TO ZERO. ((((((MAKE SURE YOU SET CFE0 BACK TO CFE0=0))))))
=1 THIS WILL CLEAR THE FAULT IN THE LOG.

RFL=2 SHOWS ON THE HANDSET CHANGE CFE0=0 THEN CHANGE IT BACK TO CFE0=1.

C OTU
----

scoot loops are wired from the pack output to the UTMC I/O Board Via Plug 1.
rt at GSA 0=0 (input 0 being det 1 on I/O board
ce blue wire from I/O det 1 to first scoot det output.
ing colours to be found in Gemini handbook page 127.

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Special Instructions

ST800 CONTROLLER ITEMS LIST SHEET 1 (*I*L*)

ITEM	DRAWING NUMBER	DESCRIPTION	QTY	TOT	REMARKS
1					
2	667/1/27000/003	Cabinet 8 Phase wired 8 Phase			
3	667/1/27000/002	Cabinet 24 Phase wired 32 Phase	1		
4	667/1/27001/001	Rack 8 Phase wired 16 Phase			
5	667/1/27001/002	Rack 24 Phase wired 32 Phase			
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23	667/1/27072/001	Cableform 8 Phase (long)			
24	667/1/27002/000	Lamp Switch Kit 8 Phase			
25	667/1/27003/000	I/O Kit	1		
26	667/1/27005/000	SDE Facility Kit	1		
27	667/1/27004/000	Integral OTU Kit			
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39	667/1/16277/175	Configuration Eprom (Issue 3. 0)	1		
40					

Note 1:
Please refer to special
instruction pages for
additional information on
items marked with an '*'.

rks Order :
l Number : E69175
gineer : P M ROUSE
ersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Special Instructions

J0 CONTROLLER ITEMS LIST SHEET 2 (*I*L*)

EM	DRAWING NUMBER	DESCRIPTION	QTY	TOT	REMARKS
1					
2	667/1/27056/001	Manual Panel Assy (Intersection Cont)			
3	667/1/27056/010	Manual Panel Assy (Sigs on/off)			
4	667/1/27056/000	Manual Panel Blanking Kit			
5					
6					
7					
8					
9					
0					
1					
2	667/7/25171/000	Current Transformer	11		See Note 3
3					
4					
5					
6					
7					
8					
9					
0					
1	667/1/27000/101	Cabinet Export 8 Phase wired 16 Phase			
2	667/1/27000/102	Cabinet Export 24 Phase wired 32 Phase			
3	667/1/27001/101	Rack Export 8 Phase wired 16 Phase			
4	667/1/27001/102	Rack Export 24 Phase wired 32 Phase			
5	667/1/27002/100	Export Lamp Switch Kit			
6	667/1/27084/001	Dimming Assembly (1.5KVA)(Fit Std UK)			
7	667/1/27084/002	Dimming Assembly (2.0KVA)			
8	667/1/27084/003	Dimming Assembly (3.0KVA)	1		
9	667/1/27130/000	30A Controller Kit			
0					
1	667/1/27001/310	ST800 SE Export Rack up to 8 Phase			
2	667/1/27223/003	ST800 SE 8 Phase Driver No LMU			
3	667/1/27223/403	ST800 SE 4 Phase Driver No LMU			
4					
5					
6					
7	667/1/27000/301	ST800 P In a Cabinet 4Ph 1 Stream PED			
8	667/1/27012/000	PED 2nd Stream Kit for ST800 P			
9	667/1/27001/300	ST800 P Rack Only 4Ph 1 Stream PED			

Note 2:
Ancillary Processor PLD Variants
101 OTU & LMU
102 OTU Only
103 LMU Only
104 OTU & LMU + Up/Download
105 OUT Only + Up/DownLoad
NB Controller Has built in LMU So LMU on Ancillary Processor Not required included for info only.

Note 3:
Fit Current Transformer starting from position TLB/z/16 on the first phase driver PCB. if more than 3 sensors are called up fit the 4th sensor to the second Phases driver PCB, and so on until all sensors have been used up.
TLB/b/14 - 1st sensor terminal
TLB/z/16 - 2nd sensor terminal
TLB/z/14 - 3rd sensor terminal
TLB/z/12 - 4th sensor terminal
TLB/z/12 - 4th sensor terminal

TLB/z/12 - 4th sensor terminal

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Special Instructions

DETECTOR EQUIPMENT SHEET (*I*L*)

Item	Drawing Number	DESCRIPTION	QTY	TOT	REMARKS
1	667/1/20690/000	Detector 11 inch detector rack kit			
2	667/1/20690/001	Detector 19 inch detector rack kit	1		
3	667/1/17705/011	Detector Beehive kit (excl Pedestal)			
4	667/2/01999/000	Pedestal (Metric) D Detr. Housing			
5	667/1/17212/000	Detector L bracket kit			
6	667/1/22447/000	Detector Mounting Kit E.F.U. (T500)			
7	667/1/22470/000	Detector Frame Assy (T500)			
8	667/1/15990/002	Detector double backplane kit			
9	667/1/15990/003	Detector single backplane kit	7		
10	667/1/15990/004	Detector logic backplane kit			
11					
12	667/1/27663/000	Siemens STR4 (4 Channel) loop detector	7		
13	667/1/21029/001	48V WAIT SUPPLY KIT	7		
14	667/1/20292/008	24V AGD SUPPLY KIT	2		
15	667/1/03887/000	Detector Cableform (1 per 2 B/Planes)			
16	667/1/15854/000	Detector Cable termination kit	5		
17					
18	667/1/15991/000	Mod Kit Regulator PSU 1.5A 21-38V			
19	667/1/15991/001	Mod Kit Regulator PSU 0.5A 21-48V			
20					
21					
22	667/7/20360/002	Microsense Detr. Board 2 Channel			Eng. to supply
23	667/7/20360/004	Microsense Detr. Board 4 Channel			Eng. to supply
24	667/7/20368/000	Microsense Rack 3Ux19"			Eng. to supply
25	667/7/20365/000	Microsense 20-Way Backplane (Std)			Eng. to supply
26	667/7/20366/000	Microsense 20-Way Logic Backplane			
27	667/7/20369/000	Microsense Card Frame Guides (Pr.)			Eng. to supply
28					
29	667/7/20361/002	Microsense 2 Channel U/D Logic			
30	667/7/20361/004	Microsense 4 Channel U/D Logic			
31	667/7/20362/000	Microsense Count Logic N,N+1,U/D & DFM			
32	667/7/20363/000	Microsense Queue Logic with DFM			Eng. to supply
33	667/7/20364/000	Microsense Bus Detector 2 Channel			Eng. to supply
34					
35					
36	667/7/20377/000	Microsense MIX 3-1-R-24 I/R detector			Nearside mounting
37	667/7/20377/001	Microsense MIX 3-2-R-24 I/R detector			Offside mounting
38	667/7/20378/000	Short fixing bracket			
39	667/7/20379/000	Sighting Hood for MIX detectors			Eng. to supply
40	667/7/20380/000	Handbook for MIX detectors			Eng. to supply

[Template - Detector items.txt issue 1.0]

orks Order :
Number : E69175
gineer : P M ROUSE
ersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Special Instructions

MENS SINGLE INTERNAL DETECTOR BACKPLANE INSTRUCTIONS SHEET (BACKPLANE 1)

CONNECTIONS MADE USING CABLEFORM 667/1/03887/002
UNUSED WIRE ENDS MUST BE TIED BACK AND INSULATED

DETECTOR RACK POWER CONNECTIONS

SIGNAL	WIRE COLOUR	SUPPLY TERMINALS FROM ST800	BACKPLANE No.1 TERMINALS
24 VOLTS	RED	1TBE 1 to 6	19
0 VOLTS	BLACK	1TBE 7 to 12	20
SCREEN	PINK	1TBE 7 to 12	22
COMMON	WHITE	1TBE 7 to 12	18

LOOP No.	LOOP DESIGNATION	INTERMEDIATE TERMINALS	WIRE COLOUR	BACKPLANE TERMINALS
1	BMLN1X1	2TBL 1 & 2TBL 2	GREEN	1 & 2
2	AMLN2X2	2TBL 3 & 2TBL 4	BLUE	3 & 4
3	AMLN3X3	2TBL 5 & 2TBL 6	ORANGE	5 & 6
4	DMLN4X4	2TBL 7 & 2TBL 8	BROWN	7 & 8

DETECTOR OUTPUTS

DETECTOR No.	BACKPLANE TERMINALS	COLOUR	CONTR TERMINALS
1	10	BLUE	1TBG 1
2	12	GREEN	1TBG 2
3	14	ORANGE	1TBG 3
4	16	YELLOW	1TBG 4

Note 1 If more than one backplane power Linking between B/Planes to be made using the Red, Black Pink and White from 667/1/03887/002

Note 2 Use the detector termination kit (667/1/15854/000) to do the intermediate wiring.

Note 3 Ensure that the correct colour wires are used for the intermediate wiring.

mplate - Internal intermediate Detectors.txt iss 1.0)

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Special Instructions

SIEMENS SINGLE INTERNAL DETECTOR BACKPLANE INSTRUCTIONS SHEET (BACKPLANE 2)

CONNECTIONS MADE USING CABLEFORM 667/1/03887/002
UNUSED WIRE ENDS MUST BE TIED BACK AND INSULATED

DETECTOR RACK POWER CONNECTIONS

SIGNAL	WIRE COLOUR	BACKPLANE NO.1 TERMINALS	BACKPLANE No.2 TERMINALS
24 VOLTS	RED	19	19
0 VOLTS	BLACK	20	20
SCREEN	PINK	22	22
COMMON	WHITE	18	18

LOOP No.	LOOP DESIGNATION	INTERMEDIATE TERMINALS	WIRE COLOUR	BACKPLANE TERMINALS
1	GMLN5X5	2TBL 9 & 2TBL 10	SLATE	1 & 2
2	CMLN6X6	2TBL 11& 2TBL 12	BLUE/WHITE	3 & 4
3	CMLN7X7	2TBM 1 & 2TBM 2	GREEN	5 & 6
4	EMLN8X8	2TBM 3 & 2TBM 4	BLUE	7 & 8

DETECTOR' OUTPUTS

DETECTOR No.	BACKPLANE TERMINALS	COLOUR	CONTR TERMINALS
1	10	BLUE	1TBG 5
2	12	GREEN	1TBG 6
3	14	ORANGE	1TBG 7
4	16	YELLOW	1TBG 8

Note 1 If more than one backplane power Linking between B/Planes to be made using the Red, Black Pink and White from 667/1/03887/002

Note 2 Use the detector termination kit (667/1/15854/000) to do the intermediate wiring.

Note 3 Ensure that the correct colour wires are used for the intermediate wiring.

[Template - Internal intermediate Detectors.txt iss 1.0]

orks Order :
M Number : E69175
gineer : P M ROUSE
tersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Special Instructions

MENS SINGLE INTERNAL DETECTOR BACKPLANE INSTRUCTIONS SHEET (BACKPLANE 3)

CONNECTIONS MADE USING CABLEFORM 667/1/03887/002
UNUSED WIRE ENDS MUST BE TIED BACK AND INSULATED

DETECTOR RACK POWER CONNECTIONS

SIGNAL	WIRE COLOUR	BACKPLANE NO.2 TERMINALS	BACKPLANE No.3 TERMINALS
24 VOLTS	RED	19	19
0 VOLTS	BLACK	20	20
SCREEN	PINK	22	22
COMMON	WHITE	18	18

LOOP No.	LOOP DESIGNATION	INTERMEDIATE TERMINALS	WIRE COLOUR	BACKPLANE TERMINALS
1	FMLN9X9	2TBM 5 & 2TBM 6	ORANGE	1 & 2
2	ALN2IN12	2TBM 7 & 2TBM 8	BROWN	3 & 4
3	ALN3IN13	2TBM 9 & 2TBM 10	SLATE	5 & 6
4	DLN4IN14	21BM 11& 2TBM 12	BLUE/WHITE	7 & 8

DETECTOR OUTPUTS

DETECTOR No.	BACKPLANE TERMINALS	COLOUR	CONTR TERMINALS
1	10	BLUE	1TBH 1
2	12	GREEN	1TBH 2
3	14	ORANGE	1TBH 3
4	16	YELLOW	1TBH 4

Note 1 If more than one backplane power Linking between B/Planes to be made using the Red, Black Pink and White from 667/1/03887/002

Note 2 Use the detector termination kit (667/1/15854/000) to do the intermediate wiring.

Note 3 Ensure that the correct colour wires are used for the intermediate wiring.

mplate - Internal intermediate Detectors.txt iss 1.0]

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Special Instructions

SIEMENS SINGLE INTERNAL DETECTOR BACKPLANE INSTRUCTIONS SHEET (BACKPLANE 4)

CONNECTIONS MADE USING CABLEFORM 667/1/03887/002
UNUSED WIRE ENDS MUST BE TIED BACK AND INSULATED

DETECTOR RACK POWER CONNECTIONS

SIGNAL	WIRE COLOUR	BACKPLANE No.3 TERMINALS	BACKPLANE No.4 TERMINALS
24 VOLTS	RED	19	19
0 VOLTS	BLACK	20	20
SCREEN	PINK	22	22
COMMON	WHITE	18	18

LOOP No.	LOOP DESIGNATION	INTERMEDIATE TERMINALS	WIRE COLOUR	BACKPLANE TERMINALS
1	GLN5IN15	2TBN 1 & 2TBN 2	GREEN	1 & 2
2	CLN6IN16	2TBN 3 & 2TBN 4	BLUE	3 & 4
3	CLN7IN17	2TBN 5 & 2TBN 6	ORANGE	5 & 6
4	ELN8IN18	2TBN 7 & 2TBN 8	BROWN	7 & 8

DETECTOR OUTPUTS

DETECTOR No.	BACKPLANE TERMINALS	COLOUR	CONTR TERMINALS
1	10	BLUE	1TBH 5
2	12	GREEN	1TBH 6
3	14	ORANGE	1TBH 7
4	16	YELLOW	1TBH 8

Note 1 If more than one backplane power Linking between B/Planes to be made using the Red, Black Pink and White from 667/1/03887/002

Note 2 Use the detector termination kit (667/1/15854/000) to do the intermediate wiring.

Note 3 Ensure that the correct colour wires are used for the intermediate wiring.

[Template - Internal intermediate Detectors.txt iss 1.0]

orks Order :
I Number : E69175
gineer : P M ROUSE
ersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Special Instructions

MENS SINGLE INTERNAL DETECTOR BACKPLANE INSTRUCTIONS SHEET (BACKPLANE 5)

CONNECTIONS MADE USING CABLEFORM 667/1/03887/002
UNUSED WIRE ENDS MUST BE TIED BACK AND INSULATED

DETECTOR RACK POWER CONNECTIONS

SIGNAL	WIRE COLOUR	BACKPLANE NO.4 TERMINALS	BACKPLANE No.5 TERMINALS
24 VOLTS	RED	19	19
0 VOLTS	BLACK	20	20
SCREEN	PINK	22	22
COMMON	WHITE	18	18

LOOP No.	LOOP DESIGNATION	INTERMEDIATE TERMINALS	WIRE COLOUR	BACKPLANE TERMINALS
1	DMLN4SL24	2TBN 9 & 2TBN 10	SLATE	1 & 2
2	EMLN8SL28	2TBN 11& 2TBN 12	BLUE/WHITE	3 & 4
3	FMLN9SL29	2TBP 1 & 2TBP 2	GREEN	5 & 6
4	AY	2TBP 3 & 2TBP 4	BLUE	7 & 8

DETECTOR OUTPUTS

DETECTOR No.	BACKPLANE TERMINALS	COLOUR	CONTR TERMINALS
1	10	BLUE	1TBN 1
2	12	GREEN	1TBN 2
3	14	ORANGE	1TBN 3
4	16	YELLOW	1TBN 4

Note 1 If more than one backplane power Linking between B/Planes to be made using the Red, Black Pink and White from 667/1/03887/002

Note 2 Use the detector termination kit (667/1/15854/000) to do the intermediate wiring.

Note 3 Ensure that the correct colour wires are used for the intermediate wiring.

emplate - Internal intermediate Detectors.txt iss 1.0]

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Special Instructions

SIEMENS SINGLE INTERNAL DETECTOR BACKPLANE INSTRUCTIONS SHEET (BACKPLANE 6)

CONNECTIONS MADE USING CABLEFORM 667/1/03887/002
UNUSED WIRE ENDS MUST BE TIED BACK AND INSULATED

DETECTOR RACK POWER CONNECTIONS

SIGNAL	WIRE COLOUR	BACKPLANE NO.5 TERMINALS	BACKPLANE No.6 TERMINALS
24 VOLTS	RED	19	19
0 VOLTS	BLACK	20	20
SCREEN	PINK	22	22
COMMON	WHITE	18	18

LOOP No.	LOOP DESIGNATION	INTERMEDIATE TERMINALS	WIRE COLOUR	BACKPLANE TERMINALS
1	BY	2TBP 5 & 2TBP 6	ORANGE	1 & 2
2	CY	2TBP 7 & 2TBP 8	BROWN	3 & 4
3	DY	2TBP 9 & 2TBP 10	SLATE	5 & 6
4	SPARE	21BP 11& 2TBP 12	BLUE/WHITE	7 & 8

DETECTOR OUTPUTS

DETECTOR No.	BACKPLANE TERMINALS	COLOUR	CONTR TERMINALS
1	10	BLUE	1TBN 5
2	12	GREEN	1TBN 6
3	14	ORANGE	1TBN 7
4	16	YELLOW	1TB

Note 1 If more than one backplane power Linking between B/Planes to be made using the Red, Black Pink and White from 667/1/03887/002

Note 2 Use the detector termination kit (667/1/15854/000) to do the intermediate wiring.

Note 3 Ensure that the correct colour wires are used for the intermediate wiring.

[Template - Internal intermediate Detectors.txt iss 1.0]

rks Order :
Number : E69175
gineer : P M ROUSE
ersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Special Instructions

MENS SINGLE INTERNAL DETECTOR BACKPLANE INSTRUCTIONS SHEET (BACKPLANE 7)

CONNECTIONS MADE USING CABLEFORM 667/1/03887/002
UNUSED WIRE ENDS MUST BE TIED BACK AND INSULATED

DETECTOR RACK POWER CONNECTIONS

SIGNAL	WIRE COLOUR	BACKPLANE No.3 TERMINALS	BACKPLANE No.4 TERMINALS
24 VOLTS	RED	19	19
0 VOLTS	BLACK	20	20
SCREEN	PINK	22	22
COMMON	WHITE	18	18

LOOP No.	LOOP DESIGNATION	INTERMEDIATE TERMINALS	WIRE COLOUR	BACKPLANE TERMINALS
1	SPARE	2TBR 1 & 2TBR 2	GREEN	1 & 2
2	SPARE	2TBR 3 & 2TBR 4	BLUE	3 & 4
3	SPARE	2TBR 5 & 2TBR 6	ORANGE	5 & 6
4	SPARE	2TBR 7 & 2TBR 8	BROWN	7 & 8

Note 1 If more than one backplane power Linking between B/Planes to be made using the Red, Black Pink and White from 667/1/03887/002

Note 2 Use the detector termination kit (667/1/15854/000) to do the intermediate wiring.

Note 3 Ensure that the correct colour wires are used for the intermediate wiring.

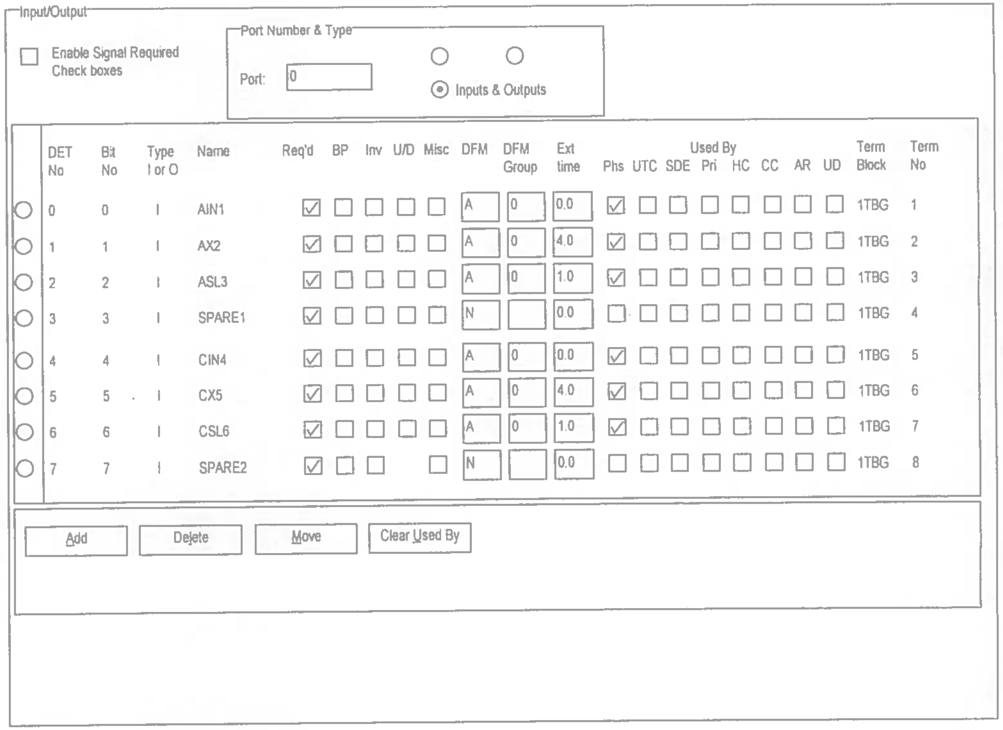
DETECTOR OUTPUTS

DETECTOR No.	BACKPLANE TERMINALS	COLOUR	CONTR TERMINALS
1	10	BLUE	1TB
2	12	GREEN	1TB
3	14	ORANGE	1TB
4	16	YELLOW	1TB

emplate - Internal intermediate Detectors.txt iss 1.0]

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Input/Output



☐ Enable Signal Required Check boxes

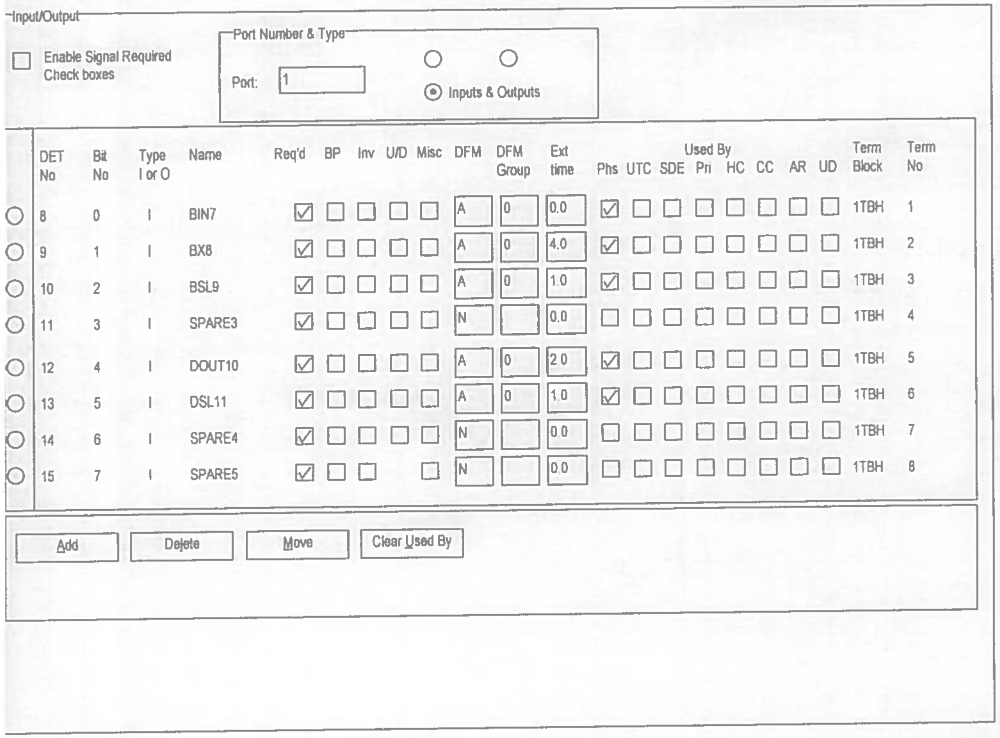
Port: 0

○ ○
● Inputs & Outputs

	DET No	Bit No	Type I or O	Name	Req'd	BP	Inv	U/D	Misc	DFM	DFM Group	Ext time	Used By								Term Block	Term No
													Phs	UTC	SDE	Pri	HC	CC	AR	UD		
○	0	0	I	AIN1	☑	☐	☐	☐	☐	A	0	0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBG	1
○	1	1	I	AX2	☑	☐	☐	☐	☐	A	0	4.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBG	2
○	2	2	I	ASL3	☑	☐	☐	☐	☐	A	0	1.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBG	3
○	3	3	I	SPARE1	☑	☐	☐	☐	☐	N		0.0	☐	☐	☐	☐	☐	☐	☐	☐	1TBG	4
○	4	4	I	CIN4	☑	☐	☐	☐	☐	A	0	0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBG	5
○	5	5	I	CX5	☑	☐	☐	☐	☐	A	0	4.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBG	6
○	6	6	I	CSL6	☑	☐	☐	☐	☐	A	0	1.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBG	7
○	7	7	I	SPARE2	☑	☐	☐		☐	N		0.0	☐	☐	☐	☐	☐	☐	☐	☐	1TBG	8

orks Order :
M Number : E69175
gineer : P M ROUSE
tersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Input/Output



☐ Enable Signal Required Check boxes

Port Number & Type

Port: 1

○ ○ ● Inputs & Outputs

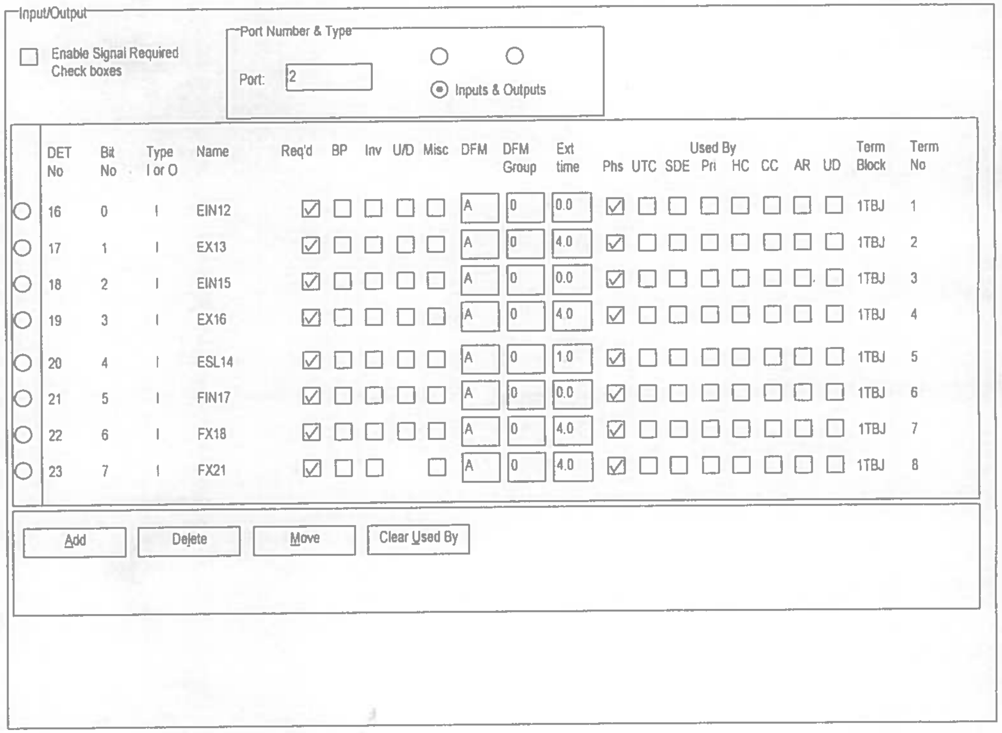
	DET No	Bit No	Type I or O	Name	Req'd	BP	Inv	U/D	Misc	DFM	DFM Group	Ext time	Used By								Term Block	Term No
													Phs	UTC	SDE	Pri	HC	CC	AR	UD		
○	8	0	I	BIN7	☑	☐	☐	☐	☐	A	0	0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBH	1
○	9	1	I	BX8	☑	☐	☐	☐	☐	A	0	4.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBH	2
○	10	2	I	BSL9	☑	☐	☐	☐	☐	A	0	1.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBH	3
○	11	3	I	SPARE3	☑	☐	☐	☐	☐	N		0.0	☐	☐	☐	☐	☐	☐	☐	☐	1TBH	4
○	12	4	I	DOUT10	☑	☐	☐	☐	☐	A	0	2.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBH	5
○	13	5	I	DSL11	☑	☐	☐	☐	☐	A	0	1.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBH	6
○	14	6	I	SPARE4	☑	☐	☐	☐	☐	N		0.0	☐	☐	☐	☐	☐	☐	☐	☐	1TBH	7
○	15	7	I	SPARE5	☑	☐	☐		☐	N		0.0	☐	☐	☐	☐	☐	☐	☐	☐	1TBH	8

Last Modified 24/05/13, Issue 3.0.10

Form Ref: 7.2 (2)

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Input/Output



☐ Enable Signal Required Check boxes

Port Number & Type

Port: 2

○ ○ ● Inputs & Outputs

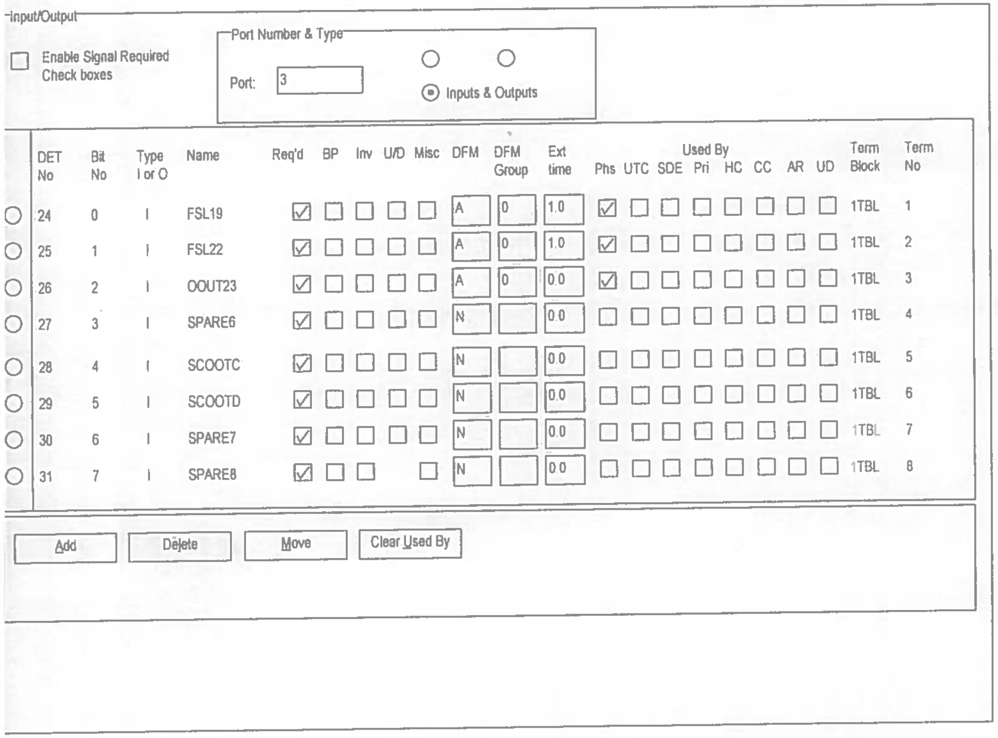
	DET No	Bit No	Type I or O	Name	Req'd	BP	Inv	U/D	Misc	DFM	DFM Group	Ext time	Used By								Term Block	Term No
													Phs	UTC	SDE	Pri	HC	CC	AR	UD		
○	16	0	I	EIN12	☑	☐	☐	☐	☐	A	0	0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBJ	1
○	17	1	I	EX13	☑	☐	☐	☐	☐	A	0	4.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBJ	2
○	18	2	I	EIN15	☑	☐	☐	☐	☐	A	0	0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBJ	3
○	19	3	I	EX16	☑	☐	☐	☐	☐	A	0	4.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBJ	4
○	20	4	I	ESL14	☑	☐	☐	☐	☐	A	0	1.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBJ	5
○	21	5	I	FIN17	☑	☐	☐	☐	☐	A	0	0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBJ	6
○	22	6	I	FX18	☑	☐	☐	☐	☐	A	0	4.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBJ	7
○	23	7	I	FX21	☑	☐	☐		☐	A	0	4.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBJ	8

Last Modified 24/05/13, Issue 3.0.10

Form Ref: 7.2 (3)

orks Order :
/ Number : E69175
gineer : P M ROUSE
ersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Input/Output



Input/Output

☐ Enable Signal Required Check boxes

Port Number & Type

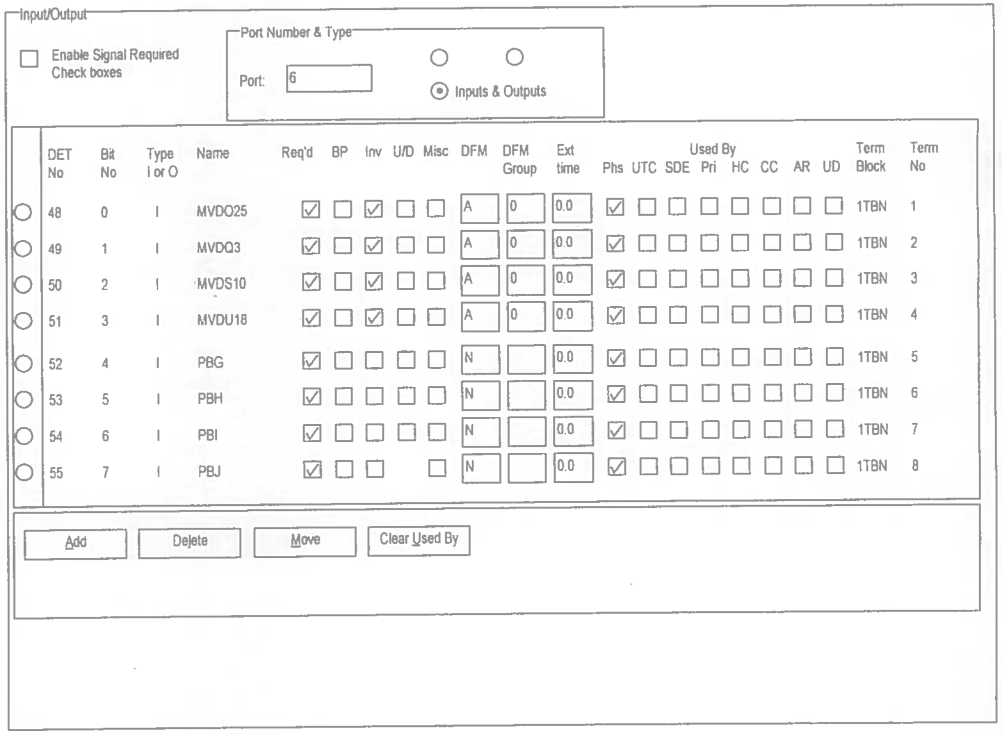
Port: 3

○ ○ ● Inputs & Outputs

	DET No	Bit No	Type I or O	Name	Req'd	BP	Inv	U/D	Misc	DFM	DFM Group	Ext time	Used By								Term Block	Term No
													Phs	UTC	SDE	Pri	HC	CC	AR	UD		
○	24	0	I	FSL19	☑	☐	☐	☐	☐	A	0	1.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBL	1
○	25	1	I	FSL22	☑	☐	☐	☐	☐	A	0	1.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBL	2
○	26	2	I	OOUT23	☑	☐	☐	☐	☐	A	0	0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBL	3
○	27	3	I	SPARE6	☑	☐	☐	☐	☐	N		0.0	☐	☐	☐	☐	☐	☐	☐	☐	1TBL	4
○	28	4	I	SCOOTC	☑	☐	☐	☐	☐	N		0.0	☐	☐	☐	☐	☐	☐	☐	☐	1TBL	5
○	29	5	I	SCOOTD	☑	☐	☐	☐	☐	N		0.0	☐	☐	☐	☐	☐	☐	☐	☐	1TBL	6
○	30	6	I	SPARE7	☑	☐	☐	☐	☐	N		0.0	☐	☐	☐	☐	☐	☐	☐	☐	1TBL	7
○	31	7	I	SPARE8	☑	☐	☐		☐	N		0.0	☐	☐	☐	☐	☐	☐	☐	☐	1TBL	8

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Input/Output



Input/Output

☐ Enable Signal Required Check boxes

Port Number & Type

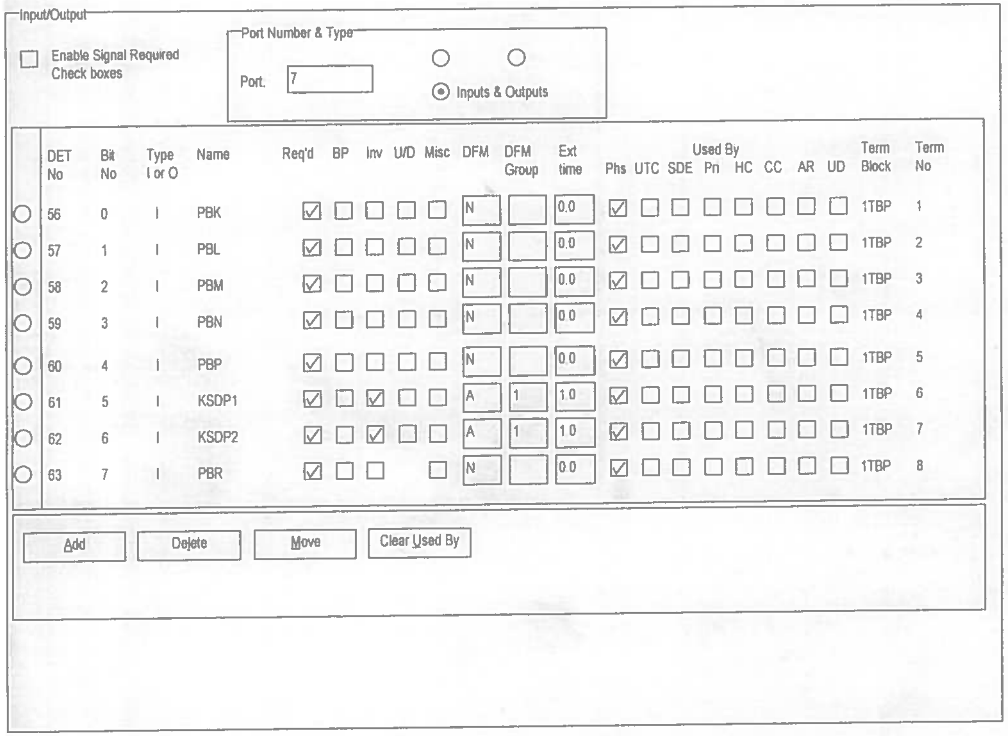
Port: 6

○ ○ ● Inputs & Outputs

	DET No	Bit No	Type I or O	Name	Req'd	BP	Inv	U/D	Misc	DFM	DFM Group	Ext time	Used By								Term Block	Term No
													Phs	UTC	SDE	Pri	HC	CC	AR	UD		
○	48	0	I	MVDO25	☑	☐	☑	☐	☐	A	0	0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBN	1
○	49	1	I	MVDQ3	☑	☐	☑	☐	☐	A	0	0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBN	2
○	50	2	I	MVDS10	☑	☐	☑	☐	☐	A	0	0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBN	3
○	51	3	I	MVDU18	☑	☐	☑	☐	☐	A	0	0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBN	4
○	52	4	I	PBG	☑	☐	☐	☐	☐	N		0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBN	5
○	53	5	I	PBH	☑	☐	☐	☐	☐	N		0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBN	6
○	54	6	I	PBI	☑	☐	☐	☐	☐	N		0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBN	7
○	55	7	I	PBJ	☑	☐	☐		☐	N		0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBN	8

Vorks Order :
:M Number : E69175
ngineer : P M ROUSE
ntersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Input/Output



Input/Output

☐ Enable Signal Required Check boxes

Port Number & Type

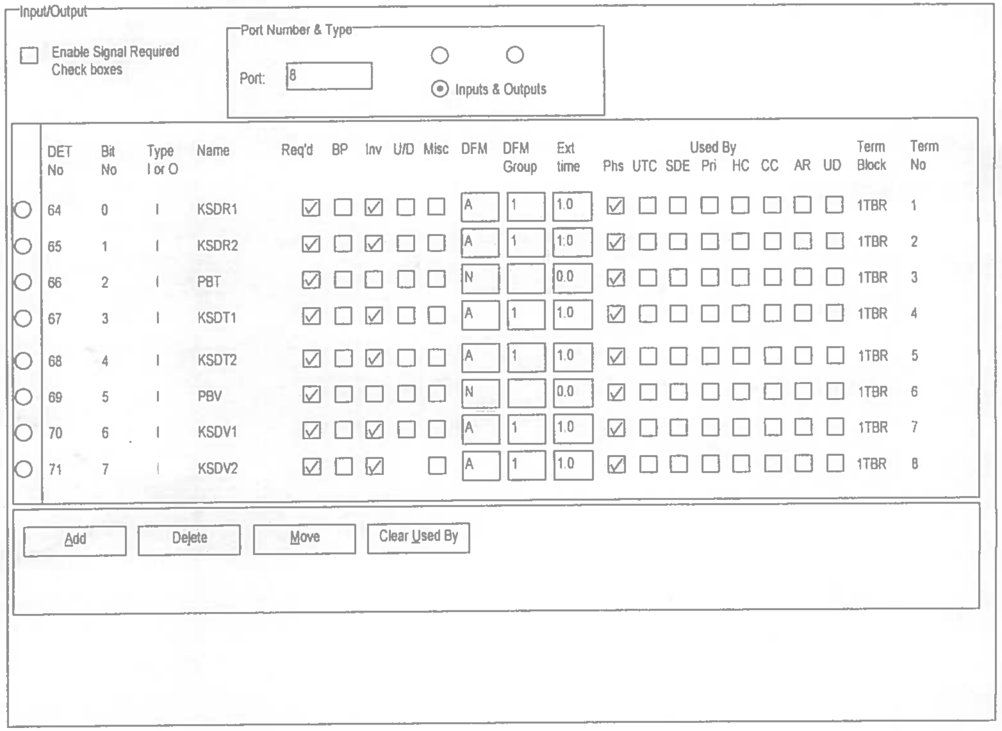
Port: 7

○ ○ ● Inputs & Outputs

	DET No	Bit No	Type I or O	Name	Req'd	BP	Inv	U/D	Misc	DFM	DFM Group	Ext time	Used By Phs	UTC	SDE	Pri	HC	CC	AR	UD	Term Block	Term No
○	56	0	I	PBK	☑	☐	☐	☐	☐	N		0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBP	1
○	57	1	I	PBL	☑	☐	☐	☐	☐	N		0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBP	2
○	58	2	I	PBM	☑	☐	☐	☐	☐	N		0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBP	3
○	59	3	I	PBN	☑	☐	☐	☐	☐	N		0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBP	4
○	60	4	I	PBP	☑	☐	☐	☐	☐	N		0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBP	5
○	61	5	I	KSDP1	☑	☐	☑	☐	☐	A	1	1.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBP	6
○	62	6	I	KSDP2	☑	☐	☑	☐	☐	A	1	1.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBP	7
○	63	7	I	PBR	☑	☐	☐		☐	N		0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBP	8

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Input/Output



Input/Output

☐ Enable Signal Required Check boxes

Port Number & Type

Port: 8

○ ○ ● Inputs & Outputs

	DET No	Bit No	Type I or O	Name	Req'd	BP	Inv	U/D	Misc	DFM	DFM Group	Ext time	Used By Phs	UTC	SDE	Pri	HC	CC	AR	UD	Term Block	Term No
○	64	0	I	KSDR1	☑	☐	☑	☐	☐	A	1	1.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBR	1
○	65	1	I	KSDR2	☑	☐	☑	☐	☐	A	1	1.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBR	2
○	66	2	I	PBT	☑	☐	☐	☐	☐	N		0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBR	3
○	67	3	I	KSDT1	☑	☐	☑	☐	☐	A	1	1.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBR	4
○	68	4	I	KSDT2	☑	☐	☑	☐	☐	A	1	1.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBR	5
○	69	5	I	PBV	☑	☐	☐	☐	☐	N		0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBR	6
○	70	6	I	KSDV1	☑	☐	☑	☐	☐	A	1	1.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBR	7
○	71	7	I	KSDV2	☑	☐	☑		☐	A	1	1.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBR	8

orks Order :
M Number : E69175
ngineer : P M ROUSE
tersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Aspect Drives

Aspect Drives

● A-L ○ M-X ○ Y-F2

Phase Driver Card 1

	Used For	Term Block	Term No
A - Red	Phase	1TBA	1
A - Amber	Phase	1TBA	2
A - Green	Phase	1TBA	3
B - Red	Phase	1TBA	4
B - Amber	Phase	1TBA	5
B - Green	Phase	1TBA	6
C - Red	Phase	1TBA	7
C - Amber	Phase	1TBA	8
C - Green	Phase	1TBA	9
D - Red	Phase	1TBA	10
D - Amber	Phase	1TBA	11
D - Green	Phase	1TBA	12

Phase Driver Card 1

	Used For	Term Block	Term No
E - Red	Phase	1TBB	1
E - Amber	Phase	1TBB	2
E - Green	Phase	1TBB	3
F - Red	Phase	1TBB	4
F - Amber	Phase	1TBB	5
F - Green	Phase	1TBB	6
G - Red	Phase	1TBB	7
G - Amber	Phase	1TBB	8
G - Green	Phase	1TBB	9
H - Red	Phase	1TBB	10
H - Amber	Phase	1TBB	11
H - Green	Phase	1TBB	12

Phase Driver Card 2

	Used For	Term Block	Term No
I - Red	Phase	1TBC	1
I - Amber	Phase	1TBC	2
I - Green	Phase	1TBC	3
J - Red	Phase	1TBC	4
J - Amber	Phase	1TBC	5
J - Green	Phase	1TBC	6
K - Red	Phase	1TBC	7
K - Amber	Phase	1TBC	8
K - Green	Phase	1TBC	9
L - Red	Phase	1TBC	10
L - Amber	Phase	1TBC	11
L - Green	Phase	1TBC	12

Works Order :
EM Number : E69175
Engineer : P M ROUSE
Intersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

Aspect Drives

Aspect Drives

○ A-L ● M-X ○ Y-F2

Phase Driver Card 2

	Used For	Term Block	Term No
M - Red	Phase	1TBD	1
M - Amber	Phase	1TBD	2
M - Green	Phase	1TBD	3
N - Red	Phase	1TBD	4
N - Amber	Phase	1TBD	5
N - Green	Phase	1TBD	6
O - Red	Phase	1TBD	7
O - Amber	Phase	1TBD	8
O - Green	Phase	1TBD	9
P - Red	Phase	1TBD	10
P - Amber	Phase	1TBD	11
P - Green	Phase	1TBD	12

Phase Driver Card 3

	Used For	Term Block	Term No
Q - Red	Phase	2TBA	1
Q - Amber	Phase	2TBA	2
Q - Green	Phase	2TBA	3
R - Red	Phase	2TBA	4
R - Amber	Phase	2TBA	5
R - Green	Phase	2TBA	6
S - Red	Phase	2TBA	7
S - Amber	Phase	2TBA	8
S - Green	Phase	2TBA	9
T - Red	Phase	2TBA	10
T - Amber	Phase	2TBA	11
T - Green	Phase	2TBA	12

Phase Driver Card 3

	Used For	Term Block	Term No
U - Red	Phase	2TBB	1
U - Amber	Phase	2TBB	2
U - Green	Phase	2TBB	3
V - Red	Phase	2TBB	4
V - Amber	Phase	2TBB	5
V - Green	Phase	2TBB	6
W - Red			
W - Amber			
W - Green			
X - Red			
X - Amber			
X - Green			

Vorks Order :
EM Number : E69175
Engineer : P M ROUSE
ntersection : Windsor Rd / Penarth Rd Vale of Glamorgan J40521

I/O - Group DFM Timings

I/O - Group DFM Timings

Input Group	State	SET A	SET B	SET C	SET D
Group 0	Active (Mins)	30	30	30	30
	InActive (Hrs)	18	24	36	48
Group 1	Active (Mins)	96	96	96	96
	InActive (Hrs)	48	24	36	48
Group 2	Active (Mins)	30	30	30	30
	InActive (Hrs)	18	18	18	18
Group 3	Active (Mins)	30	30	30	30
	InActive (Hrs)	18	18	18	18
Group 4	Active (Mins)	30	30	30	30
	InActive (Hrs)	18	18	18	18
Group 5	Active (Mins)	30	30	30	30
	InActive (Hrs)	18	18	18	18
Group 6	Active (Mins)	30	30	30	30
	InActive (Hrs)	18	18	18	18
Group 7	Active (Mins)	30	30	30	30
	InActive (Hrs)	18	18	18	18

Note - 255 or blank disables DFM monitoring of that state (active or inactive) during that timeset (A to

Handset Limiting Values

State	Min	Max
Active (Mins)	0	255
InActive (Hrs)	0	255

Index

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Administration

02001

General Specifications

Customer Name: VALE OF GLAMORGAN
Intersection/ General Description: CARDIFF ROAD / THE MURCH
Controller: ● New ○ Modification
Area Specifications/ Customer Drawings: STS68427
Specification Section:
Contract/Tender Ref:
Quotation No.:
Works Order No.:

Customer Order No.:
Controller/ Serial Number:
S.T.S. /EM Number: E68427 Issue 4
Equipment Installation by: SIEMENS TRAFFIC
Slot Cutting by:
Civil Works by:
Customer's Engineer: COLIN HILL
Telephone Number: 02920 673063

Signal Company Use Only

Signal Engineer: P M ROUSE
(IF Prom Label as >) Prom Number: 16276 Prom Variant: 427
Configuration Check Value: 36 1 0 FA

Controller Options

Hardware: T800
Firmware Type and Issue: PB800 ISS 19
Other Options: KTD LO

ST900/ST750 Series Cabinet Options

Cabinet/Rack
Kit Type Options ○ ○ ○ ○
Cabinet/Rack Variant
Cuckoo Options ☐

Mains Supply: 240 Volts 50 Hz
Peak Lamp Current: 11 Amps
Average Lamp Power: 2206 Watts
Total Average Power: 2267 Watts
Dimming Voltage: 160
Answer Issue: 0
Edit Issue: 12
Date Created: 06/05/03

Power feed fuse rating: requires 30 Amp minimum for controller, 15 Amp minimum for pelican/lightly loaded controller

---

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Streams, Stages, Phases Control

Select Object to Add/Delete/Insert

Streams

○ Current Number of Streams: 1

Phases

○ Current Total Number of Phases: 8
● Number of Real Phases: 8
○ Number of Dummy Phases: 0

Stages

○ Current Number of stages (inc. ALL-RED stages): 8

Switched Signs

○ Number of Switched Signs: 0

Action

Add At
Delete At

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Facilities/Modes Enabled and Mode Priority Levels

Facilities

☑ Manual Control
☐ Manual Step On Mode
☑ CLF (Base Time)
☐ CLF (non-Base Time)
☑ UTC Facility
☐ Hurry Call Mode
☐ Priority
☐ Emergency Vehicles

7 Starting Intergreen

☐ Part Time
☑ Master Time Clock
☑ RED Lamp Monitoring
☑ Lamp Monitoring
☐ Linked Fixed Time
☑ FT To Current MAX
☐ Speed Measurement
☐ Download To Level 3

☐ London IMU
☐ Extend All Red
☐ Fail To Hardware Flashing
☐ Ripple Change
☐ Non-UK

☐ Pelican/Puffin/Toucan Facilities
☐ Standalone Manual
☐ Holiday Clock
☐ Fail to Part Time
☑ Serial MOVA
☑
☐ Free-Standing OTU
☐ Integral OTU

Mode Priority

PRIORITY	1	2	3	4	5	6	7	8	9	10	11
Part Time	○	○	○	○	○	○	○	○	○	○	○
Emergency Vehicle	○	○	○	○	○	○	○	○	○	○	○
Hurry Call	○	○	○	○	○	○	○	○	○	○	○
Selected Man Cntrl	●	○	○	○	○	○	○	○	○	○	○
UTC	○	○	●	○	○	○	○	○	○	○	○
Manual Step On	○	○	○	○	○	○	○	○	○	○	○
Selected FT or VA or CLF	○	●	○	○	○	○	○	○	○	○	○
Cableless Link (CLF)	○	○	○	●	○	○	○	○	○	○	○
Priority Vehicle	○	○	○	○	○	○	○	○	○	○	○
Vehicle Actuated	○	○	○	○	●	○	○	○	○	○	○
Fixed Time	○	○	○	○	○	●	○	○	○	○	○

Configuration Complexity

○ Low ○ Medium ○ High ● Maximum

standard.8DF
Default PROM data file

Correspondence Monitoring to inc.

☑ Reds ☑ Ambers
☐ Switched Signs ☐ Ignore Reds and Ambers during Fail to Part Time

Flash Rate (ms)

400 Off 400 On

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

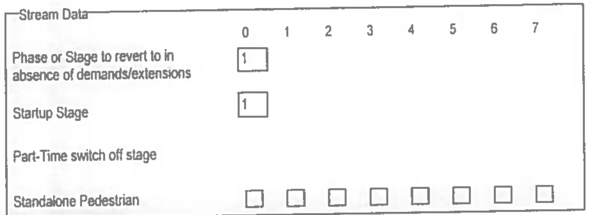
Phases in Stages

Phases

In Stages	A	B	C	D	E	F	G	H
0								
1	■	■						
2	■		■					
3		■		■				
4			■	■	□			
5					□	■		
6							■	
7								■

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

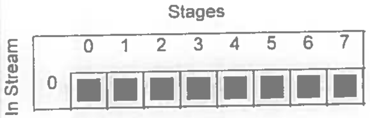
Stages in Streams



Stream Data

	0	1	2	3	4	5	6	7
Phase or Stage to revert to in absence of demands/extensions	1							
Startup Stage	1							
Part-Time switch off stage								
Standalone Pedestrian	☐	☐	☐	☐	☐	☐	☐	☐

NB : For a Stand-Alone Stream, the reversion must be to All Red stage or Traffic stage/phase to meet the relevant standard or specification.

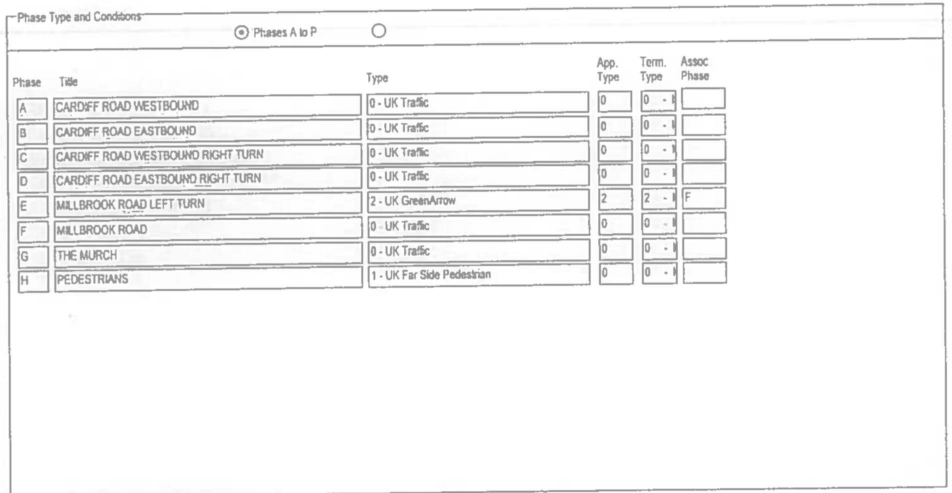


Stages

In Stream	0	1	2	3	4	5	6	7
0	■	■	■	■	■	■	■	■

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Phase Type and Conditions



Phase Type and Conditions

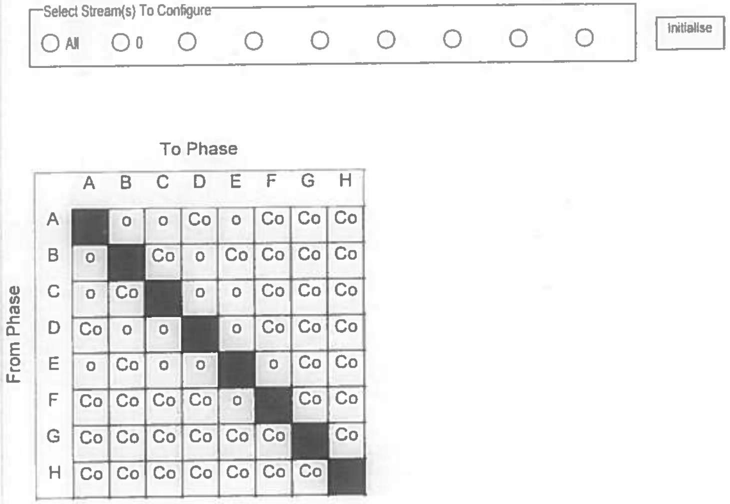
● Phases A to P ○

Phase	Title	Type	App. Type	Term. Type	Assoc Phase
A	CARDIFF ROAD WESTBOUND	0 - UK Traffic	0	0 -	
B	CARDIFF ROAD EASTBOUND	0 - UK Traffic	0	0 -	
C	CARDIFF ROAD WESTBOUND RIGHT TURN	0 - UK Traffic	0	0 -	
D	CARDIFF ROAD EASTBOUND RIGHT TURN	0 - UK Traffic	0	0 -	
E	MILLBROOK ROAD LEFT TURN	2 - UK GreenArrow	2	2 -	F
F	MILLBROOK ROAD	0 - UK Traffic	0	0 -	
G	THE MURCH	0 - UK Traffic	0	0 -	
H	PEDESTRIANS	1 - UK Far Side Pedestrian	0	0 -	

1) App Types 0 = Always Appears, 1 = Appears if dem'd prior to interstage, 2 = If dem'd, 3 = If dem'd before end of window time
2) Term Types 0 = Term's at end of stage 1 = Term's when Assoc phase gains R O W 2 = Term's when Assoc phase loses R.O.W.
3) The H/W Fail Flash fields are for information only on all but ST900ELV Controllers. For other controllers, physical switches or links (etc) select which aspects flash and these need to be set up manually

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Opposing and Conflicting Phases



Select Stream(s) To Configure

○ All ○ 0 ○ ○ ○ ○ ○ ○ ○

Initialise

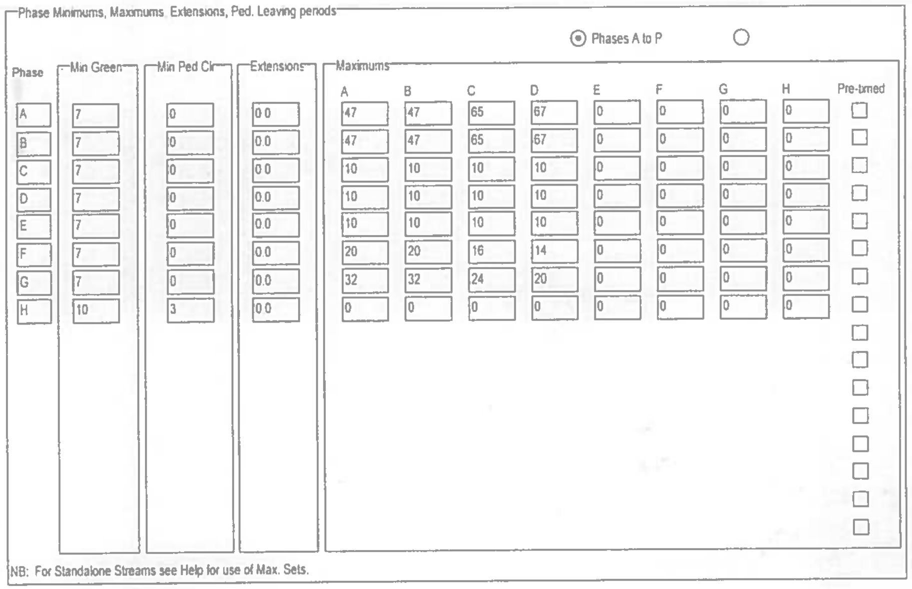
To Phase

From Phase

	A	B	C	D	E	F	G	H
A	■	o	o	Co	o	Co	Co	Co
B	o	■	Co	o	Co	Co	Co	Co
C	o	Co	■	o	o	Co	Co	Co
D	Co	o	o	■	o	Co	Co	Co
E	o	Co	o	o	■	o	Co	Co
F	Co	Co	Co	Co	o	■	Co	Co
G	Co	Co	Co	Co	Co	Co	■	Co
H	Co	Co	Co	Co	Co	Co	Co	■

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Phase Minimums, Maximums, Extensions, Ped. Leaving periods



Phase Minimums, Maximums, Extensions, Ped. Leaving periods

● Phases A to P ○

Phase	Min Green	Min Ped Clr	Extensions	Maximums A	B	C	D	E	F	G	H	Pre-timed
A	7	0	0 0	47	47	65	67	0	0	0	0	☐
B	7	0	0.0	47	47	65	67	0	0	0	0	☐
C	7	0	0 0	10	10	10	10	0	0	0	0	☐
D	7	0	0.0	10	10	10	10	0	0	0	0	☐
E	7	0	0.0	10	10	10	10	0	0	0	0	☐
F	7	0	0.0	20	20	16	14	0	0	0	0	☐
G	7	0	0.0	32	32	24	20	0	0	0	0	☐
H	10	3	0 0	0	0	0	0	0	0	0	0	☐
												☐
												☐
												☐
												☐
												☐
												☐
												☐
												☐

NB: For Standalone Streams see Help for use of Max. Sets.

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Phase Intergreen Times

Select Stream(s) To Configure

○ All ○ 0 ○ ○ ○ ○ ○ ○ ○

NB: On a Stand Alone Pelican/Toucan/Puffin Stream the Intergreens between Pedestrian and Traffic Phases are controlled by the timings (PBT, PIT, CMX, CDY, CRD and PAR), therefore 0 should be entered for the appropriate intergreen times in grid below

To Phase

From Phase	A	B	C	D	E	F	G	H
A	■			6		5	6	10
B		■	6		6	6	7	10
C		5	■			5	5	10
D	5			■		5	5	10
E		5			■		5	10
F	6	5	5	6		■	5	10
G	5	6	6	6	6	5	■	10
H	10	10	10	10	10	10	10	■

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Handset Intergreen Limits

HIGH 199

Copy Intergreen Values

To Phase

From Phase	A	B	C	D	E	F	G	H
A	■			5		5	5	8
B		■	5		5	5	5	8
C		5	■			5	5	8
D	5			■		5	5	8
E		5			■		5	8
F	5	5	5	5		■	5	8
G	5	5	5	5	5	5	■	8
H	8	8	8	8	8	8	8	■

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Phase Timing Handset Ranges

Phase Timing Handset Ranges

Initialise Min Green Limits

Phase	Min. Green Min.	Min. Green Max.
A	3	255
B	3	255
C	3	255
D	3	255
E	3	255
F	3	255
G	3	255
H	3	255
I		
J		
K		
L		
M		
N		
O		
P		

Phase	Min. Green Min.	Min. Green Max.
Q		
R		
S		
T		
U		
V		
W		
X		
Y		
Z		
A2		
B2		
C2		
D2		
E2		
F2		

	Min.	Max.
Max. Green	0	255
Vehicle Extension	0.0	10.0
Phase Delay	0	30
Starting I/G	4	12
Min Ped Clr (PBT)	0	12
Traffic Phase Leaving	3.0	3.0
Traffic Phase Red/Amber	2	2

Modified 15/03/11, Issue 4.0.12

Form Ref: 2.3.4

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Phase - VA Demand and Extend Definitions

VA Demand and Extend Definitions

● Phases A to P ○

Demands

For Unlatched demands preceed the name with a #
Conditioning MUST be used to specify unlatched demands.

Phase				
A	AX2	ASL4		
B	BX7	BSL9		
C	CX3	#CSL5		
D	DX8	#DSL10		
E	ESL12			
F	FX11	#FSL13		
G	GX14	#GSL15		
H	PEDH1	PEDH2	PEDH3	PEDH4

Extensions

Phase				
A	AX2	ASL4		
B	BX7	BSL9		
C	CX3	CSL5		
D	DX8	DSL10		
E				
F	FX11	FSL13	ESL12	
G	GX14	GSL15		
H				

Last Modified 15/03/11, Issue 4.0.12

Form Ref. 2.4

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Phase Internal/Revertive Demands

Phase Internal/Revertive Demands

Start-up Vehicle Responsive Demands

A ☑ B ☑ C ☑ D ☑ E ☑ F ☑ G ☑ H ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Demands Inserted When Leaving Manual and Fixed Time Modes

A ☑ B ☑ C ☑ D ☑ E ☑ F ☑ G ☑ H ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Unlatched Demands that Start Max Timers

A ☑ B ☑ C ☑ D ☑ E ☑ F ☑ G ☑ H ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Revertive Phase Demands

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
A	B	C	D	F	F	G									
Q	R	S	T	U	V	W	X	Y	Z	A2	B2	C2	D2	E2	F2

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Stage Internal Demands / Ped. Window Times

Stage Internal Demands / Ped. Window Times

Start-up Vehicle Responsive Demands

0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Demands Inserted When Leaving Manual and Fixed Time Modes

0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Unlatched Demands that Start Maximum Timers

0 ☑ 1 ☑ 2 ☑ 3 ☑ 4 ☑ 5 ☑ 6 ☑ 7 ☑ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Window Times

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0	0	0	0								
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Phase delays

Phase delays

● Phase Delays 0-29 ○ Phase Delays 30-59 ○ Phase Delays 60-89 ○ Phase Delays 90-119

No.	Delay Phase	On Change from Stage	To Stage	By (X) Seconds	No.	Delay Phase	On Change from Stage	To Stage	By (X) Seconds
0	E	0	4	2	15				0
1				0	16				0
2				0	17				0
3				0	18				0
4				0	19				0
5				0	20				0
6				0	21				0
7				0	22				0
8				0	23				0
9				0	24				0
10				0	25				0
11				0	26				0
12				0	27				0
13				0	28				0
14				0	29				0

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Fixed Time

Fixed Time

Stage Moves & Times (Not Fixed Time to Current Max)

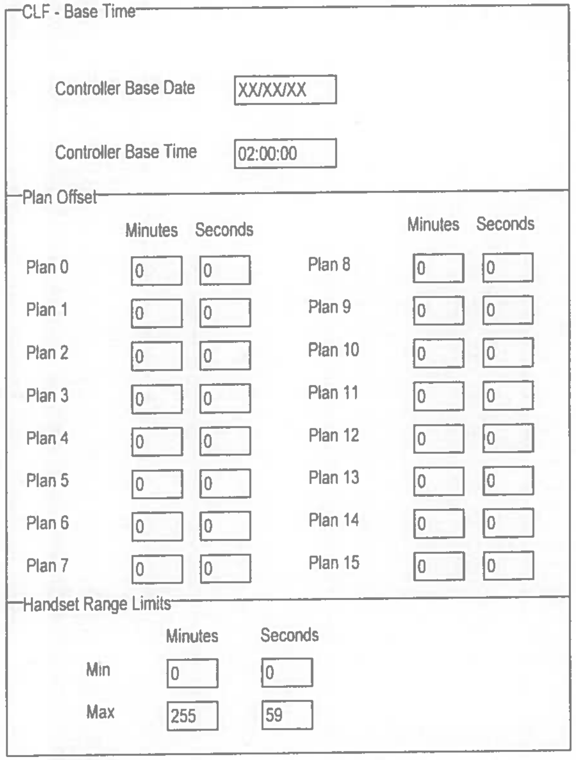
Current Stage	0	1	2	3	4	5	6	7
Next Stage								
Time								
Current Stage	8	9	10	11	12	13	14	15
Next Stage								
Time								
Current Stage	16	17	18	19	20	21	22	23
Next Stage								
Time								
Current Stage	24	25	26	27	28	29	30	31
Next Stage								
Time								

Phases Demanded and Extended under Fixed Time to Current Max

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Demand	☑	☑	☑	☑	☐	☑	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
Extend	☑	☑	☑	☑	☐	☑	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Q	R	S	T	U	V	W	X	Y	Z	A2	B2	C2	D2	E2	F2
Demand	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Extend	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

CLF - Base Time



CLF - Base Time

Controller Base Date: XX/XX/XX

Controller Base Time: 02:00:00

Plan Offset

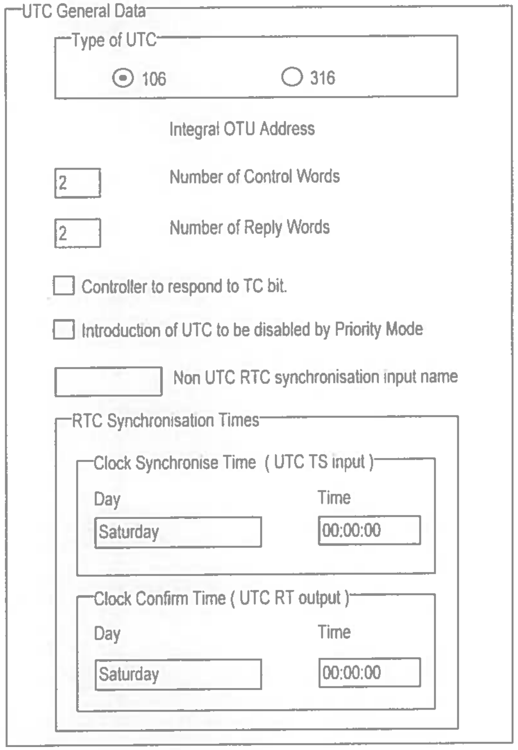
	Minutes	Seconds		Minutes	Seconds
Plan 0	0	0	Plan 8	0	0
Plan 1	0	0	Plan 9	0	0
Plan 2	0	0	Plan 10	0	0
Plan 3	0	0	Plan 11	0	0
Plan 4	0	0	Plan 12	0	0
Plan 5	0	0	Plan 13	0	0
Plan 6	0	0	Plan 14	0	0
Plan 7	0	0	Plan 15	0	0

Handset Range Limits

	Minutes	Seconds
Min	0	0
Max	255	59

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

UTC General Data



UTC General Data

Type of UTC

● 106 ○ 316

Integral OTU Address

2 Number of Control Words

2 Number of Reply Words

☐ Controller to respond to TC bit.

☐ Introduction of UTC to be disabled by Priority Mode

Non UTC RTC synchronisation input name:

RTC Synchronisation Times

Clock Synchronise Time (UTC TS input)

Day: Saturday
Time: 00:00:00

Clock Confirm Time (UTC RT output)

Day: Saturday
Time: 00:00:00

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

UTC Control and Reply Data Format

UTC Control and Reply Data Format

Control Words

	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8
Word 1	F1	F2	F3	F4	F5	F6	F7	
Word 2								
Word 3								
Word 4								

Reply Words

	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8
Word 1	G1	G2	G3	G4	G5	G6	G7	GA
Word 2	GB	GC	GD	GE				
Word 3								
Word 4								
Word 5								
Word 6								
Word 7								
Word 8								
Word 9								
Word 10								
Word 11								
Word 12								
Word 13								
Word 14								

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

UTC Stage and Modes Data Definitions

UTC Stage and Modes Data Definitions

Stage	Force Bit	Green Confirm Bit	Demand Confirm Bit	Stage	Force Bit	Green Confirm Bit	Demand Confirm Bit
0				16			
1	F1	G1		17			
2	F2	G2		18			
3	F3	G3		19			
4	F4	G4		20			
5	F5	G5		21			
6	F6	G6		22			
7	F7	G7		23			
8				24			
9				25			
10				26			
11				27			
12				28			
13				29			
14				30			
15				31			

Mode Data Definitions

Manual Mode Operative
☐ G1/G2 ☐ RR ☐

Manual Mode Selected:
☐ G1/G2 ☐ RR ☐

No Lamp Power, or Lamps Off due to RLM
☐ G1/G2 ☐ ☐

Detector Fault:
☐ ☐ ☐ DF

Normal NOT selected on the Manual Panel:
☐ G1/G2 ☐ RR ☐

RR Button Selected:
☐ G1/G2 ☐ RR ☐

If UTC Reply Confirms are required for a Controller Fault (CF) OR for separate MC and RR replies, Conditioning must be used.

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Serial MOVA

Serial MOVA

1	AIN1	2	AX2	3	CX3	4	ASL4	5	CSL5	6	BIN6	7	BX7	8	DX8
9	BSL9	10	DSL10	11	FX11	12	ESL12	13	FSL13	14	GX14	15	GSL15	16	
17		18		19		20		21		22		23		24	
25		26		27		28		29		30		31		32	
33		34		35		36		37		38		39		40	
41		42		43		44		45		46		47		48	
49		50		51		52		53		54		55		56	
57		58		59		60		61		62		63		64	

Note - only 32 detectors available on MOVA 4.0

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

MTC - Time Switch Parameters

MTC - Time Switch Parameters

	Type	Event		Type	Event
0	Alternate Max	MAXSETB	16	No Action	
1	Alternate Max	MAXSETC	17	No Action	
2	Alternate Max	MAXSETD	18	No Action	
3	Alternate DFM	ALTDFMB	19	No Action	
4	Alternate DFM	ALTDFMC	20	No Action	
5	Alternate DFM	ALTDFMD	21	No Action	
6	No Action		22	No Action	
7	No Action		23	No Action	
8	No Action		24	No Action	
9	No Action		25	No Action	
10	No Action		26	No Action	
11	No Action		27	No Action	
12	No Action		28	No Action	
13	No Action		29	No Action	
14	No Action		30	No Action	
15	No Action		31	No Action	

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

MTC - Time Switch Parameters Array

Parameters

Events	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
MAXSETB		■																														
MAXSETC			■																													
MAXSETD				■																												
ALTDFMB																																
ALTDFMC																																
ALTDFMD																																
UnUsed																																
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Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

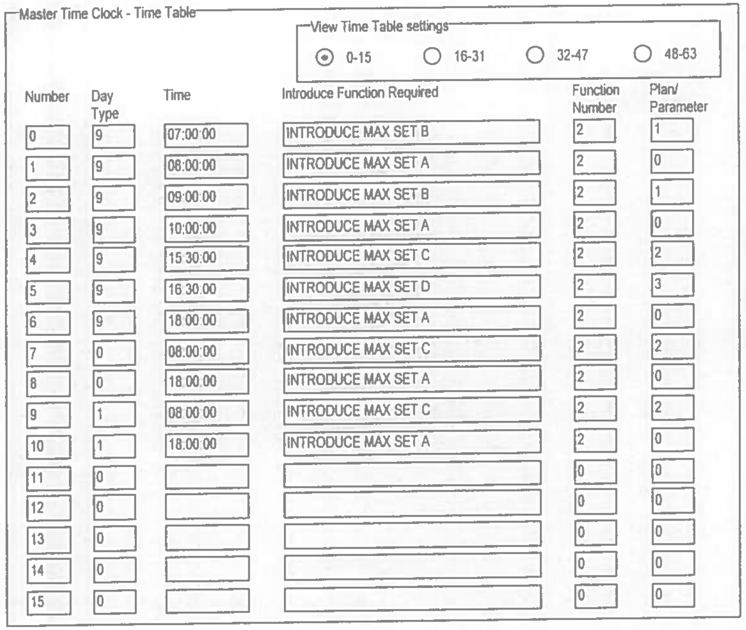
Master Time Clock - Day Type

Master Time Clock - Day Type

No	Mon	Tue	Wed	Thu	Fri	Sat	Sun
0	☐	☐	☐	☐	☐	☑	☐
1	☐	☐	☐	☐	☐	☐	☑
2	☑	☐	☐	☐	☐	☐	☐
3	☐	☑	☐	☐	☐	☐	☐
4	☐	☐	☑	☐	☐	☐	☐
5	☐	☐	☐	☑	☐	☐	☐
6	☐	☐	☐	☐	☑	☐	☐
7	☑	☑	☑	☑	☑	☑	☑
8	☑	☑	☑	☑	☑	☑	☐
9	☑	☑	☑	☑	☑	☐	☐
10	☐	☐	☐	☐	☐	☐	☐
11	☐	☐	☐	☐	☐	☐	☐
12	☐	☐	☐	☐	☐	☐	☐
13	☐	☐	☐	☐	☐	☐	☐
14	☐	☐	☐	☐	☐	☐	☐
15	☐	☐	☐	☐	☐	☐	☐

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Master Time Clock - Time Table



Master Time Clock - Time Table

View Time Table settings

● 0-15 ○ 16-31 ○ 32-47 ○ 48-63

Number	Day Type	Time	Introduce Function Required	Function Number	Plan/ Parameter
0	9	07:00:00	INTRODUCE MAX SET B	2	1
1	9	08:00:00	INTRODUCE MAX SET A	2	0
2	9	09:00:00	INTRODUCE MAX SET B	2	1
3	9	10:00:00	INTRODUCE MAX SET A	2	0
4	9	15:30:00	INTRODUCE MAX SET C	2	2
5	9	16:30:00	INTRODUCE MAX SET D	2	3
6	9	18:00:00	INTRODUCE MAX SET A	2	0
7	0	08:00:00	INTRODUCE MAX SET C	2	2
8	0	18:00:00	INTRODUCE MAX SET A	2	0
9	1	08:00:00	INTRODUCE MAX SET C	2	2
10	1	18:00:00	INTRODUCE MAX SET A	2	0
11	0			0	0
12	0			0	0
13	0			0	0
14	0			0	0
15	0			0	0

Function Numbers

0 = Isolate From CLF

1 = Introduce a CLF Plan

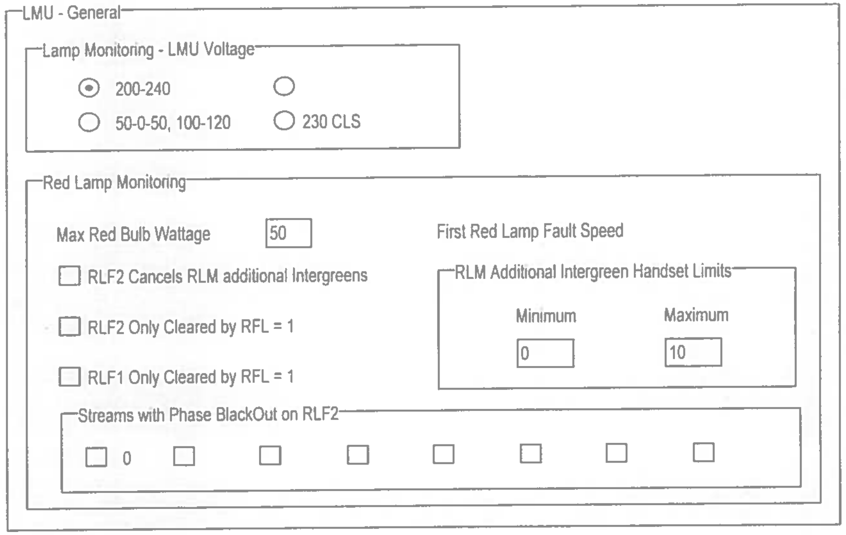
2 = Introduce a Parameter (Combination of event switches

3 = Selects an Individual event switch to be set

4 = Selects an Individual event switch to be cleared

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

LMU - General



LMU - General

Lamp Monitoring - LMU Voltage

● 200-240 ○
○ 50-0-50, 100-120 ○ 230 CLS

Red Lamp Monitoring

Max Red Bulb Wattage 50

First Red Lamp Fault Speed

☐ RLF2 Cancels RLM additional Intergreens

☐ RLF2 Only Cleared by RFL = 1

☐ RLF1 Only Cleared by RFL = 1

RLM Additional Intergreen Handset Limits

Minimum 0

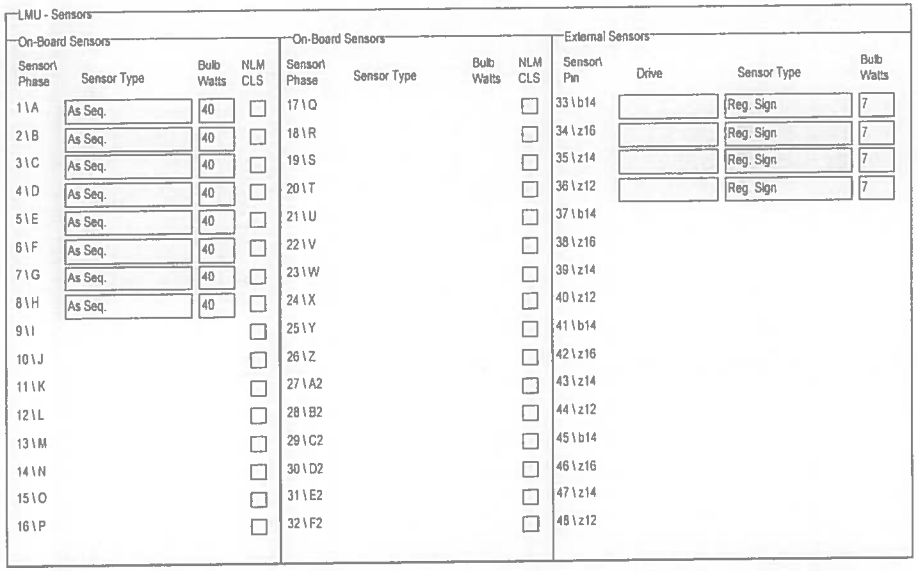
Maximum 10

Streams with Phase BlackOut on RLF2

☐ 0 ☐ ☐ ☐ ☐ ☐ ☐ ☐

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

LMU - Sensors



LMU - Sensors

On-Board Sensors

Sensor\ Phase	Sensor Type	Bulb Watts	NLM CLS
1 \ A	As Seq.	40	☐
2 \ B	As Seq.	40	☐
3 \ C	As Seq.	40	☐
4 \ D	As Seq.	40	☐
5 \ E	As Seq.	40	☐
6 \ F	As Seq.	40	☐
7 \ G	As Seq.	40	☐
8 \ H	As Seq.	40	☐
9 \ I			☐
10 \ J			☐
11 \ K			☐
12 \ L			☐
13 \ M			☐
14 \ N			☐
15 \ O			☐
16 \ P			☐

On-Board Sensors

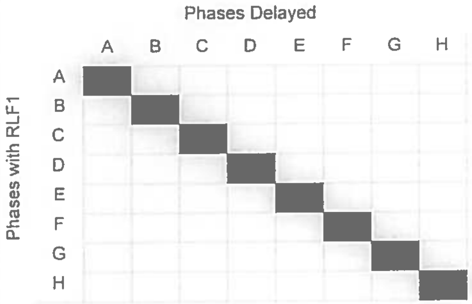
Sensor\ Phase	Sensor Type	Bulb Watts	NLM CLS
17 \ Q			☐
18 \ R			☐
19 \ S			☐
20 \ T			☐
21 \ U			☐
22 \ V			☐
23 \ W			☐
24 \ X			☐
25 \ Y			☐
26 \ Z			☐
27 \ A2			☐
28 \ B2			☐
29 \ C2			☐
30 \ D2			☐
31 \ E2			☐
32 \ F2			☐

External Sensors

Sensor\ Pin	Drive	Sensor Type	Bulb Watts
33 \ b14		Reg. Sign	7
34 \ z16		Reg. Sign	7
35 \ z14		Reg. Sign	7
36 \ z12		Reg. Sign	7
37 \ b14			
38 \ z16			
39 \ z14			
40 \ z12			
41 \ b14			
42 \ z16			
43 \ z14			
44 \ z12			
45 \ b14			
46 \ z16			
47 \ z14			
48 \ z12			

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

RLM Additional Intergreens



Phases Delayed

Phases with RLF1

	A	B	C	D	E	F	G	H
A	■							
B		■						
C			■					
D				■				
E					■			
F						■		
G							■	
H								■

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

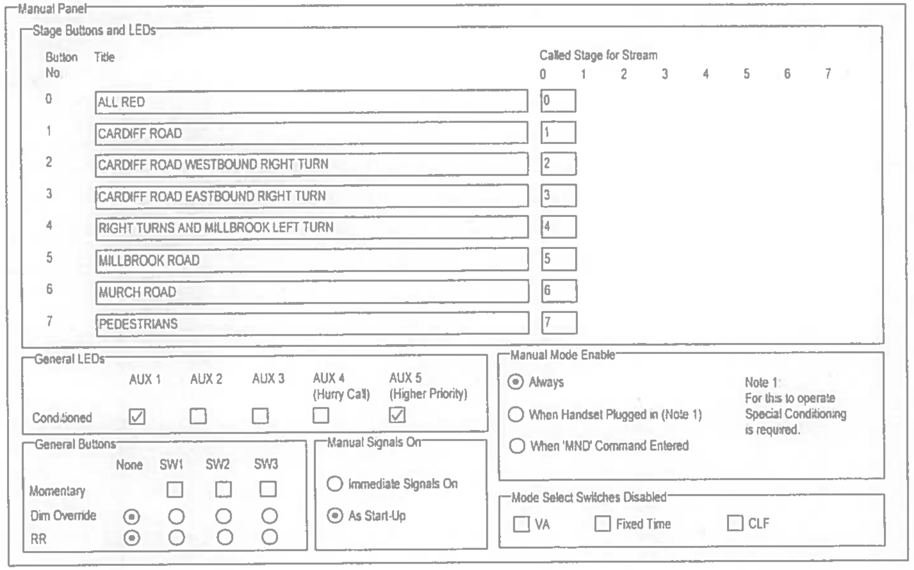
RLM Phase Inhibits

Phases Inhibited/Blacked-out

Phases with RLF2	A	B	C	D	E	F	G	H
A								■
B								■
C								■
D								■
E								
F								■
G								■
H								

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Manual Panel



Manual Panel

Stage Buttons and LEDs

Button No.	Title	Called Stage for Stream 0	1	2	3	4	5	6	7
0	ALL RED	0							
1	CARDIFF ROAD	1							
2	CARDIFF ROAD WESTBOUND RIGHT TURN	2							
3	CARDIFF ROAD EASTBOUND RIGHT TURN	3							
4	RIGHT TURNS AND MILLBROOK LEFT TURN	4							
5	MILLBROOK ROAD	5							
6	MURCH ROAD	6							
7	PEDESTRIANS	7							

General LEDs

	AUX 1	AUX 2	AUX 3	AUX 4 (Hurry Call)	AUX 5 (Higher Priority)
Conditioned	☑	☐	☐	☐	☑

General Buttons

	None	SW1	SW2	SW3
Momentary		☐	☐	☐
Dim Override	●	○	○	○
RR	●	○	○	○

Manual Signals On
○ Immediate Signals On
● As Start-Up

Manual Mode Enable
● Always
○ When Handset Plugged in (Note 1)
○ When 'MND' Command Entered

Note 1:
For this to operate Special Conditioning is required.

Mode Select Switches Disabled
☐ VA ☐ Fixed Time ☐ CLF

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Manual Mode - Optional Phases Appearance

Manual Mode - Optional Phases Appearance

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Never Appears	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Demand Dependant	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Always Appears	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○

	Q	R	S	T	U	V	W	X	Y	Z	A2	B2	C2	D2	E2	F2
Never Appears	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Demand Dependant	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Always Appears	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Special Conditioning

```
; MANUAL PANEL
; ============

PHASEE=MIL22                                           ; PHASE E AT GREEN LIGHTS AUX 1 LED
(MODE0 EQL<6>)=MIL17                                   ; MOVA ACTIVE LIGHT HIGHER PRIORITY LED



; DELAYED CALL STOP LINE LOOPS
; ============================
IFT NOT(CSL5) THN                                      ; Hold delay timer reset when CSL5 is inactive.
    RUN<1>
END
IFT PHASEC THN                                         ; If phase C is green feed CSL5 directly to MOVA.
    CSL5=MOVADET5
ELS
    CSL5.NOT(CNDTMA1):=MOVADET5                        ; If phase C is not green only feed CSL5 to MOVA
                     *=+LCPHC                          ; and demand phase C after delay time.
END

IFT NOT(DSL10) THN                                     ; Hold delay timer reset when DSL10 is inactive.
    RUN<2>
END
IFT PHASED THN                                         ; If phase D is green feed DSL10 directly to MOVA.
    DSL10=MOVADET10
ELS
    DSL10.NOT(CNDTMA2):=MOVADET10                      ; If phase D is not green only feed DSL10 to MOVA
                      *=+LCPHD                         ; and demand phase D after delay time.
END

IFT NOT(FSL13) THN                                     ; Hold delay timer reset when FSL13 is inactive.
    RUN<3>
END
IFT PHASEF THN                                         ; If phase F is green feed FSL13 directly to MOVA.
    FSL13=MOVADET13
ELS
    FSL13.NOT(CNDTMA3):=MOVADET13                      ; If phase F is not green only feed FSL13 to MOVA
                      *=+LCPHF                         ; and demand phase F after delay time.
END

IFT NOT(GSL15) THN                                     ; Hold delay timer reset when GSL15 is inactive.
    RUN<4>
END
IFT PHASEG THN                                         ; If phase G is green feed GSL15 directly to MOVA.
    GSL15=MOVADET15
ELS
    GSL15.NOT(CNDTMA4):=MOVADET15                      ; If phase G is not green only feed GSL15 to MOVA
                      *=+LCPHG                         ; and demand phase G after delay time.
END



; MOVA CONFIRMS
; =============

NOT(PHASEA)=GA                                         ; PHASE CONFIRMS
NOT(PHASEB)=GB
NOT(PHASEC)=GC
NOT(PHASED)=GD
NOT(PHASEE)=GE
PRSLMPAH.NOT(LMUINHH)=MOVADET16                        ; PED WAIT CONFIRM
```

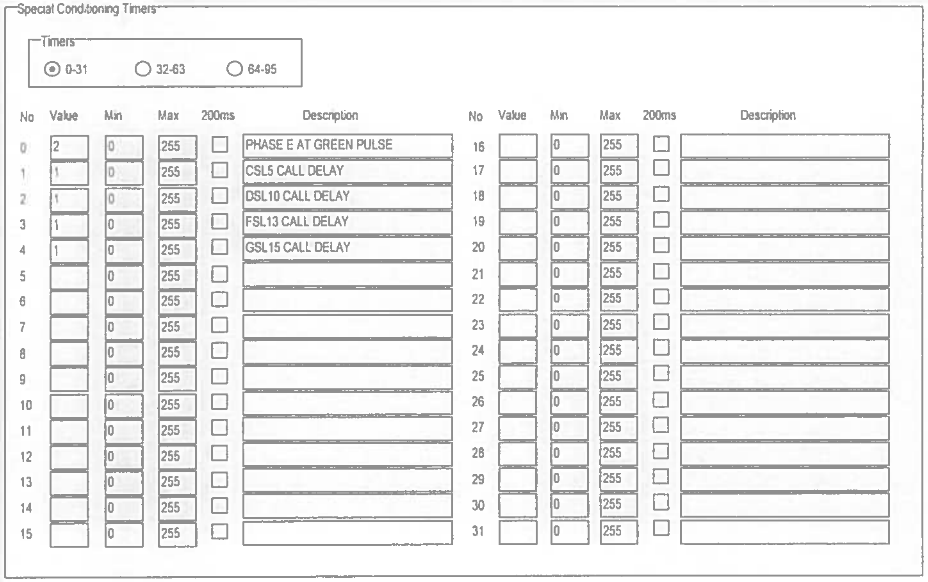
Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Special Conditioning

```
; PHASE E GREEN ARROW PULSE TO MOVA
; =================================

IFT PHASEE.NOT(SCRT0) THN                       ; PHASE E AT GREEN STARTS TIMER 0
    RUN<0>
END
CNDTMA0=MOVADET17                               ; TIMER 0 ACTIVE SETS MOVADET17 (2 SECS PULSE)
PHASEE=SCRT0                                    ; SET BIT TO STOP REPULSE
                                                ; USE DETECTOR 17 IN THE DATASET TO CALL STAGE 5



; PHASE E
; =======

IFT STAGE4.PHASEE THN                           ; IF PHASE E IS AT GREEN PREVENT ALL STAGES
    TRUE:::::=PRVST0                            ; AND INSERT A DEMAND FOR STAGE 5 TO CLOSE THE
            *=PRVST1                            ; GREEN ARROW
            *=SCRT2
            *=SCRT3
            *=PRVST6
            *=PRVST7
ELS
    FALSE:::::=PRVST0
             *=PRVST1
             *=SCRT2
             *=SCRT3
             *=PRVST6
             *=PRVST7
END
PHASEE=+UCST5
LCPHE=+UCST1



; MOVA CRB
; ========

IFT (PRSLMPRA+PRSLMPAA+PRSLMPGA) THN            ; MIN LAMPS OFF TIMER
    RUN<94>
END
IFT NOT(MODE0 EQL<6>).NOT(CNDTMA95).SSNRM THN   ; NOT IN MOVA MODE AND IN NORMAL RUN TIMER
    RUN<95>
END
IFT CNDTER95+((PRVMODO EQL<6>).NOT(MODE0 EQL<6>)) THN
    LOD<10> 2SCRTCH31
    TRUE=2SCRT239
END                                             ; START A 2 SEC INTERNAL TIMER FOR CRB TOGGLE
NOT(2SCRTST31 EQL<0>)=.2SCRT239
IFT (2SCRTST31 GRT<0>) THN
    DEC 2SCRTCH31
END
SSNRM.(NOT(2SCRT239)+(MODE0 EQL<6>)).CNDTMA94=MOVACRB   ; WHEN TIMER TERMINATES TOGGLE CRB
; VA STAGE PREVENTS
; =================

(MODE0 EQL<2>):=SCRT12                          ; STAGES 2 + 3 ARE NOT ALLOWED IN V/A MODE
             *=SCRT13
(MODE0 EQL<2>).NOT(LCPHC+UCPHC+LCPHD+UCPHD $    ; PREVENT STAGE 4 IF NO DEMAND FOR PHASES C OR D
+LCST4+UCST4)=PRVST4

(SCRT2+SCRT12)=PRVST2                           ; BITS SET PREVENT STAGE 2
(SCRT3+SCRT13)=PRVST3                           ; BITS SET PREVENT STAGE 3
```

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Special Conditioning Timers

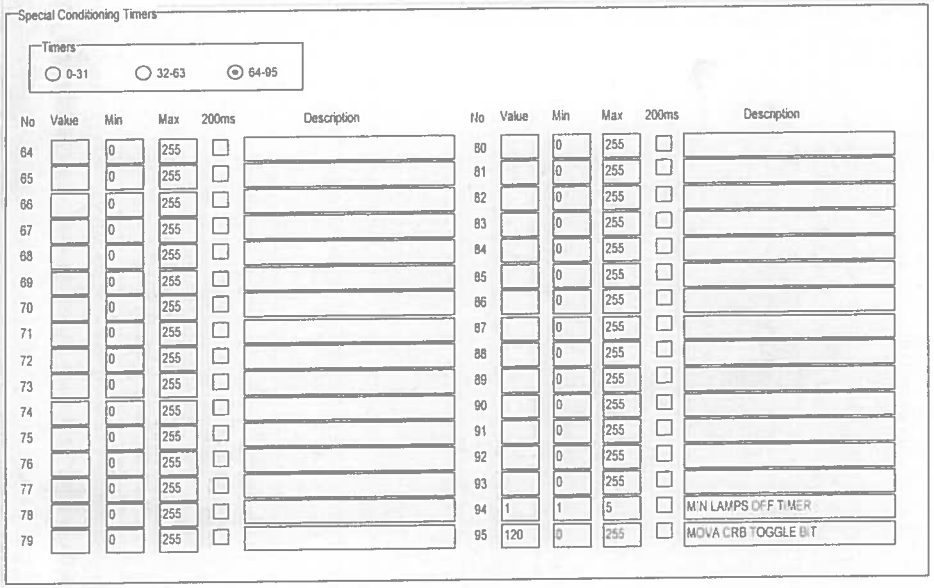


● 0-31 ○ 32-63 ○ 64-95

No	Value	Min	Max	200ms	Description	No	Value	Min	Max	200ms	Description
0	2	0	255	☐	PHASE E AT GREEN PULSE	16		0	255	☐	
1	1	0	255	☐	CSL5 CALL DELAY	17		0	255	☐	
2	1	0	255	☐	DSL10 CALL DELAY	18		0	255	☐	
3	1	0	255	☐	FSL13 CALL DELAY	19		0	255	☐	
4	1	0	255	☐	GSL15 CALL DELAY	20		0	255	☐	
5		0	255	☐		21		0	255	☐	
6		0	255	☐		22		0	255	☐	
7		0	255	☐		23		0	255	☐	
8		0	255	☐		24		0	255	☐	
9		0	255	☐		25		0	255	☐	
10		0	255	☐		26		0	255	☐	
11		0	255	☐		27		0	255	☐	
12		0	255	☐		28		0	255	☐	
13		0	255	☐		29		0	255	☐	
14		0	255	☐		30		0	255	☐	
15		0	255	☐		31		0	255	☐	

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Special Conditioning Timers



Special Conditioning Timers

Timers ○ 0-31 ○ 32-63 ● 64-95

No	Value	Min	Max	200ms	Description
64		0	255	☐	
65		0	255	☐	
66		0	255	☐	
67		0	255	☐	
68		0	255	☐	
69		0	255	☐	
70		0	255	☐	
71		0	255	☐	
72		0	255	☐	
73		0	255	☐	
74		0	255	☐	
75		0	255	☐	
76		0	255	☐	
77		0	255	☐	
78		0	255	☐	
79		0	255	☐	
80		0	255	☐	
81		0	255	☐	
82		0	255	☐	
83		0	255	☐	
84		0	255	☐	
85		0	255	☐	
86		0	255	☐	
87		0	255	☐	
88		0	255	☐	
89		0	255	☐	
90		0	255	☐	
91		0	255	☐	
92		0	255	☐	
93		0	255	☐	
94	1	1	5	☐	MIN LAMPS OFF TIMER
95	120	0	255	☐	MOVA CRB TOGGLE BIT

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Special Instructions

```
E68427
Board     Position    Skt     Port    Type I or O    Line        Cable    Block
CPU       A           X3I     0       I              00 - 07     101      1TBG
CPU       A           X3I     1       I              08 - 15              1TBH
CPU       A           X3O     11      O              88 - 91     105      1TBX
IO1       B           B       2       I              16 - 23     103      1TBJ
IO1       B           E       4       O              32 - 39              1TBK
IO1       B           C       3       I              24 - 31     103      1TBL
IO1       B           D       5       O              40 - 47              1TBM

The socket X3 on the CPU pcb is the double stacked one
X3I = Inner (nearest the board)
X3O = Outer
```

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Special Instructions

ST800 CONTROLLER ITEMS LIST SHEET 1 ('I'L')

ITEM	DRAWING NUMBER	DESCRIPTION	QTY	TOT	REMARKS
1					
2	667/1/27000/003	Cabinet 8 Phase wired 8 Phase	1		
3	667/1/27000/002	Cabinet 24 Phase wired 32 Phase			
4	667/1/27001/001	Rack 8 Phase wired 16 Phase			
5	667/1/27001/002	Rack 24 Phase wired 32 Phase			
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23	667/1/27072/001	Cableform 8 Phase (long)			
24	667/1/27002/000	Lamp Switch Kit 8 Phase			
25	667/1/27003/000	I/O Kit	1		
26	667/1/27005/000	SDE Facility Kit			
27	667/1/27004/000	Integral OTU Kit			
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39	667/1/16276/427	Configuration Eprom (Issue 4. 0)	1		
40					

Note 1:
Please refer to special instruction pages for additional information on items marked with an '*'.

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Special Instructions

ST800 CONTROLLER ITEMS LIST SHEET 2 ('I'L')

ITEM	DRAWING NUMBER	DESCRIPTION	QTY	TOT	REMARKS
41					
42	667/1/27056/001	Manual Panel Assy (Intersection Cont)			
43	667/1/27056/010	Manual Panel Assy (Sigs on/off)			
44	667/1/27056/000	Manual Panel Blanking Kit			
45					
46					
47					
48					
49					
50					
51					
52	667/7/25171/000	Current Transformer			
53					
54					
55	667/1/27002/002	Lamp Switch Kit 8 Phase CLS			
56	667/1/27002/102	Lamp Switch Kit 8 Phase Export CLS			
57					
58	667/1/27000/800	CLS Mod Kit (firmware only)			
59					
60					
61	667/1/27000/101	Cabinet Export 8 Phase wired 16 Phase			
62	667/1/27000/102	Cabinet Export 24 Phase wired 32 Phase			
63	667/1/27001/101	Rack Export 8 Phase wired 16 Phase			
64	667/1/27001/102	Rack Export 24 Phase wired 32 Phase			
65	667/1/27002/100	Export Lamp Switch Kit			
66	667/1/27084/001	Dimming Assembly (1.5KVA)(Fit Std UK)			
67	667/1/27084/002	Dimming Assembly (2.0KVA)			
68	667/1/27084/003	Dimming Assembly (3.0KVA)			
69	667/1/27130/000	30A Controller Kit			
70					
71	667/1/27001/310	ST800 SE Export Rack up to 8 Phase			
72	667/1/27223/003	ST800 SE 8 Phase Driver No LMU			
73	667/1/27223/403	ST800 SE 4 Phase Driver No LMU			
74					
75					
76					
77	667/1/27000/301	ST800 P In a Cabinet 4Ph 1 Stream PED			
78	667/1/27012/000	PED 2nd Stream Kit for ST800 P			
79	667/1/27001/300	ST800 P Rack Only 4Ph 1 Stream PED			

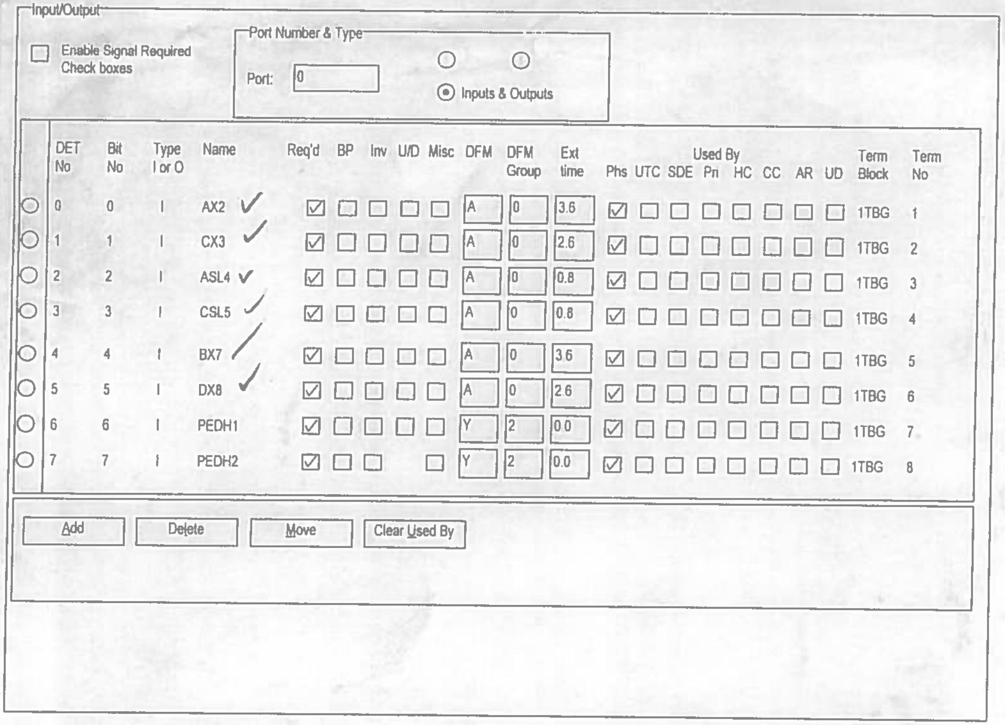
Note 2:
Ancillary Processor PLD Variants
101 OTU & LMU
102 OTU Only
103 LMU Only
104 OTU & LMU + Up/Download
105 OUT Only + Up/DownLoad
NB Controller Has built in LMU So LMU on Ancillary Processor Not required included for info only.

Note 3:
Fit Current Transformer starting from position TLB/z/16 on the first phase driver PCB. if more than 3 sensors are called up fit the 4th sensor to the second Phases driver PCB, and so on until all sensors have been used up.
TLB/b/14 - 1st sensor terminal
TLB/z/16 - 2nd sensor terminal
TLB/z/14 - 3rd sensor terminal
TLB/z/12 - 4th sensor terminal
TLB/z/12 - 4th sensor terminal

TLB/z/12 - 4th sensor terminal

ROAD / THE MURCH

Input/Output



Input/Output

☐ Enable Signal Required Check boxes

Port Number & Type

Port: 0

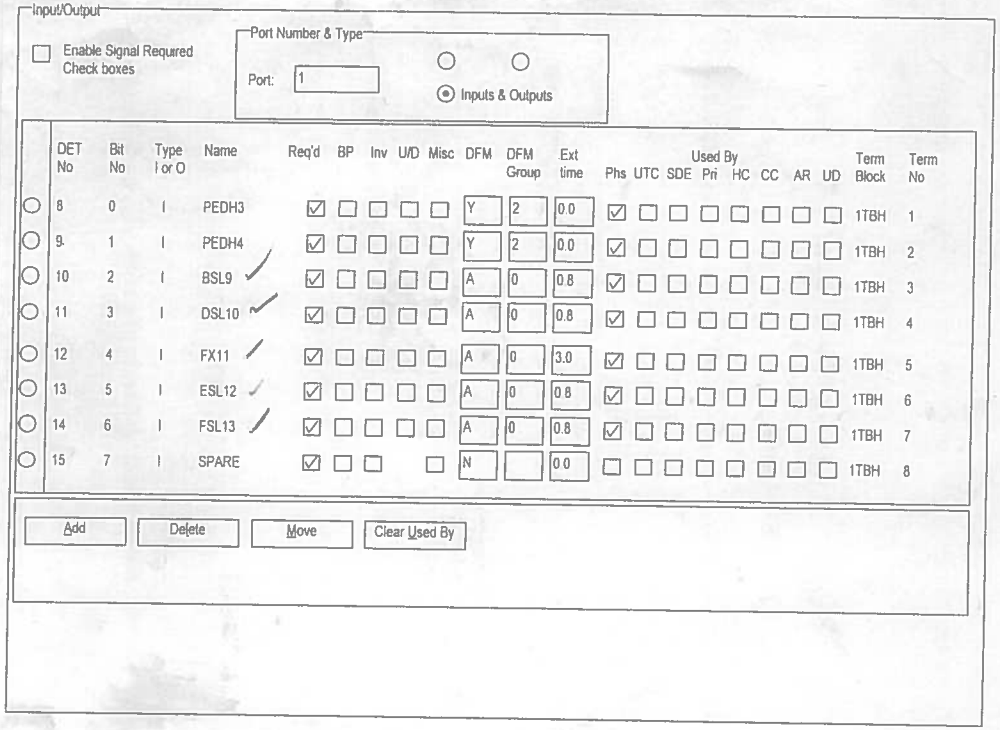
○ ○ ● Inputs & Outputs

	DET No	Bit No	Type I or O	Name	Req'd	BP	Inv	U/D	Misc	DFM	DFM Group	Ext time	Used By								Term Block	Term No
													Phs	UTC	SDE	Pri	HC	CC	AR	UD		
○	0	0	I	AX2 ✓	☑	☐	☐	☐	☐	A	0	3.6	☑	☐	☐	☐	☐	☐	☐	☐	1TBG	1
○	1	1	I	CX3 ✓	☑	☐	☐	☐	☐	A	0	2.6	☑	☐	☐	☐	☐	☐	☐	☐	1TBG	2
○	2	2	I	ASL4 ✓	☑	☐	☐	☐	☐	A	0	0.8	☑	☐	☐	☐	☐	☐	☐	☐	1TBG	3
○	3	3	I	CSL5 ✓	☑	☐	☐	☐	☐	A	0	0.8	☑	☐	☐	☐	☐	☐	☐	☐	1TBG	4
○	4	4	I	BX7 ✓	☑	☐	☐	☐	☐	A	0	3.6	☑	☐	☐	☐	☐	☐	☐	☐	1TBG	5
○	5	5	I	DX8 ✓	☑	☐	☐	☐	☐	A	0	2.6	☑	☐	☐	☐	☐	☐	☐	☐	1TBG	6
○	6	6	I	PEDH1	☑	☐	☐	☐	☐	Y	2	0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBG	7
○	7	7	I	PEDH2	☑	☐	☐		☐	Y	2	0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBG	8

Add　Delete　Move　Clear Used By

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Input/Output



Input/Output

☐ Enable Signal Required Check boxes

Port Number & Type

Port: 1

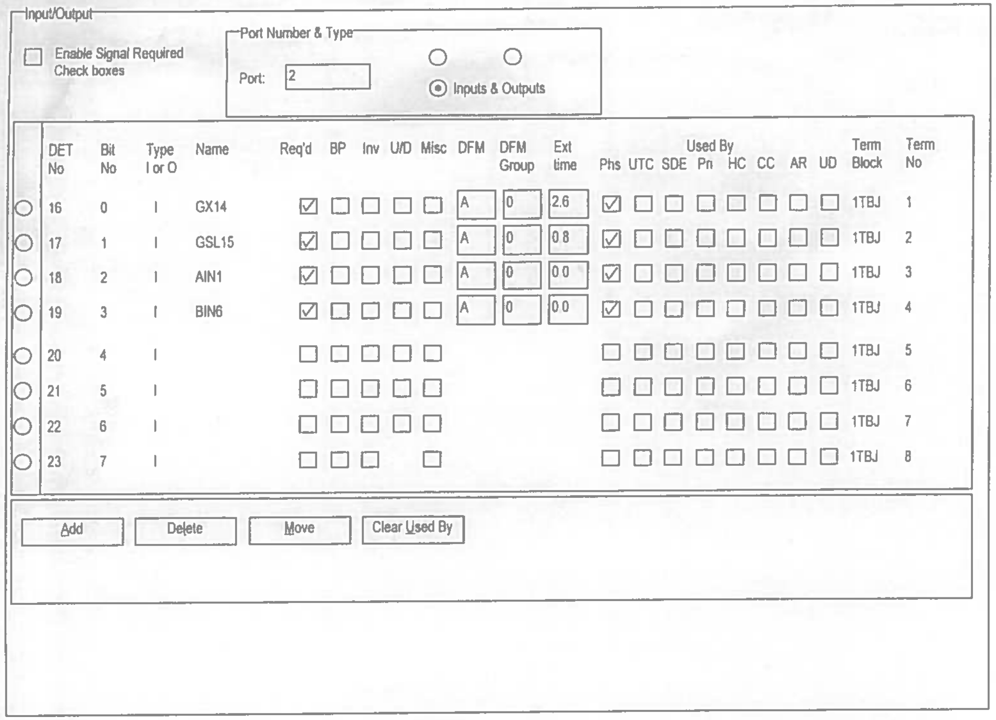
○ ○ ● Inputs & Outputs

	DET No	Bit No	Type I or O	Name	Req'd	BP	Inv	U/D	Misc	DFM	DFM Group	Ext time	Used By								Term Block	Term No
													Phs	UTC	SDE	Pri	HC	CC	AR	UD		
○	8	0	I	PEDH3	☑	☐	☐	☐	☐	Y	2	0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBH	1
○	9	1	I	PEDH4	☑	☐	☐	☐	☐	Y	2	0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBH	2
○	10	2	I	BSL9 ✓	☑	☐	☐	☐	☐	A	0	0.8	☑	☐	☐	☐	☐	☐	☐	☐	1TBH	3
○	11	3	I	DSL10 ✓	☑	☐	☐	☐	☐	A	0	0.8	☑	☐	☐	☐	☐	☐	☐	☐	1TBH	4
○	12	4	I	FX11 ✓	☑	☐	☐	☐	☐	A	0	3.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBH	5
○	13	5	I	ESL12 ✓	☑	☐	☐	☐	☐	A	0	0.8	☑	☐	☐	☐	☐	☐	☐	☐	1TBH	6
○	14	6	I	FSL13 ✓	☑	☐	☐	☐	☐	A	0	0.8	☑	☐	☐	☐	☐	☐	☐	☐	1TBH	7
○	15	7	I	SPARE	☑	☐	☐		☐	N		0.0	☐	☐	☐	☐	☐	☐	☐	☐	1TBH	8

Add　Delete　Move　Clear Used By

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Input/Output



Input/Output

☐ Enable Signal Required Check boxes

Port Number & Type

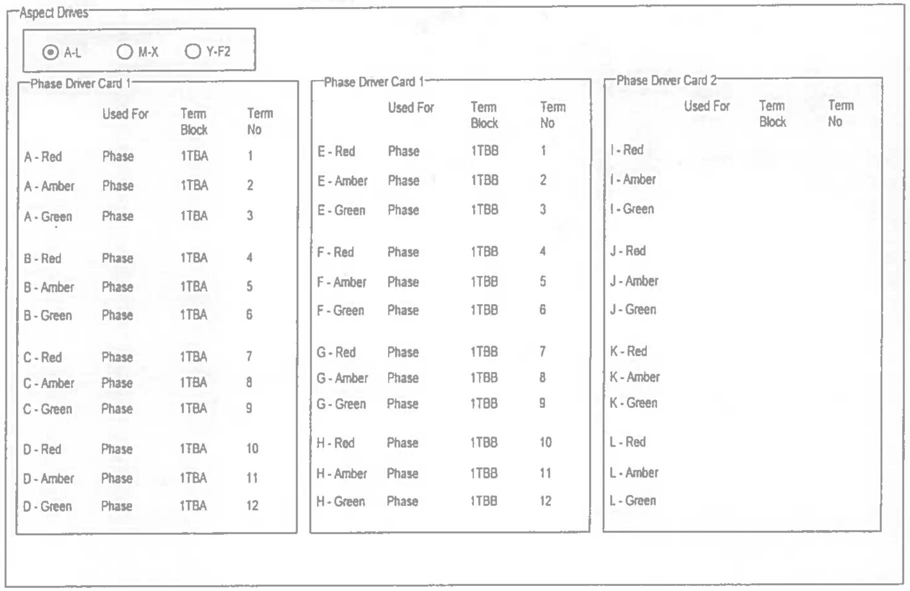
Port: 2

○ ○ ● Inputs & Outputs

	DET No	Bit No	Type I or O	Name	Req'd	BP	Inv	U/D	Misc	DFM	DFM Group	Ext time	Used By								Term Block	Term No
													Phs	UTC	SDE	Pn	HC	CC	AR	UD		
○	16	0	I	GX14	☑	☐	☐	☐	☐	A	0	2.6	☑	☐	☐	☐	☐	☐	☐	☐	1TBJ	1
○	17	1	I	GSL15	☑	☐	☐	☐	☐	A	0	0.8	☑	☐	☐	☐	☐	☐	☐	☐	1TBJ	2
○	18	2	I	AIN1	☑	☐	☐	☐	☐	A	0	0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBJ	3
○	19	3	I	BIN6	☑	☐	☐	☐	☐	A	0	0.0	☑	☐	☐	☐	☐	☐	☐	☐	1TBJ	4
○	20	4	I		☐	☐	☐	☐	☐				☐	☐	☐	☐	☐	☐	☐	☐	1TBJ	5
○	21	5	I		☐	☐	☐	☐	☐				☐	☐	☐	☐	☐	☐	☐	☐	1TBJ	6
○	22	6	I		☐	☐	☐	☐	☐				☐	☐	☐	☐	☐	☐	☐	☐	1TBJ	7
○	23	7	I		☐	☐	☐		☐				☐	☐	☐	☐	☐	☐	☐	☐	1TBJ	8

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

Aspect Drives



Aspect Drives

● A-L ○ M-X ○ Y-F2

Phase Driver Card 1

	Used For	Term Block	Term No
A - Red	Phase	1TBA	1
A - Amber	Phase	1TBA	2
A - Green	Phase	1TBA	3
B - Red	Phase	1TBA	4
B - Amber	Phase	1TBA	5
B - Green	Phase	1TBA	6
C - Red	Phase	1TBA	7
C - Amber	Phase	1TBA	8
C - Green	Phase	1TBA	9
D - Red	Phase	1TBA	10
D - Amber	Phase	1TBA	11
D - Green	Phase	1TBA	12

Phase Driver Card 1

	Used For	Term Block	Term No
E - Red	Phase	1TBB	1
E - Amber	Phase	1TBB	2
E - Green	Phase	1TBB	3
F - Red	Phase	1TBB	4
F - Amber	Phase	1TBB	5
F - Green	Phase	1TBB	6
G - Red	Phase	1TBB	7
G - Amber	Phase	1TBB	8
G - Green	Phase	1TBB	9
H - Red	Phase	1TBB	10
H - Amber	Phase	1TBB	11
H - Green	Phase	1TBB	12

Phase Driver Card 2

	Used For	Term Block	Term No
I - Red			
I - Amber			
I - Green			
J - Red			
J - Amber			
J - Green			
K - Red			
K - Amber			
K - Green			
L - Red			
L - Amber			
L - Green			

Works Order :
EM Number : E68427
Engineer : P M ROUSE
Intersection : CARDIFF ROAD / THE MURCH

I/O - Group DFM Timings

I/O - Group DFM Timings

Input Group	State	SET A	SET B	SET C	SET D
Group 0	Active (Mins)	30	30	30	30
	InActive (Hrs)	18	18	18	18
Group 1	Active (Mins)	30	30	30	30
	InActive (Hrs)	72	72	72	72
Group 2	Active (Mins)	10	10	10	10
	InActive (Hrs)				
Group 3	Active (Mins)	30	30	30	30
	InActive (Hrs)	18	18	18	18
Group 4	Active (Mins)	30	30	30	30
	InActive (Hrs)	18	18	18	18
Group 5	Active (Mins)	30	30	30	30
	InActive (Hrs)	18	18	18	18
Group 6	Active (Mins)	30	30	30	30
	InActive (Hrs)	18	18	18	18
Group 7	Active (Mins)	30	30	30	30
	InActive (Hrs)	18	18	18	18

Note - 255 or blank disables DFM monitoring of that state (active or inactive) during that timeset (

Handset Limiting Values

State	Min	Max
Active (Mins)	0	254
InActive (Hrs)	0	254

Index

Barons Court Junction

AM Peak		PM Peak	
Green Start time for Phase B -A4055 Cogan Spur	Cycle Time	Green Start time for Phase B -A4055 Cogan Spur	Cycle Time
07:56:19		16:00:59	
07:59:03	00:02:44	16:02:58	00:01:59
08:01:36	00:02:33	16:05:28	00:02:30
08:04:22	00:02:46	16:07:54	00:02:26
08:07:11	00:02:49	16:10:20	00:02:26
08:09:59	00:02:48	16:12:51	00:02:31
08:12:46	00:02:47	16:15:22	00:02:31
08:15:36	00:02:50	16:17:47	00:02:25
08:18:22	00:02:46	16:20:17	00:02:30
08:21:13	00:02:51	16:22:49	00:02:32
08:23:58	00:02:45	16:25:17	00:02:28
08:26:37	00:02:39	16:27:48	00:02:31
08:29:19	00:02:42	16:30:07	00:02:19
08:32:08	00:02:49	16:32:27	00:02:20
08:34:56	00:02:48	16:34:47	00:02:20
08:37:43	00:02:47	16:37:19	00:02:32
08:40:20	00:02:37	16:39:38	00:02:19
08:43:09	00:02:49	16:42:09	00:02:31
		16:44:26	00:02:17
Average cycle time	**00:02:45**	Average cycle time	**00:02:25**
	165		145

Merrie Harrier Junction

AM Peak		PM Peak	
Green Start time for Phase G (Barry Road)	Cycle Time	Green Start time for Phase G (Barry Road)	Cycle Time
07:44:27		15:59:35	
07:46:35	00:02:08	16:01:48	00:02:13
07:48:22	00:01:47	16:04:04	00:02:16
07:50:08	00:01:46	16:06:06	00:02:02
07:51:49	00:01:41	16:08:47	00:02:41
07:53:28	00:01:39	16:10:10	00:01:23
07:55:23	00:01:55	16:12:17	00:02:07
07:56:53	00:01:30	16:14:20	00:02:03
07:59:00	00:02:07	16:16:42	00:02:22
08:00:44	00:01:44	16:19:19	00:02:37
08:02:31	00:01:47	16:20:53	00:01:34
08:04:27	00:01:56	16:23:29	00:02:36
08:06:14	00:01:47	16:25:26	00:01:57
08:08:01	00:01:47	16:27:45	00:02:19
08:09:23	00:01:22	16:29:45	00:02:00
08:11:32	00:02:09	16:31:59	00:02:14
08:13:19	00:01:47	16:34:23	00:02:24
08:15:16	00:01:57	16:37:01	00:02:38
08:17:08	00:01:52	16:38:36	00:01:35
08:18:57	00:01:49	16:40:43	00:02:07
08:20:38	00:01:41	16:42:41	00:01:58
08:22:41	00:02:03	16:44:33	00:01:52
08:24:06	00:01:25	16:47:14	00:02:41
08:26:01	00:01:55	16:49:29	00:02:15
08:27:53	00:01:52	16:51:47	00:02:18
08:29:45	00:01:52	16:53:41	00:01:54
08:31:37	00:01:52	16:56:01	00:02:20
08:33:39	00:02:02	16:58:29	00:02:28
08:35:26	00:01:47		
08:36:54	00:01:28		
08:38:37	00:01:43		
08:40:17	00:01:40		
08:41:59	00:01:42		
08:43:29	00:01:30		
Average cycle time	**00:01:47**	Average cycle time	**00:02:11**
	107		131

Murch Road Junction

AM Peak		PM Peak	
Green Start time for Phase B (Cardiff Road SB)	Cycle Time	Green Start time for Phase B (Cardiff Road SB)	Cycle Time
07:45:05		16:06:41	
07:46:51	00:01:46	16:09:21	00:02:40
07:49:15	00:02:24	16:11:53	00:02:32
07:51:44	00:02:29	16:14:22	00:02:29
07:53:54	00:02:10	16:16:44	00:02:22
07:56:03	00:02:09	16:18:35	00:01:51
07:57:54	00:01:51	16:21:20	00:02:45
07:59:48	00:01:54	16:24:00	00:02:40
08:01:53	00:02:05	16:26:10	00:02:10
08:04:32	00:02:39	16:28:19	00:02:09
08:06:56	00:02:24	16:29:55	00:01:36
08:09:17	00:02:21	16:31:46	00:01:51
08:11:44	00:02:27	16:33:38	00:01:52
08:14:15	00:02:31	16:36:34	00:02:56
08:16:51	00:02:36	16:37:58	00:01:24
08:20:58	00:04:07	16:40:18	00:02:20
08:22:48	00:01:50	16:42:09	00:01:51
08:24:02	00:01:14	16:44:23	00:02:14
08:27:41	00:03:39	16:46:56	00:02:33
08:29:06	00:01:25	16:48:24	00:01:28
08:30:46	00:01:40	16:51:19	00:02:55
08:32:28	00:01:42	16:53:46	00:02:27
08:34:56	00:02:28	16:55:44	00:01:58
08:37:20	00:02:24	16:57:28	00:01:44
08:39:28	00:02:08		
08:42:54	00:03:26		
08:44:38	00:01:44		
08:46:14	00:01:36		
Average cycle time	**00:02:16**	Average cycle time	**00:02:12**
	136		132

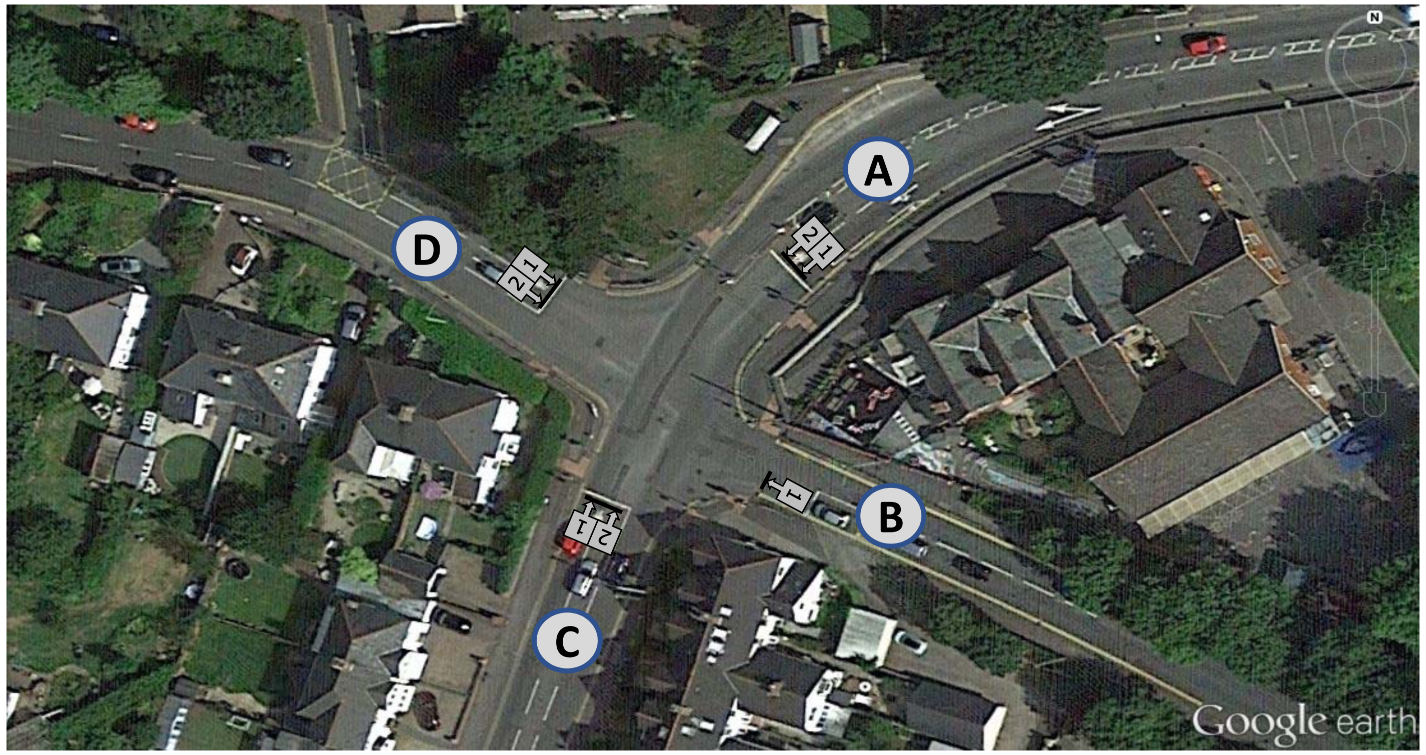
Junction	Arm Name	Arm Notation	No. of Lanes	Distance (m)	Max Surevyed Queue(PCU) on all lanes												Surevyed Mean Max Queue (PCU)	Surveyed Max Max Queue (PCU)	Base Model Linsig Mean Max Queue (PCU)
					AM Peak - 07:45-08:45														
					07:45	07:50	07:55	08:00	08:05	08:10	08:15	08:20	08:25	08:30	08:35	08:40			
Murch Road Junction	Cardiff Road North	A	2	200+	18.0	13.5	12.0	23.0	32.0	39.5	18.0	15.0	14.5	31.5	28.5	16.5	22	40	25.4
	Murch Road	B	1	200+	7.0	12.0	9.5	13.0	13.5	11.5	13.0	7.0	12.0	13.0	18.0	7.0	11	18	14.5
	Cardiff Road South	C	2	200+	25.0	20.0	16.0	15.0	13.5	10.5	19.5	16.0	17.0	13.5	20.0	7.0	16	25	17.1
	Millbrook Road	D	2	200+	3.0	3.0	4.0	4.0	2.0	5.0	4.0	3.0	4.5	4.0	4.0	3.0	4	5	3
Merrie Harrier	Penlan Road	A	2	172	8.0	8.0	4.0	7.0	7.0	14.0	7.0	4.0	7.5	7.0	5.0	6.5	7	14	12.6
	Barry Road	B	2	200+	7.0	10.0	11.0	16.0	12.5	17.0	13.0	14.0	12.0	9.5	4.0	2.0	11	17	13.3
	Andrew Road	C	1	200+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0	1	0
	Redlands Road	D	2	200+	19.0	23.0	23.0	19.0	22.0	19.0	22.0	22.0	23.5	24.0	24.0	22.0	22	24	20.7
	Cardiff Road	E	2	200+	29.0	25.0	27.5	25.0	24.0	28.0	29.5	28.0	25.0	35.0	29.0	30.5	28	35	26.3
	Corbett Road	F	1	200+	1.0	0.0	0.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0	1	0
Barons Court Junction	A4055 North	A	4	200+	29.5	29.5	33.5	35.5	29.5	31.0	32.0	33.0	34.0	34.0	33.5	36.5	33	37	18
	A4160 East	B	4	139	17.0	17.0	22.0	22.0	12.0	22.0	18.0	18.5	17.0	24.0	19.5	15.0	19	24	29.5
	A4055 South	C	4	200+	35.0	37.5	35.0	35.0	34.0	35.0	35.0	37.5	40.0	42.0	34.0	37.0	36	42	23.4
	A4160 West	D	3	200+	9.0	10.0	7.0	19.0	20.0	21.5	11.0	10.0	6.0	9.0	11.0	10.0	12	22	8.8

AM

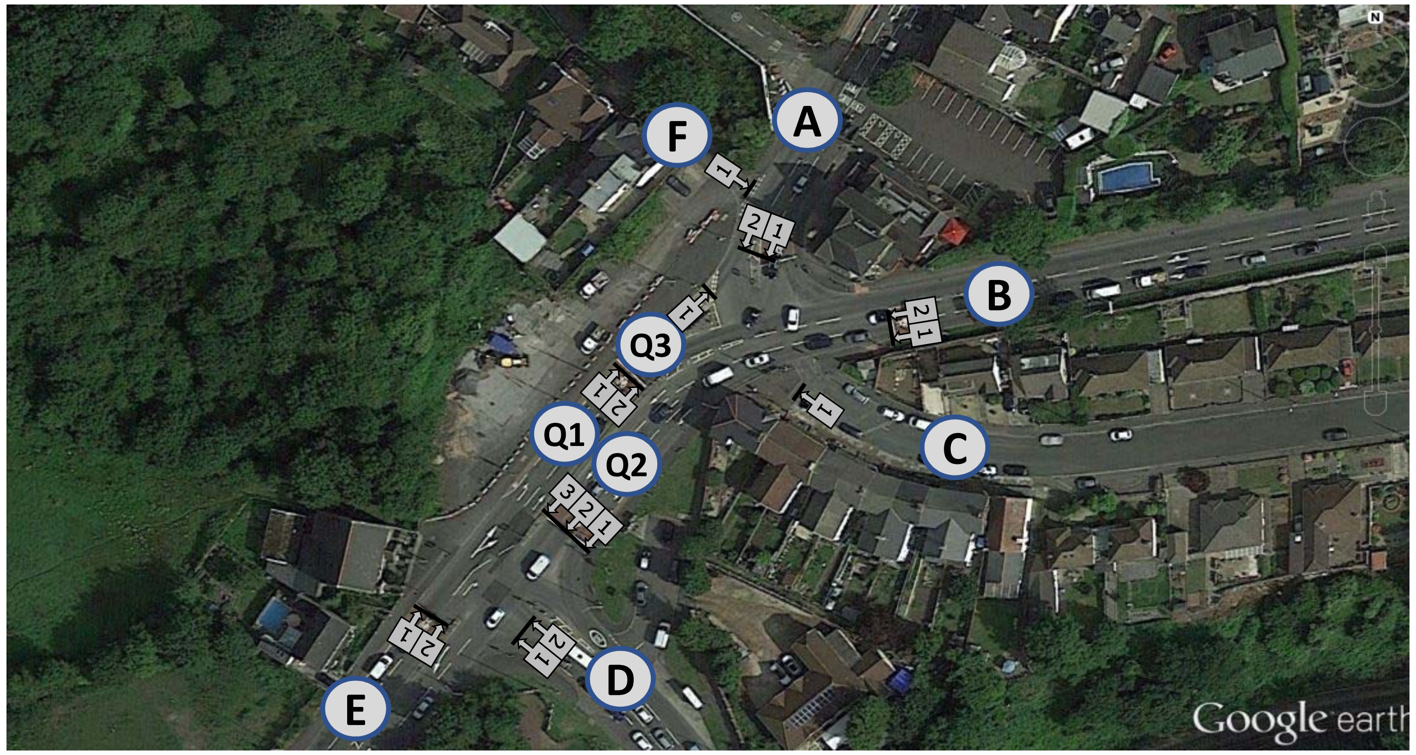
Junction	Arm Name	Arm Notation	No. of Lanes	Distance (m)	Max Surevyed Queue(PCU) on all lanes												Surevyed Mean Max Queue (PCU)	Surveyed Max Max Queue (PCU)	Base Model Linsig Mean Max Queue (PCU)
					PM Peak - 16:00-17:00														
					16:00	16:05	16:10	16:15	16:20	16:25	16:30	16:35	16:40	16:45	16:50	16:55			
Murch Road Junction	Cardiff Road North	A	2	200+	29.5	37.0	35.0	35.0	38.0	33.0	35.0	25.0	33.5	30.0	29.0	26.0	32	38	35.8
	Murch Road	B	1	200+	10.0	17.0	15.0	7.0	9.0	8.0	7.0	7.0	6.0	10.5	10.5	4.5	9	17	13.1
	Cardiff Road South	C	2	200+	18.5	16.0	16.0	20.0	22.0	9.0	10.5	10.0	19.0	14.0	16.5	11.0	15	22	15.9
	Millbrook Road	D	2	200+	3.0	5.0	6.0	10.0	9.0	11.0	6.0	10.0	6.0	7.0	7.0	10.0	8	11	12.3
Merrie Harrier	Penlan Road	A	2	172	18.0	17.0	11.0	30.0	33.0	18.0	20.0	30.0	12.0	12.5	18.0	23.0	20	33	20.4
	Barry Road	B	2	200+	40.0	20.0	28.0	33.5	17.0	28.5	19.0	18.0	19.0	9.0	15.0	11.0	22	40	28
	Andrew Road	C	1	200+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0
	Redlands Road	D	2	200+	20.0	19.0	19.0	19.0	18.0	25.0	17.0	12.0	11.0	19.5	17.0	15.0	18	25	18.6
	Cardiff Road	E	2	200+	14.0	27.0	25.0	21.0	22.0	18.0	20.0	21.0	23.0	26.0	24.5	22.5	22	27	28.8
	Corbett Road	F	1	200+	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	1	0
Barons Court Junction	A4055 North	A	4	200+	26.0	27.5	32.5	29.5	42.0	37.0	33.0	35.0	34.0	35.0	34.0	35.0	33	42	17.9
	A4160 East	B	4	139	17.0	19.0	17.0	17.0	16.0	17.0	14.0	18.0	15.0	12.5	18.0	19.0	17	19	14.8
	A4055 South	C	4	200+	17.0	19.5	16.5	22.0	17.0	21.0	16.0	17.0	15.0	21.0	20.0	22.0	19	22	15.5
	A4160 West	D	3	200+	12.0	14.0	15.0	15.0	13.0	16.0	14.0	18.0	14.0	16.0	15.0	15.0	15	18	20.2

PM

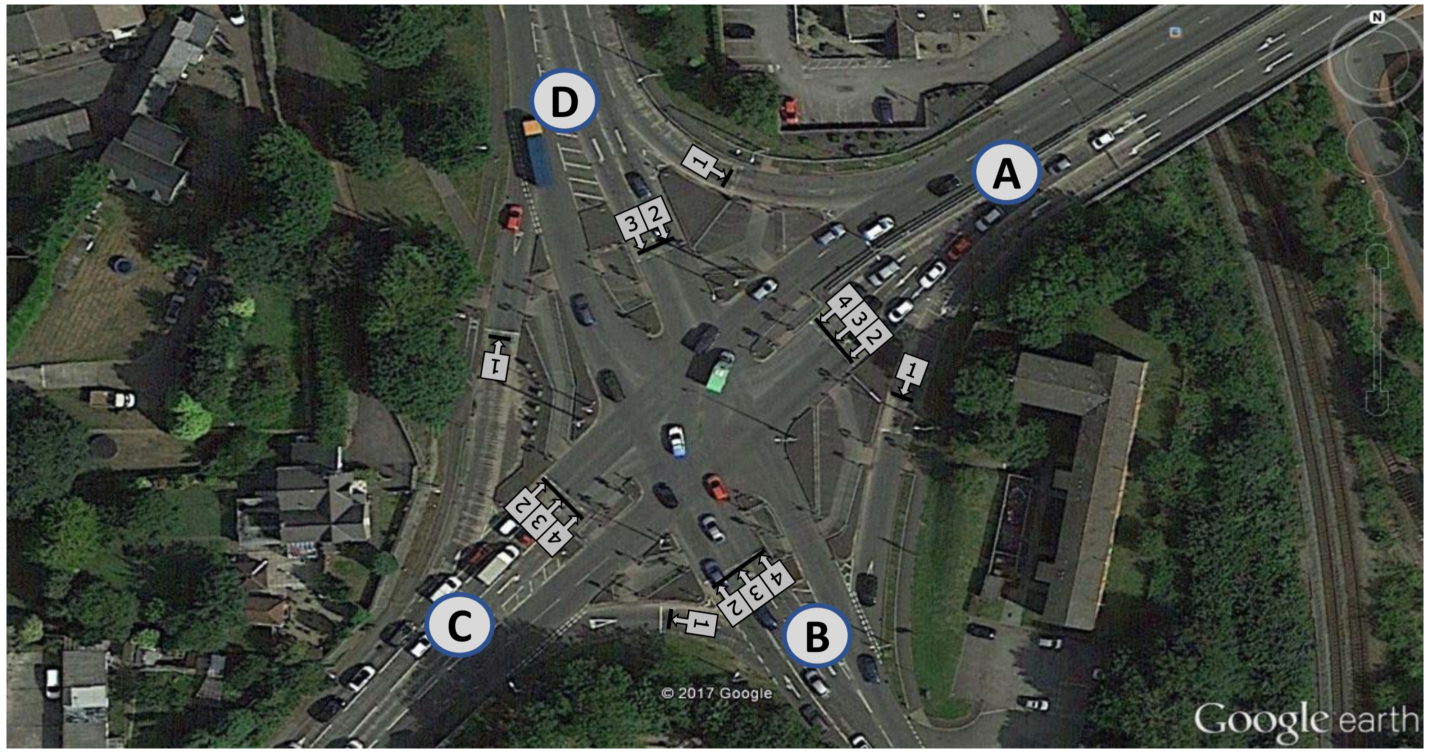
Murch Road Junction



Merrie Harrier Junction



Barrons Court Junction



Appendix B: VISSIM LMVR

DINAS POWYS TRANSPORT NETWORK

Vissim Local Model Validation Report

DRAFT NO STATUS

JANUARY 2019

Incorporating

Dinas Powys Transport Network

Vissim Local Model Validation Report

Author	MK
Checker	NC
Approver	JH
Report No	10015022-ARC-XX-XX-RP-TP-0004
Date	JANUARY 2019

Version Control

Version	Date	Author	Changes
D01	31st July 2018	MK	Draft for internal review
D02	20th September 2018	MK	Draft for technical review
D03	25th September 2018	MK	Confidential draft for client review
D04	28th January 2019	MK	Draft No Status

This report dated 28 January 2019 has been prepared for Vale of Glamorgan Council (the "Client") in accordance with the terms and conditions of appointment dated 02 November 2017 (the "Appointment") between the Client and Arcadis (UK) Limited ("Arcadis") for the purposes specified in the Appointment. For avoidance of doubt, no other person(s) may use or rely upon this report or its contents, and Arcadis accepts no responsibility for any such use or reliance thereon by any other third party.

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1 INTRODUCTION

1.1 Purpose of the Vissim model

1.1.1 Arcadis has been commissioned by Vale of Glamorgan Council to develop and appraise potential options for improving the strategic transport network around Dinas Powys. The purpose of this local model validation report is to document the development of the base traffic model. The operational modelling note will assess the scheme proposals included as part of the WelTAG Stage Two assessment encompassing the proposed bypass (Green alignment) and multi-modal options against the do-minimum scenario.

1.1.2 The A4055 corridor in Dinas Powys is a fully saturated traffic corridor with significant traffic queuing as well as bus priority measures. A Vissim model is required in order to assess the impact of the proposed measures on blocking back traffic congestion and on the bus network.

1.1.3 The primary objectives of the Vissim model are to test the impact of several interventions:

- A bypass (Green alignment) option; and,
- A multi-modal option.

1.1.4 The Vissim model is part of a traffic modelling ecosystem and is consistent with the strategic traffic model and the LinSig junction analysis.

1.2 Reference Standard

1.2.1 This Local Model Validation Report (LMVR) has been prepared in accordance with best practices inspired by both:

- WebTAG unit M3.1 section 3.2.10;
- The Design Manual for Local Roads and Bridges, Volume 12, Section 2, Part 1, Appendix B; and,
- The Traffic Modelling Guidelines, TfL Traffic Manager and Network Performance Best Practice, Version 3.0.

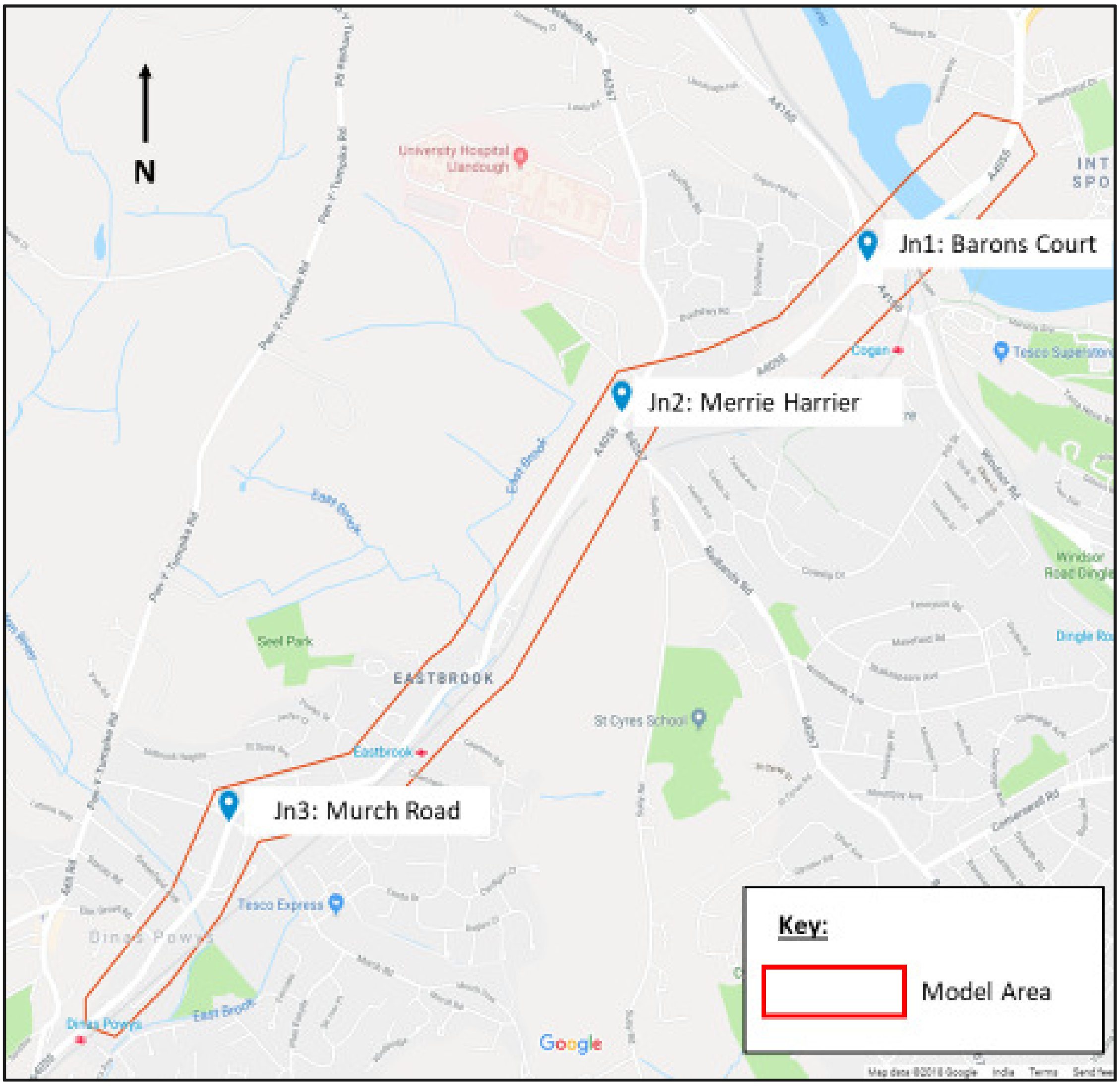
1.2.2 The calibration and validation criteria used for this model are:

- GEH < 5 for the turning count calibration;
- End to end route journey time validation of up to 15% (or 60 seconds, if higher than 15%); and,
- Queue length observations (no quantitative criteria).

1.3 Model Study Area

1.3.1 The extent of the study area covered in the Vissim model is shown in Figure 1 below. The client was concerned by the impact that the proposed schemes would have on the three signalised junctions located between Dinas Powys and the outskirt of Cardiff. The study area is limited to the three junctions represented in the model area because they are the only bottlenecks along this corridor.

Figure 1 Extent of Study Area



1.3.2 The length of the corridor is around 3.3 kilometres long and includes the following signalised junctions:

- Junction 1: A4055 Barons Court Junction (Signal controlled);
- Junction 2: A4055 Merrie Harrier Junction (Signal controlled); and,
- Junction 3: A4055 Murch Road Junction (Signal controlled).

2 DESCRIPTION OF DATA USED

2.1 Traffic Signal Data

2.1.1 All three key junctions on the corridor are signalised. The controller specification was provided by the council and is included in Appendix A.

2.1.2 The cycle time and demand dependency has been measured from video recordings captured on site during the traffic surveys. Green time measurements were also made at the Barons Court junction.

2.2 Traffic Count Data

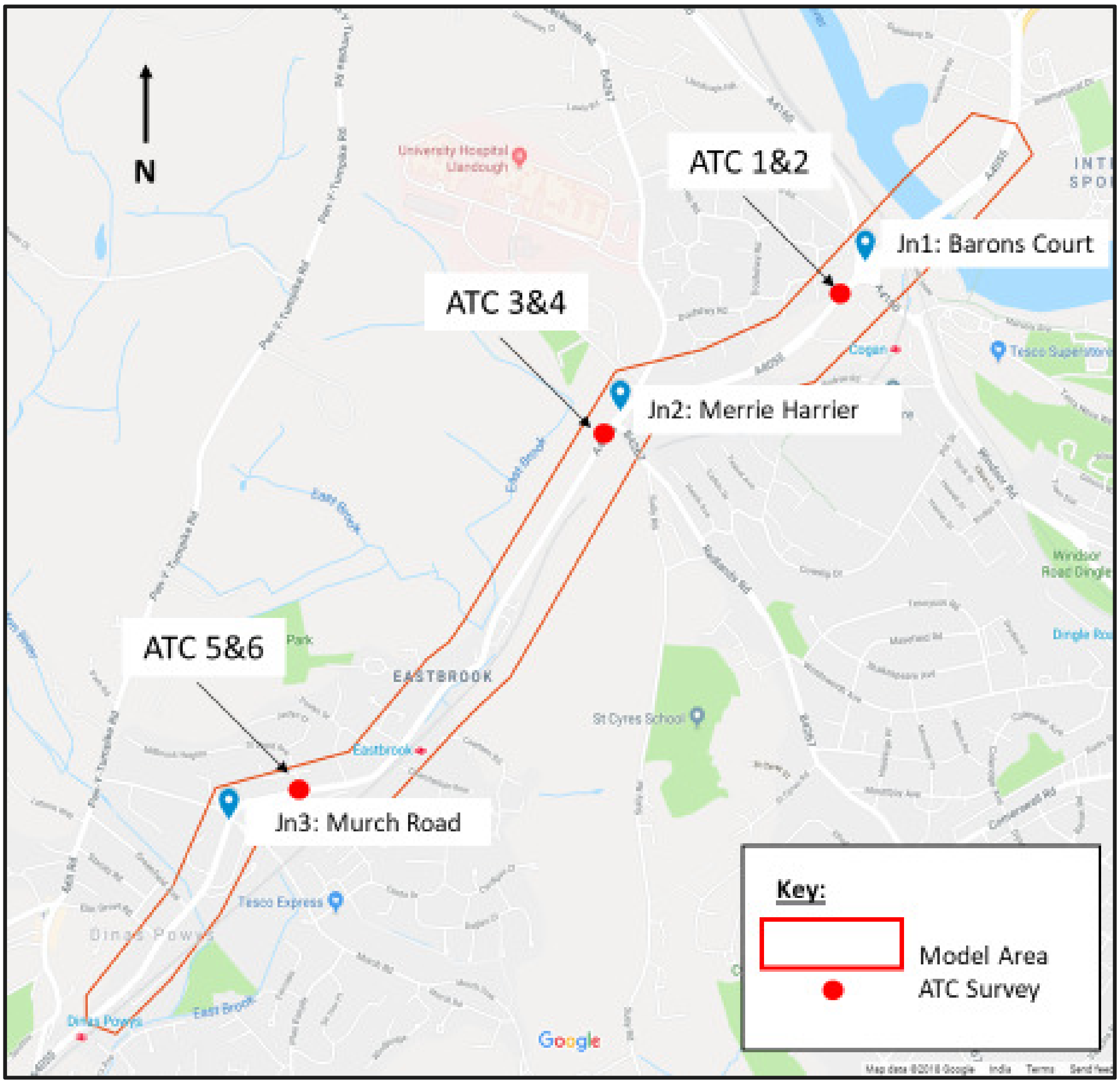
Junction Turning Count

2.2.1 The Junction Turning Counts (JTC) survey was conducted on Thursday, 23 November 2017 between 07:00 and 19:00 for all three signalised junctions. The data is provided in Appendix B.

Automatic Traffic Count (ATC)

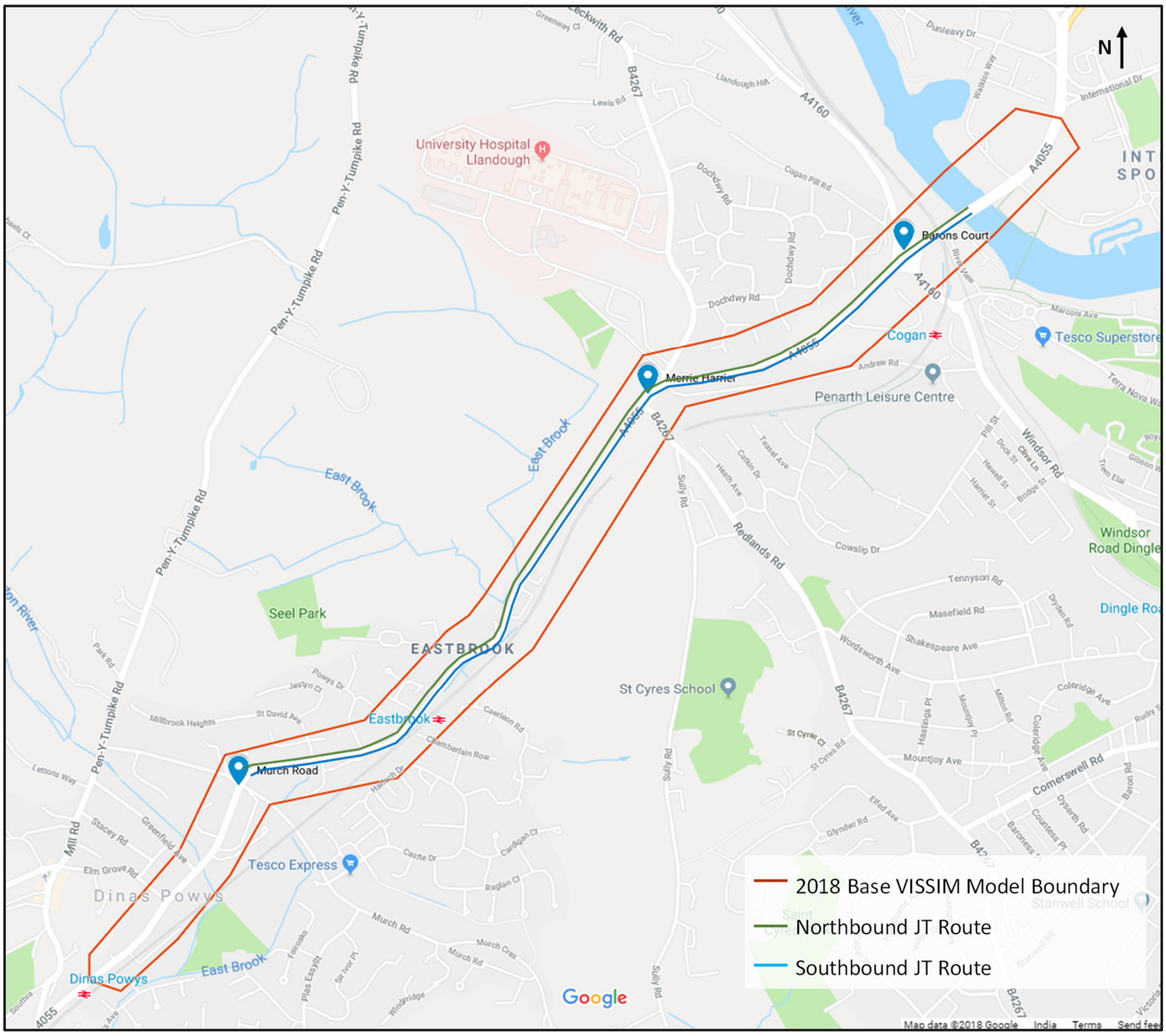
2.2.2 ATC data for a typical week in February 2015 was available for the locations shown in Figure 2. Average mid-link traffic counts for a week day was extracted from this data.

Figure 2 ATC Locations



2.2.3 Journey time data was used to validate the base Vissim model. Average journey times for the two routes identified in Figure 3 were extracted from the Automatic Number Plate Recognition (ANPR) survey conducted on Thursday, 23 November 2017 between 07:00 and 19:00. The data is available in Appendix B.

Figure 3 Journey Time Routes used for Validation



2.3 Queue Length Survey Data

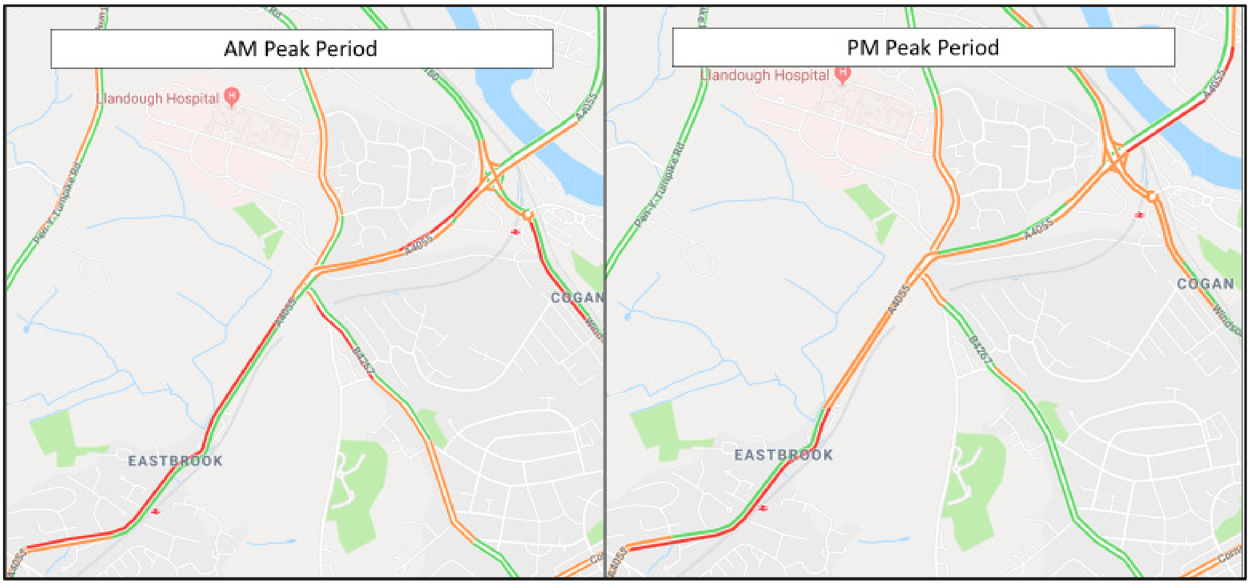
2.3.1 Queue length have been captured on Thursday, 23 November 2017 between 07:00 and 19:00 for all three signalised junctions. The data is provided in Appendix B. Queue length data was also compared to Google traffic typical conditions.

3 DESCRIPTION OF OBSERVED TRAFFIC CONDITIONS

3.1 Overall Network

3.1.1 The network is tidal by nature with predominant traffic flow pattern going northbound during the AM peak period and southbound during the PM peak period. Drivers are travelling to Cardiff in the morning and leaving Cardiff in the evening. The A4055 corridor is heavily congested in the dominant direction of the tide, situation graphically illustrated on the Google Traffic images in Figure 4.

Figure 4 Queue Length Captured in Google Traffic



3.1.2 The ANPR journey time record closely match the Google Traffic description. The journey time for the AM peak is 857 seconds in the northbound direction and 311 seconds in the southbound direction. The northbound direction is the slowest moving movement during the AM peak period.

3.1.3 The journey time for the PM peak is 274 seconds in the northbound direction and 748 seconds in the southbound direction. The southbound direction is the slowest moving movement during the PM peak period.

3.2 Key Junctions

3.2.1 Barons Court Junction is a congested junction experiencing high level of queuing during the AM an PM peak period. A long queue was observed on the A4055 Barry Road in the northbound and southbound direction. It was also observed that Cogan Hill gets called twice in a single cycle during the AM peak period. The junction is currently running under MOVA control with pedestrian crossings on all approaches.

3.2.2 The Cogan Hill approach get called twice in a cycle during the AM peak period to compensate for the long gap between vehicles.

3.2.3 The Merrie Harrier junction is a congested junction experiencing high level of queueing on the A4055 in the northbound direction as well as on the B4267 Penland Road during both AM and PM peak period. The junction is running under MOVA control with a pedestrian crossing on the eastern approach.

3.2.4 The A4055 Cardiff Road/ Much Road Junction is a congested junction experiencing high level of queuing on the A4055 Cardiff Road and Millbrook Road. The junction is running under MOVA control with pedestrian crossings on all approaches.

4 MODEL DESCRIPTION

4.1 Model Properties

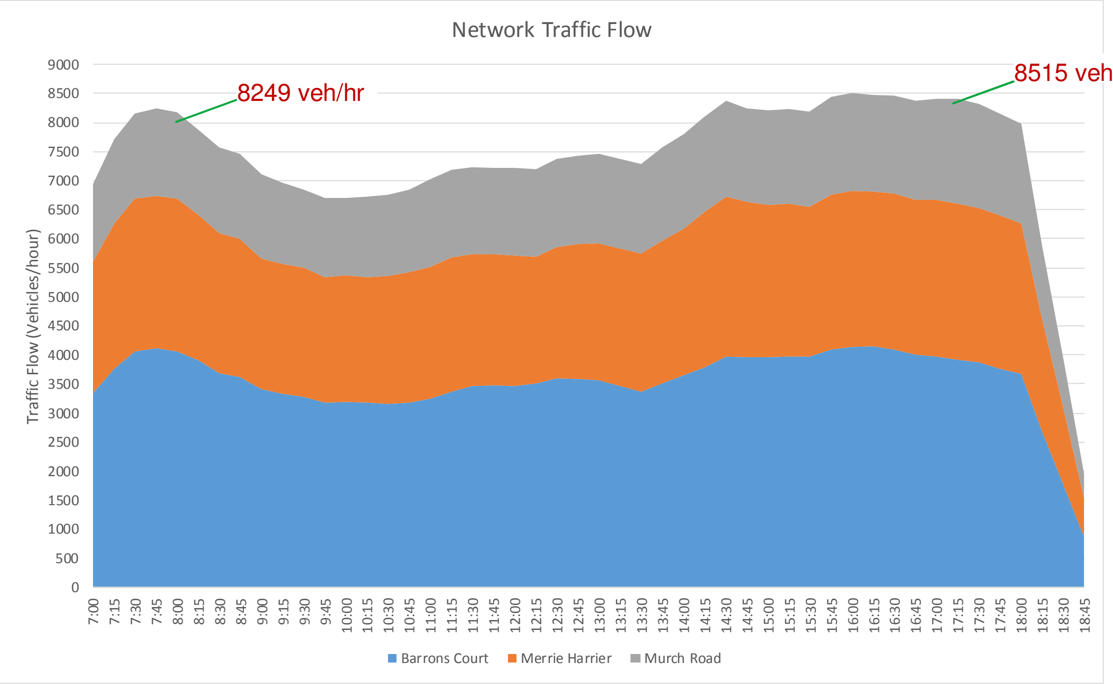
4.1.1 Based on the local configuration of the network, the following modelling choices have been selected:

- The study area is limited to the A4055 corridor only, resulting in a static, all or nothing traffic assignment type. The matrix structure has therefore not been calibrated and validated;
- Traffic signals coding have been extracted from video recording, as is typically required from TfL for congested corridor with demand dependant corridors;
- Bus routes have been modelled, but taxis have been included into the general traffic mix and cyclists have not been represented; and,
- Due to the level of congestion, additional traffic has been added to the preload to ensure adequate levels of queues at the beginning of the modelled period.

4.2 Modelled Peak Hours

4.2.1 The peak hours were calculated based on the total network flow using the junction turning count, i.e. the hours corresponding with the highest total network flows during the morning and evening would be the AM and PM peak hours respectively. ATC were not used to calculate the peak period because the ATC were done in 2015. The total junction flows at each of the three junctions were calculated on an hourly basis from the 15 minute vehicle counts available from the traffic survey data. These and are shown in Appendix B. Figure 5 shows a stacked graph of the hourly total junction flows at the three junctions, with the hours starting every 15 minutes.

Figure 5 Hourly Network Flow



4.2.2 Figure 5, and the calculations shown in Appendix B, indicate that the highest network flows during the morning and evening are 8,249 veh/hr and 8,515 veh/hr respectively. These occur during the hours starting at 07:45 and 16:00 respectively. Therefore, the network peak hours to be used in the Vissim model are identified as the following;

- Weekday AM peak hour: 07:45 – 08:45
- Weekday PM peak hour: 16:00 – 17:00

4.2.3 Both AM and PM peak scenarios cover a total modelling period of one and half hours, including 30-minute warm up period, the peak hours identified in Section 2.2 earlier, and a 15-minute cool down period.

4.3 Traffic Signals Coding

4.3.1 LinSig models were developed for the three signalised junction and the intergreen, phase, stage and phase delay were obtained from the controller specification. The survey videos were observed to measure the cycle time for all signalised junctions.

4.3.2 A LinSig model for each signalised junction was developed to extract the signal timings from. Cycle time have been measured on site as well as stage timing for the Barons Court and Merrie Harrier junction and the A4055 Cardiff Road/ Murch Road junction.

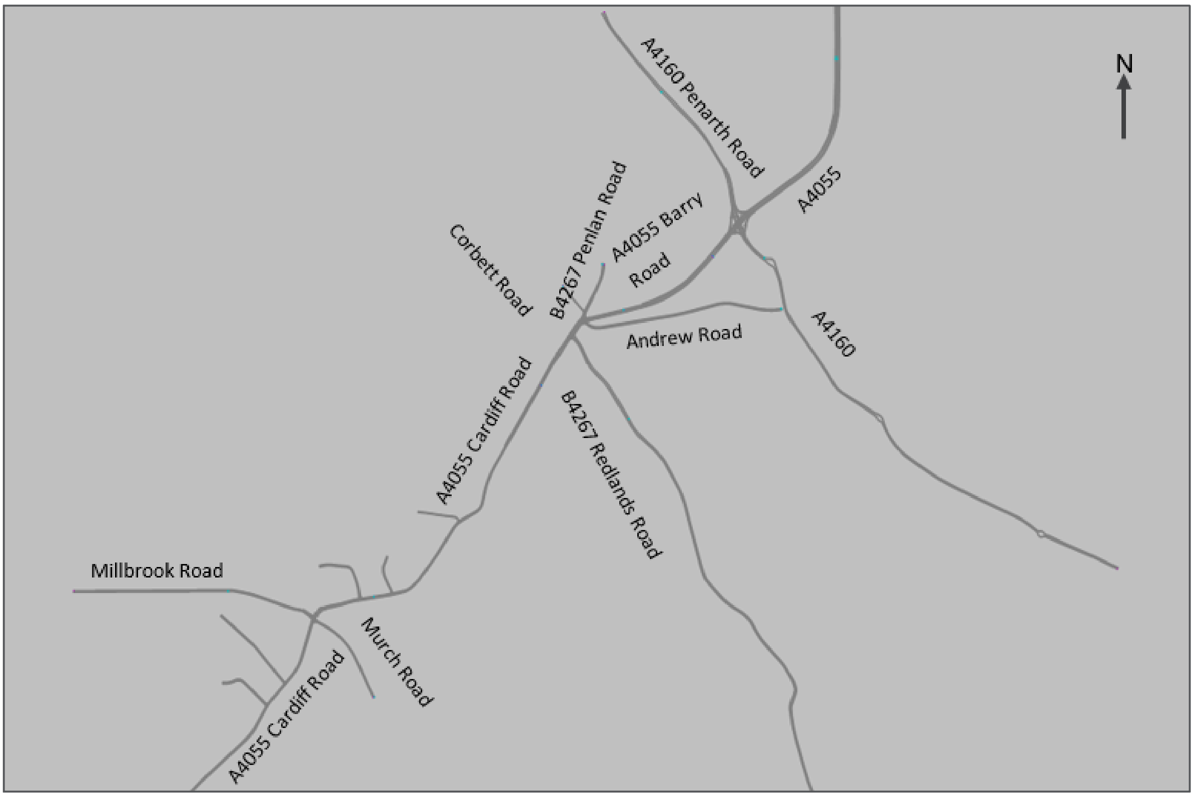
4.3.3 Signal timings (green times and offsets between junctions) were adopted from the LinSig model developed for use in the Vissim model.

4.3.4 Traffic signals were coded into Vissim using VisVAP programming for the three signal-controlled junctions based on signal timing sheets and LinSig model results. VisVAP was preferred compare to fixed time because it is easier to update the signal timing and update the demand dependency if needed at later stage. The Signal timings used in Vissim are the same as in LINSIG.

4.4 Background Map and Model Extent

4.4.1 Bing maps and Google maps have been used to code the road network. The Base Vissim network is shown in Figure 6 below.

Figure 6 Dinas Powys Base Vissim Network



4.5 Bus Routes

4.5.1 Bus routes and frequencies obtained from the website: www.traveline.info.

4.6 Driving Parameters

4.6.1 Wiedemann 74 default car-following model has been used.

4.7 Vehicle Types

4.7.1 The following Vehicle Types/ Classes were used in the base model:

- Lights (Car and LGV);
- HGVs (OGV1 and OGV2); and
- Buses.

4.8 Random Seed

4.8.1 The model was run for 15 iterations using different random seeds to represent the daily variation in traffic. The final modelled outputs shown in the calibration and validation tables are the averages of all 15 runs carried out.

5 BASE MODEL CALIBRATION AND VALIDATION

5.1 Preload Queue Calibration

5.1.1 Queues at the beginning of the modelling hour have been adjusted by adding traffic during the pre-load period. The volumes added was very limited and consisted of:

- +149 vehicles for the AM peak; and,
- +27 vehicles for the PM peak.

5.2 Traffic flow Calibration and Validation

5.2.1 Calibration is conducted to verify that total flows generated by the model are comparable with the total surveyed flows.

5.2.2 For the traffic flow calibration, the following measures suggested by WebTAG unit M3.1 sections 3.2.7 and 3.2.8 were used:

- The absolute percentage differences between modelled flows and counts.
- The GEH statistic, which is a form of the Chi-squared statistic that incorporates both relative and absolute errors and is defined as:

$$GEH = \sqrt{\frac{(M-C)^2}{(M+C)/2}}$$

Where:

- GEH is the Geoffrey E. Havers statistic used in traffic modelling to compare two sets of traffic volumes;
- M is the modelled flow; and,
- C is the observed flow.

5.2.3 Traffic flows turning counts are calibrated for GEH values below 5.

5.2.4 The results of the turning count flows show that they calibrate very well in both peak hours with more than the 95% of all turning counts falling within the required GEH of less than 5. Results of the turn flow calibration are detailed in Appendix C.

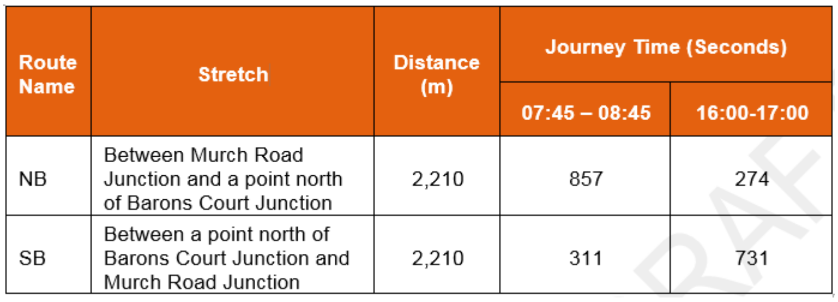
Table 1 Turn Flows Calibration Results

Peak Hour	Turn Flow Calibration (%)			
	Lights	HGV	Bus	Total vehicles
07:45-08:45	97.92%	100%	100%	100.00%
16:00 – 17:00	100.00%	100%	100%	100.00%

5.3 Journey Time Validation

5.3.1 Average journey times were calculated for AM and PM peak hours. The calculated journey times are summarised in Table 2.

Table 2 Journey Time Data processed from ANPR



Route Name	Stretch	Distance (m)	Journey Time (Seconds)	
			07:45 – 08:45	16:00-17:00
NB	Between Murch Road Junction and a point north of Barons Court Junction	2,210	857	274
SB	Between a point north of Barons Court Junction and Murch Road Junction	2,210	311	731

5.3.2 The Base Vissim model was validated for the two journey time routes. The aim was to validate the modelled journey times recorded in Vissim in accordance with WebTAG unit M3.1 section 3.2.10 which accepts a variation up to 15% (or 60 seconds, if higher than 15%) of the surveyed data values.

5.3.3 Average journey time for general traffic was extracted from the base model for the peak hour was compared with the observed journey time from ANPR survey.

5.3.4 A summary of the Journey Time Validation is given in Table 3 and the detail comparison is included in Appendix D.

5.3.5 All routes validate well expect in the southbound direction during the PM peak period with a percentage difference of 16% which is very close the 15% limit. The difference is considered acceptable.

Table 3 Journey Time Validation Results

Route Name	Stretch	Distance (m)	Journey Time Validation Result	
			07:45 – 08:45	16:00 – 17:00
NB	Between Murch Road Junction and Barons Court Junction NB arm	2,210	(5%;<60s) Pass	(21%;<60s) Pass
SB	Between Barons Court NB arm and Murch Road Junction	2,210	(7%;<60s) Pass	(16%; >60s) Fail

6 MODELLER TRAFFIC CONDITIONS

6.1 Queue Length Validation

6.1.1 The model has been validated against the queue length data which was captured on the day of the survey. The Queue length table can be found in Appendix D.

Table 4 AM Peak Queue Length

Junction Name	Road Name	No. of Lanes	Storage Length (m)	Observed Mean Max Queue		Modelled Mean Max Queue (m)	Comment
				Metres	PCU		
Murch Road Junction	Cardiff Road North	2	200+	126	22	108	
	Murch Road	1	200+	65	11	107	
	Cardiff Road South	2	200+	92	16	109	
	Millbrook Road	2	200+	21	4	32	
Merrie Harrier	Penlan Road	2	172	41	7	48	
	Barry Road	2	200+	61	11	79	
	Andrew Road	1	200+	0	0	0	
	Redlands Road	2	200+	126	22	483	The queue in google is observed to be 648 metres and also it is an entry link with 860 vehicles.
	Cardiff Road	2	200+	161	28	337	The queue in google is observed to be 1300 metres.
	Corbett Road	1	200+	2	0	0	
Barons Court Junction	A4055 North	4	200+	188	33	498	The queue in google is 260metres. However it is an entry link with input flow of 1200 vehicles.
	A4160 East	4	139	107	19	503	The queue in google is observed to be 930 metres and it is an entry link with 1440 vehicles.
	A4055 South	4	200+	209	36	455	The queue in google is observed to be 440 metres.
	A4160 West	3	200+	69	12	404	Entry link with flow of 500 vehicles (getting only 17sec of green time)

6.1.2 The queue length for the AM peak period is either in line with the data observed on site or the queue observed on Google traffic. The data observed in google represent the speed band however it gives a good indication of the level of queue experienced on site. The value shown in Table 4 are consistent with the values recorded on site. Some values highlighted in orange in the Mean Max Queue column exceed the observed mean queue values by a factor greater than 10% but these values are lower than the values observed in Google.

6.1.3 The only value which is above the observed Google queue is on the A4055 at the Barons Court Junction South with 455 metres. This value is only 15 metres above what is observed in which is acceptable.

Table 5 PM Peak Queue Length

Junction Name	Road Name	No. of Lanes	Storage Length (m)	Observed Mean Max Queue		Modelled Mean Max Queue (m)	Comment
				Metres	PCU		
Murch Road Junction	Cardiff Road North	2	200+	185	32	445	The queue in google is observed to be 780 metres . The corridor is carrying 680 vehicles.
	Murch Road	1	200+	53	9	92	
	Cardiff Road South	2	200+	87	15	101	
	Millbrook Road	2	200+	43	8	329	Entry link with 200 vehicles. (getting only 10sec green time)
Merrie Harrier	Penlan Road	2	172	116	20	98	
	Barry Road	2	200+	124	22	94	
	Andrew Road	1	200+	0	0	0	
	Redlands Road	2	200+	101	18	195	The queue in google is observed to be 370 metres and an entry link with 600 vehicles.
	Cardiff Road	2	200+	127	22	335	Corridor carrying 644 vehicles
	Corbett Road	1	200+	0	0	0	
Barons Court Junction	A4055 North	4	200+	192	33	288	The queue in google is observed to be 530 metres. It is an entry link carrying 1480 vehicles.
	A4160 East	4	139	96	17	501	The queue in google is observed to be 600 metres and it is an entry link carrying 870 vehicles.
	A4055 South	4	200+	107	19	95	
	A4160 West	3	200+	85	15	197	It is an entry link with 700 vehicles (getting 37sec of green time and only single lane for through traffic and a flare of 75m for right turn)

6.1.4 All the values presented in Table 5 are representative of the queue on site. Some values have been highlighted in orange but these values are below the values observed in Google Traffic. The queue length results shown in Table 4 and Table 5 show that the model validate well against observation.

7 CONCLUSION

7.1.1 The Model Validation Report has outlined the development and validation of the highway traffic model. The results presented in this report are for the base year of 2017. The results demonstrate that the model performs well in terms of:

- Turning flow;
- Journey times; and,
- Queue length.

7.1.2 The model is represents well the saturated traffic conditions of the corridor and is fit for purpose to test the proposed options.

8 ABBREVIATIONS AND GLOSSARY

ANPR	Automatic Number Plate Recognition
ATC	Automatic Traffic Count
JTC	Junction Turn Counts
DfT	Department for Transport
DSD	Desired Speed Decision
GEH	The Geoffrey E. Havers statistic used in traffic modelling to compare two sets of traffic volumes.
HGV	Heavy Goods Vehicle
LGV	Light Goods Vehicle
LinSig	LinSig is the UK industry standard software for the assessment and design of traffic signal junctions.
NB	North Bound
OGV	Other Goods Vehicle
PCU	Passenger Car Unit
RSA	Reduced Speed Area
SB	South Bound
VAP	Vehicle Actuated Program
VisVAP	Software associated with Vissim, used to generate VAP files
WebTAG	Transport Analysis Guidelines given by Department of Transport
PRC	Practical Reserve Capacity

APPENDIX A

Signal Data

Parameter	Junction 1- Murch Road												
	AM Peak												
	Cycle-1												
Stage	1		2		3		4			5		6	7
Phases	A	B	A	C	B	D	C	D	E	F	E	G	H
Green time (s)	39	38	13	7	7	6	7	13	7	7	12	24	10
Cycle time (s)	143												
	Cycle-2												
Stage	1		2		3		4			5		6	
Phases	A	B	A	C	B	D	C	D	E	F	E	G	
Green time (s)	38	38	13	7	7	6	7	13	7	7	12	26	
Cycle time (s)	129												

**Each cycle runs alternately*

Parameter	Junction 1- Murch Road												
	PM Peak												
	Cycle-1												
Stage	1		2		3		4			5		6	7
Phases	A	B	A	C	B	D	C	D	E	F	E	G	H
Green time (s)	41	40	13	7	7	6	7	13	7	10	15	16	10
Cycle time (s)	140												
	Cycle-2												
Stage	1		2		3		4			5		6	
Phases	A	B	A	C	B	D	C	D	E	F	E	G	
Green time (s)	40	40	13	7	7	6	7	13	7	10	15	16	
Cycle time (s)	124												

**Each cycle runs alternately*

<table>
<tr><th rowspan="2">Parameter</th><th colspan="23">Junction 2- Merrie Harrier</th></tr>
<tr><th colspan="23">AM Peak</th></tr>
<tr><td colspan="24">Cycle-1</td></tr>
<tr><td>Stage</td><td colspan="4">1</td><td colspan="4">2</td><td colspan="2">3</td><td colspan="4">4</td><td colspan="5">5</td><td colspan="4">6</td></tr>
<tr><td>Phases</td><td>B</td><td>C</td><td>D</td><td>G</td><td>B</td><td>D</td><td>G</td><td>L</td><td>C</td><td>F</td><td>C</td><td>F</td><td>H</td><td>K</td><td>A</td><td>E</td><td>F</td><td>H</td><td>J</td><td>B</td><td>E</td><td>G</td><td>J</td></tr>
<tr><td>Green time (s)</td><td>32</td><td>27</td><td>27</td><td>32</td><td>11</td><td>11</td><td>11</td><td>6</td><td>8</td><td>13</td><td>15</td><td>15</td><td>13</td><td>13</td><td>9</td><td>16</td><td>16</td><td>16</td><td>10</td><td>18</td><td>23</td><td>18</td><td>23</td></tr>
<tr><td>Cycle time (s)</td><td colspan="23">110</td></tr>
<tr><td colspan="24">Cycle-2</td></tr>
<tr><td>Stage</td><td colspan="4">1</td><td colspan="4">2</td><td colspan="2">3</td><td colspan="4">4</td><td colspan="5">5</td><td colspan="4">6</td></tr>
<tr><td>Phases</td><td>B</td><td>C</td><td>D</td><td>G</td><td>B</td><td>D</td><td>G</td><td>L</td><td>C</td><td>F</td><td>C</td><td>F</td><td>H</td><td>K</td><td>A</td><td>E</td><td>F</td><td>H</td><td>J</td><td>B</td><td>E</td><td>G</td><td>J</td></tr>
<tr><td>Green time (s)</td><td>32</td><td>27</td><td>27</td><td>32</td><td>11</td><td>11</td><td>11</td><td>6</td><td>8</td><td>13</td><td>15</td><td>15</td><td>13</td><td>13</td><td>9</td><td>16</td><td>16</td><td>16</td><td>10</td><td>18</td><td>23</td><td>18</td><td>23</td></tr>
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<tr><td>Stage</td><td colspan="4">1</td><td colspan="4">2</td><td colspan="2">3</td><td colspan="4">4</td><td colspan="9">6</td></tr>
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<tr><td>Green time (s)</td><td>32</td><td>27</td><td>27</td><td>32</td><td>11</td><td>11</td><td>11</td><td>6</td><td>8</td><td>13</td><td>15</td><td>15</td><td>13</td><td>13</td><td colspan="2">25</td><td colspan="2">30</td><td colspan="2">25</td><td colspan="3">17</td></tr>
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</table>

Cycles run in sequence 1-2-3

<table>
<tr><th rowspan="2">Parameter</th><th colspan="23">Junction 2- Merrie Harrier</th></tr>
<tr><th colspan="23">PM Peak</th></tr>
<tr><td colspan="24">Cycle-1</td></tr>
<tr><td>Stage</td><td colspan="4">1</td><td colspan="4">2</td><td colspan="2">3</td><td colspan="4">4</td><td colspan="5">5</td><td colspan="4">6</td></tr>
<tr><td>Phases</td><td>B</td><td>C</td><td>D</td><td>G</td><td>B</td><td>D</td><td>G</td><td>L</td><td>C</td><td>F</td><td>C</td><td>F</td><td>H</td><td>K</td><td>A</td><td>E</td><td>F</td><td>H</td><td>J</td><td>B</td><td>E</td><td>G</td><td>J</td></tr>
<tr><td>Green time (s)</td><td>39</td><td>34</td><td>34</td><td>39</td><td>10</td><td>10</td><td>10</td><td>5</td><td>8</td><td>13</td><td>35</td><td>35</td><td>33</td><td>33</td><td>11</td><td>18</td><td>18</td><td>18</td><td>12</td><td>17</td><td>22</td><td>17</td><td>22</td></tr>
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<tr><td colspan="24">Cycle-2</td></tr>
<tr><td>Stage</td><td colspan="4">1</td><td colspan="4">2</td><td colspan="2">3</td><td colspan="4">4</td><td colspan="9">6</td></tr>
<tr><td>Phases</td><td>B</td><td>C</td><td>D</td><td>G</td><td>B</td><td>D</td><td>G</td><td>L</td><td>C</td><td>F</td><td>C</td><td>F</td><td>H</td><td>K</td><td colspan="2">B</td><td colspan="2">E</td><td colspan="2">G</td><td colspan="3">J</td></tr>
<tr><td>Green time (s)</td><td>39</td><td>34</td><td>34</td><td>39</td><td>10</td><td>10</td><td>10</td><td>5</td><td>8</td><td>13</td><td>35</td><td>35</td><td>33</td><td>33</td><td colspan="2">23</td><td colspan="2">28</td><td colspan="2">23</td><td colspan="3">15</td></tr>
<tr><td>Cycle time (s)</td><td colspan="23">125</td></tr>
</table>

**Each cycle runs alternately*

Parameter	**Junction 3-Barons Court**																											
	AM Peak																											
	Stream 1																											
Stage	1				2						3						4						5					
Phases	A	B	J	N	C	D	G	J	K	N	F	G	H	J	L	M	E	H	I	K	L	N	F	G	H	J	L	M
Green time (s)	30	30	40	33	10	10	6	17	6	17	54	65	58	65	58	54	14	22	12	13	22	17	10	11	21	15	21	11
Cycle time (s)	165																											
	Stream 2																											
Stage	1																2											
Phases	O																P											
Green time (s)	147																6											
Cycle time (s)	165																											
	Stream 3																											
Stage	1																2											
Phases	Q																R											
Green time (s)	148																6											
Cycle time (s)	165																											
	Stream 4																											
Stage	1																2											
Phases	S																T											
Green time (s)	148																6											
Cycle time (s)	165																											
	Stream 5																											
Stage	1																2											
Phases	U																V											
Green time (s)	148																6											
Cycle time (s)	165																											

Parameter	**Junction 3-Barons Court**																					
	PM Peak																					
	Stream 1																					
Stage	1				2						3						4					
Phases	A	B	J	N	C	D	G	J	K	N	F	G	H	J	L	M	E	H	I	K	L	N
Green time (s)	39	39	41	49	16	16	12	23	12	23	38	49	42	49	42	38	35	43	33	34	43	38
Cycle time (s)	164																					
	Stream 2																					
Stage	1											2										
Phases	O											P										
Green time (s)	146											6										
Cycle time (s)	164																					
	Stream 3																					
Stage	1											2										
Phases	Q											R										
Green time (s)	147											6										
Cycle time (s)	164																					
	Stream 4																					
Stage	1											2										
Phases	S											T										
Green time (s)	147											6										
Cycle time (s)	164																					
	Stream 5																					
Stage	1											2										
Phases	U											V										
Green time (s)	147											6										
Cycle time (s)	164																					

APPENDIX B

Total Junction Flows

Project Number: **TSP13598**
Project Name: **Dinas Powys**
Survey Type: **Manual Classified Turning Count**
Site No: **6**
Location: **Barons Court Junction (A4160 / A4055)**
Date: **23 November 2017, Thursday**

Time	15 minute Vehicle Counts - Total Junction								
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	TOTAL	TOTAL (PCU)
7:00	487	86	14	5	6	2	9	4	613	626
7:15	635	96	10	6	8	2	1	7	765	782
7:30	775	112	4	2	3	2	0	2	900	908
7:45	895	129	20	5	6	1	2	5	1063	1081
8:00	889	108	9	7	3	3	3	7	1029	1041
8:15	942	94	15	3	7	4	4	6	1075	1090
8:30	831	82	20	9	3	9	5	2	961	990
8:45	844	115	20	9	5	6	3	1	1003	1033
9:00	751	75	18	2	1	10	2	0	859	880
9:15	717	107	25	3	5	4	2	3	866	888
9:30	725	111	28	7	6	8	2	2	889	923
9:45	644	94	24	10	3	9	2	2	788	822
10:00	667	104	21	3	3	3	1	0	802	822
10:15	651	117	19	11	8	3	0	0	809	844
10:30	650	101	25	6	3	2	2	0	789	813
10:45	655	91	35	6	5	7	1	1	801	837
11:00	647	102	27	2	4	1	1	0	784	805
11:15	649	99	18	4	5	5	0	0	780	804
11:30	667	118	25	4	3	5	1	0	823	848
11:45	725	109	18	5	4	7	2	1	871	896
12:00	759	106	21	1	4	5	3	1	900	918
12:15	723	106	26	2	4	1	0	0	862	883
12:30	692	119	20	5	3	2	1	1	843	863
12:45	718	109	20	2	4	2	3	1	859	875
13:00	787	120	29	5	1	4	1	1	948	973
13:15	789	122	18	3	4	6	3	2	947	967
13:30	716	96	14	3	5	2	3	2	841	856
13:45	689	105	17	6	4	5	2	1	829	852
14:00	708	102	22	5	3	3	4	1	848	868
14:15	715	108	24	2	4	6	4	1	864	885
14:30	816	108	26	4	7	7	2	1	971	1001
14:45	817	116	18	6	4	7	3	0	971	997
15:00	856	90	22	2	4	5	0	1	980	1002
15:15	892	113	19	4	5	9	3	3	1048	1073
15:30	838	96	12	6	3	3	3	0	961	979
15:45	834	114	8	3	4	8	2	0	973	992
16:00	862	103	11	5	3	3	6	1	994	1008
16:15	924	103	8	3	6	2	3	1	1050	1063
16:30	956	101	8	3	4	3	4	2	1081	1092
16:45	903	79	12	4	3	4	5	2	1012	1026
17:00	923	68	8	1	5	2	7	2	1016	1023
17:15	909	66	4	1	4	1	4	0	989	995
17:30	934	43	7	2	3	1	5	6	1001	1003
17:45	906	51	2	0	5	1	6	2	973	975
18:00	904	43	6	1	3	1	4	6	968	969
18:15	858	59	2	0	4	2	4	4	933	934
18:30	838	30	5	1	7	0	5	4	890	895
18:45	815	46	1	1	6	2	4	2	877	883

Hourly Flows

Time From	Time To	Total Vehicle	Total PCUs
7:00	8:00	3341	3397
7:15	8:15	3757	3812
7:30	8:30	4067	4121
7:45	8:45	4128	4203
8:00	9:00	4068	4155
8:15	9:15	3898	3994
8:30	9:30	3689	3791
8:45	9:45	3617	3725
9:00	10:00	3402	3514
9:15	10:15	3345	3455
9:30	10:30	3288	3411
9:45	10:45	3188	3301
10:00	11:00	3201	3316
10:15	11:15	3183	3298
10:30	11:30	3154	3259
10:45	11:45	3188	3294
11:00	12:00	3258	3352
11:15	12:15	3374	3466
11:30	12:30	3456	3544
11:45	12:45	3476	3559
12:00	13:00	3464	3539
12:15	13:15	3512	3593
12:30	13:30	3597	3677
12:45	13:45	3595	3670
13:00	14:00	3565	3647
13:15	14:15	3465	3543
13:30	14:30	3382	3462
13:45	14:45	3512	3607
14:00	15:00	3654	3752
14:15	15:15	3786	3885
14:30	15:30	3970	4073
14:45	15:45	3960	4050
15:00	16:00	3962	4045
15:15	16:15	3976	4051
15:30	16:30	3978	4042
15:45	16:45	4098	4155
16:00	17:00	4137	4188
16:15	17:15	4159	4203
16:30	17:30	4098	4135
16:45	17:45	4018	4046
17:00	18:00	3979	3996
17:15	18:15	3931	3942
17:30	18:30	3875	3882
17:45	18:45	3764	3773
18:00	19:00	3668	3681

VISSIM Local Model Validation Report

Project Number:	**TSP13598**
Project Name:	**Dinas Powys**
Survey Type:	**Manual Classified Turning Count**
Site No:	**4**
Location:	**Merrie Harrier Junction (A4055/ B4267/ Andrew Road)**
Date:	**23 November 2017, Thursday**

traffic survey partners

Time	**15 minute Vehicle Counts - Total Junction**									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
7:00	354	60	9	4	5	3	6	2	443	456
7:15	465	65	7	2	9	3	1	7	559	571
7:30	519	63	6	1	4	4	3	2	602	611
7:45	532	76	15	4	2	2	2	5	638	650
8:00	624	62	3	4	5	3	3	1	705	717
8:15	584	53	12	3	5	5	2	7	671	684
8:30	526	48	15	5	3	6	3	2	608	628
8:45	534	70	14	2	4	16	2	3	645	671
9:00	497	46	18	1	2	19	2	1	586	615
9:15	483	57	15	2	2	7	1	3	570	586
9:30	467	71	17	3	6	7	1	2	574	597
9:45	430	62	17	5	5	7	3	0	529	554
10:00	473	67	10	4	5	3	1	0	563	581
10:15	440	73	12	7	4	5	0	0	541	565
10:30	439	57	13	6	4	3	0	0	522	543
10:45	443	57	31	2	6	5	0	1	545	573
11:00	465	65	15	2	2	2	1	0	552	566
11:15	480	73	15	4	3	5	0	0	580	601
11:30	470	74	18	0	4	2	2	0	570	584
11:45	462	66	17	3	7	4	1	0	560	583
12:00	516	63	15	0	3	2	3	0	602	613
12:15	485	48	12	0	5	2	0	0	552	565
12:30	445	66	15	3	5	2	1	1	538	555
12:45	471	60	20	1	4	1	2	0	559	574
13:00	452	70	12	2	4	2	1	0	543	557
13:15	523	65	17	3	1	4	6	2	621	633
13:30	505	55	10	2	5	5	2	0	584	600
13:45	504	69	14	3	5	3	6	3	607	620
14:00	469	54	22	3	6	6	2	0	562	588
14:15	508	71	17	1	3	4	2	1	607	622
14:30	582	70	11	2	5	11	1	1	683	706
14:45	575	62	15	3	6	10	2	0	673	699
15:00	623	49	15	3	3	11	0	0	704	729
15:15	586	66	17	3	4	8	5	3	692	711
15:30	522	56	5	3	5	10	5	0	606	624
15:45	533	64	12	2	5	5	1	1	623	640
16:00	617	59	7	0	1	7	7	2	700	706
16:15	554	62	7	2	3	3	4	1	636	645
16:30	628	63	6	1	2	3	2	1	706	713
16:45	593	37	11	2	6	2	6	1	658	670
17:00	581	58	3	1	3	2	3	4	655	658
17:15	616	41	2	1	2	2	1	3	668	671
17:30	612	43	5	1	4	0	5	5	675	676
17:45	628	36	1	1	9	2	5	5	687	693
18:00	593	36	4	0	3	2	3	8	649	648
18:15	598	38	0	0	2	1	1	5	645	643
18:30	614	32	3	0	8	1	2	1	661	670
18:45	594	45	0	0	5	0	3	3	650	651

Hourly Flows

Time From	Time To	Total Vehicle	Total PCUs
7:00	8:00	2242	2287
7:15	8:15	2504	2548
7:30	8:30	2616	2662
7:45	8:45	2622	2678
8:00	9:00	2629	2700
8:15	9:15	2510	2598
8:30	9:30	2409	2500
8:45	9:45	2375	2470
9:00	10:00	2259	2353
9:15	10:15	2236	2318
9:30	10:30	2207	2297
9:45	10:45	2155	2243
10:00	11:00	2171	2262
10:15	11:15	2160	2247
10:30	11:30	2199	2283
10:45	11:45	2247	2323
11:00	12:00	2262	2333
11:15	12:15	2312	2380
11:30	12:30	2284	2344
11:45	12:45	2252	2316
12:00	13:00	2251	2307
12:15	13:15	2192	2251
12:30	13:30	2261	2319
12:45	13:45	2307	2365
13:00	14:00	2355	2411
13:15	14:15	2374	2441
13:30	14:30	2360	2430
13:45	14:45	2459	2535
14:00	15:00	2525	2614
14:15	15:15	2667	2756
14:30	15:30	2752	2845
14:45	15:45	2675	2764
15:00	16:00	2625	2705
15:15	16:15	2621	2681
15:30	16:30	2565	2615
15:45	16:45	2665	2704
16:00	17:00	2700	2734
16:15	17:15	2655	2686
16:30	17:30	2687	2712
16:45	17:45	2656	2675
17:00	18:00	2685	2698
17:15	18:15	2679	2688
17:30	18:30	2656	2660
17:45	18:45	2642	2654
18:00	19:00	2605	2612

VISSIM Local Model Validation Report

Project Number: **TSP13598**
Project Name: **Dinas Powys**
Survey Type: **Manual Classified Turning Count**
Site No: **3**
Location: **Milbrook Road / A4055 / Murch Road**
Date: **23 November 2017, Thursday**

traffic survey partners

Time	15 minute Vehicle Counts - Total Junction									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	TOTAL	TOTAL (PCU)
7:00	217	43	5	5	3	1	2	2	278	288
7:15	289	50	5	0	4	1	0	2	351	357
7:30	281	42	6	2	8	4	1	1	345	361
7:45	289	45	11	3	4	1	2	2	357	369
8:00	338	39	7	4	2	5	2	6	403	413
8:15	317	36	6	5	2	3	2	2	373	385
8:30	308	32	11	2	3	7	3	0	366	382
8:45	271	52	10	1	3	6	2	0	345	359
9:00	329	33	9	0	0	11	1	0	383	398
9:15	321	35	13	1	1	6	0	0	377	392
9:30	298	55	12	4	2	3	1	0	375	391
9:45	242	51	12	2	4	2	0	1	314	328
10:00	274	45	8	2	3	3	0	0	335	348
10:15	268	48	10	3	1	1	1	0	332	342
10:30	315	44	10	6	3	1	0	0	379	396
10:45	244	21	15	1	3	2	0	0	286	300
11:00	311	51	13	3	1	1	0	0	380	392
11:15	296	47	14	2	1	2	0	0	362	375
11:30	316	52	11	1	2	2	3	0	387	396
11:45	301	50	14	2	5	4	1	0	377	395
12:00	312	37	11	0	2	3	2	0	367	376
12:15	305	50	10	0	2	1	0	0	368	376
12:30	308	49	11	1	2	2	1	0	374	384
12:45	330	39	13	2	3	2	1	0	390	404
13:00	304	48	9	1	1	3	1	1	368	376
13:15	322	49	8	3	1	1	2	7	393	396
13:30	333	39	9	1	2	5	0	0	389	402
13:45	336	39	8	3	4	1	4	2	397	406
14:00	298	40	15	4	3	5	3	1	369	387
14:15	334	44	12	2	2	4	1	1	400	413
14:30	359	52	9	2	3	7	1	1	434	450
14:45	347	45	10	3	4	7	3	0	419	437
15:00	346	39	7	3	0	5	0	1	401	413
15:15	332	43	12	3	2	5	1	1	399	415
15:30	337	47	5	2	2	7	5	0	405	416
15:45	362	39	8	2	3	4	0	0	418	432
16:00	358	43	3	1	3	5	2	0	415	425
16:15	364	47	5	0	1	0	2	0	419	421
16:30	381	39	7	1	3	0	0	1	432	439
16:45	361	34	8	2	1	2	4	0	412	419
17:00	356	39	2	0	4	0	1	2	404	407
17:15	388	32	1	1	1	1	1	2	427	429
17:30	416	27	2	2	0	1	2	3	453	454
17:45	419	36	2	1	6	0	3	2	469	474
18:00	416	21	3	0	1	3	4	2	450	452
18:15	383	28	2	0	1	0	0	2	416	416
18:30	378	26	1	0	7	0	2	1	415	421
18:45	391	32	0	1	3	0	1	1	429	432

Hourly Flows

Time From	Time To	Total Vehicles	Total PCUs
7:00	8:00	1331	1375
7:15	8:15	1456	1499
7:30	8:30	1478	1527
7:45	8:45	1499	1548
8:00	9:00	1487	1539
8:15	9:15	1467	1524
8:30	9:30	1471	1531
8:45	9:45	1480	1539
9:00	10:00	1449	1508
9:15	10:15	1401	1458
9:30	10:30	1356	1408
9:45	10:45	1360	1414
10:00	11:00	1332	1386
10:15	11:15	1377	1430
10:30	11:30	1407	1463
10:45	11:45	1415	1463
11:00	12:00	1506	1558
11:15	12:15	1493	1542
11:30	12:30	1499	1543
11:45	12:45	1486	1532
12:00	13:00	1499	1540
12:15	13:15	1500	1540
12:30	13:30	1525	1560
12:45	13:45	1540	1578
13:00	14:00	1547	1580
13:15	14:15	1548	1591
13:30	14:30	1555	1608
13:45	14:45	1600	1656
14:00	15:00	1622	1687
14:15	15:15	1654	1713
14:30	15:30	1653	1714
14:45	15:45	1624	1680
15:00	16:00	1623	1675
15:15	16:15	1637	1687
15:30	16:30	1657	1694
15:45	16:45	1684	1717
16:00	17:00	1678	1704
16:15	17:15	1667	1686
16:30	17:30	1675	1694
16:45	17:45	1696	1709
17:00	18:00	1753	1763
17:15	18:15	1799	1808
17:30	18:30	1788	1796
17:45	18:45	1750	1762
18:00	19:00	1710	1720

Peak Hour Calculation

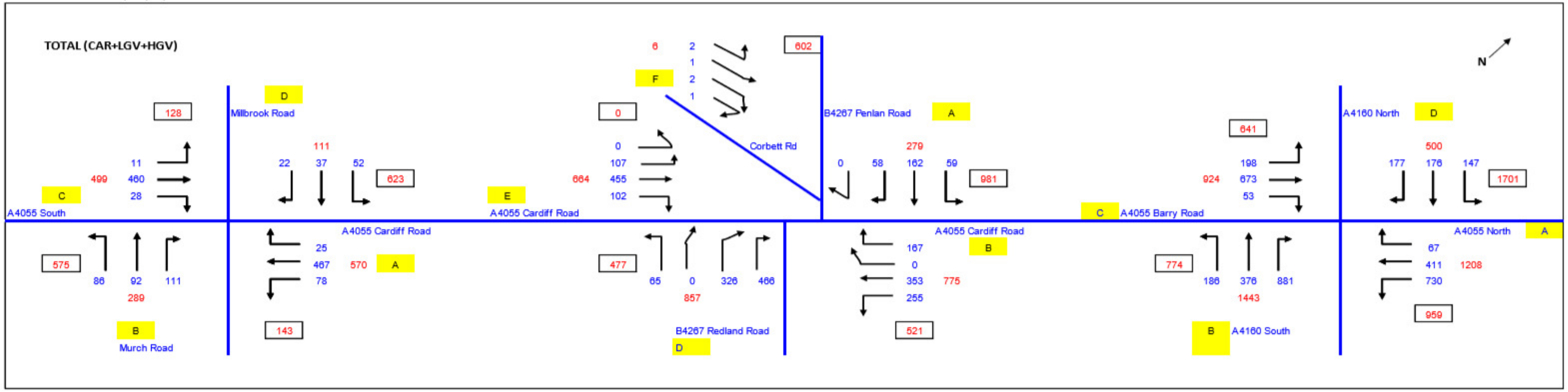
Hour Starting at	Barons Court Flow (veh/hr)	Merrie Harrier Flow (veh/hr)	Murch Road Flow (veh/hr)	Total Network Flow (veh/hr)
07:00	3341	2242	1331	6914
07:15	3757	2504	1456	7717
07:30	4067	2616	1478	8161
07:45	4128	2622	1499	**8249**
08:00	4068	2629	1487	8184
08:15	3898	2510	1467	7875
08:30	3689	2409	1471	7569
08:45	3617	2375	1480	7472
09:00	3402	2259	1449	7110
09:15	3345	2236	1401	6982
09:30	3288	2207	1356	6851
09:45	3188	2155	1360	6703
10:00	3201	2171	1332	6704
10:15	3183	2160	1377	6720
10:30	3154	2199	1407	6760
10:45	3188	2247	1415	6850
11:00	3258	2262	1506	7026
11:15	3374	2312	1493	7179
11:30	3456	2284	1499	7239
11:45	3476	2252	1486	7214
12:00	3464	2251	1499	7214
12:15	3512	2192	1500	7204
12:30	3597	2261	1525	7383
12:45	3595	2307	1540	7442
13:00	3565	2355	1547	7467
13:15	3465	2374	1548	7387
13:30	3382	2360	1555	7297
13:45	3512	2459	1600	7571
14:00	3654	2525	1622	7801
14:15	3786	2667	1654	8107
14:30	3970	2752	1653	8375

VISSIM Local Model Validation Report

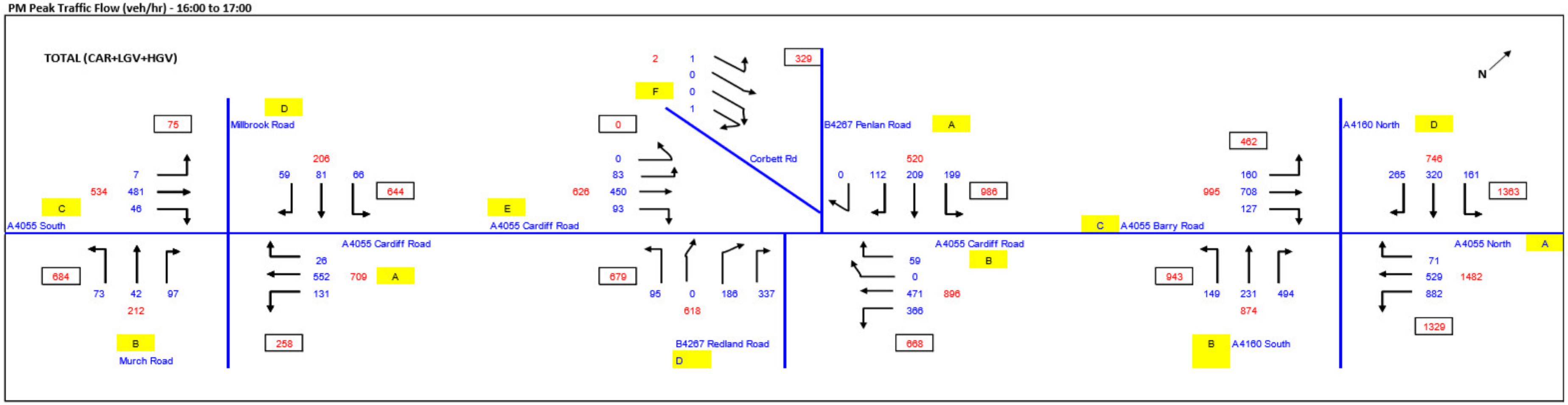
Hour Starting at	Barons Court Flow (veh/hr)	Merrie Harrier Flow (veh/hr)	Murch Road Flow (veh/hr)	Total Network Flow (veh/hr)
14:45	3960	2675	1624	8259
15:00	3962	2625	1623	8210
15:15	3976	2621	1637	8234
15:30	3978	2565	1657	8200
15:45	4098	2665	1684	8447
16:00	4137	2700	1678	**8515**
16:15	4159	2655	1667	8481
16:30	4098	2687	1675	8460
16:45	4018	2656	1696	8370
17:00	3979	2685	1753	8417
17:15	3931	2679	1799	8409
17:30	3875	2656	1788	8319
17:45	3764	2642	1750	8156
18:00	3668	2605	1710	7983
18:15	2700	1956	1260	5916
18:30	1767	1311	844	3922
18:45	877	650	429	1956

Traffic Input

AM Peak Traffic Flow (veh/hr) -07:45 to 08:45



PM Peak Traffic Flow (veh/hr) - 16:00 to 17:00



APPENDIX C

Turn Flow Calibration

Node No.	Junction Name	From Arm	To Arm	AM Peak														
				Observed Data				Modelled Data				GEH				Flow Criteria		Validation Criteria
				Lights (Car+LGV)	HGV	Bus	Total	Lights (Car+LGV)	HGV	Bus	Model Total	Lights (Car+LGV)	HGV	Bus	Model Total	Abs Diff	% Diff	
1	Barrons Court	A4055 North	A4160 South	713	17	0	730	664	18	0	682	1.9	0.3	0.0	1.8	-48	-7%	Pass
		A4055 North	A4055 Barry Road	389	22	4	415	391	12	2	406	0.1	2.4	1.2	0.5	-9	-2%	Pass
		A4055 North	A4160 North (Penarth Rd)	63	4	0	67	66	2	0	67	0.3	1.3	0.0	0.0	0	0%	Pass
		A4160 South	A4055 North	872	9	1	882	742	23	0	765	4.6	3.4	1.4	4.1	-117	-13%	Pass
		A4160 South	A4055 Barry Road	182	4	0	186	157	5	0	162	1.9	0.4	0.0	1.8	-24	-13%	Pass
		A4160 South	A4160 North (Penarth Rd)	374	2	7	383	312	10	5	327	3.3	3.2	0.8	3.0	-56	-15%	Pass
		A4055 Barry Road	A4055 North	658	15	0	673	682	22	1	704	0.9	1.5	1.4	1.2	31	5%	Pass
		A4055 Barry Road	A4160 South	53	0	0	53	44	1	0	45	1.3	1.5	0.0	1.1	-8	-15%	Pass
		A4055 Barry Road	A4160 North (Penarth Rd)	189	9	0	198	181	5	0	187	0.6	1.4	0.0	0.8	-11	-6%	Pass
		A4160 North (Penarth Rd)	A4055 North	135	12	0	147	142	5	0	147	0.6	2.4	0.0	0.0	0	0%	Pass
		A4160 North (Penarth Rd)	A4160 South	175	1	6	182	159	5	6	171	1.2	2.5	0.1	0.8	-11	-6%	Pass
		A4160 North (Penarth Rd)	A4055 Barry Road	167	10	1	178	162	5	0	167	0.4	1.9	1.4	0.8	-11	-6%	Pass
2	Merrie Harrier 1	B4267 Penlan Rd	A4055 Barry Rd	56	3	0	59	60	2	1	63	0.5	0.8	1.4	0.5	4	6%	Pass
		B4267 Penlan Rd	Andrew Rd	0	0	1	1	0	0	1	1	0.0	0.0	0.0	0.0	0	0%	Pass
		B4267 Penlan Rd	A4055 Cardiff Rd	217	3	3	223	222	7	5	233	0.3	1.7	1.0	0.7	10	5%	Pass
		A4055 Barry Rd	B4267 Penlan Rd	164	3	2	169	150	5	1	156	1.1	1.0	0.8	1.1	-13	-8%	Pass
		A4055 Barry Rd	Andrew Rd	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0%	Pass
		A4055 Barry Rd	A4055 Cardiff Rd	577	31	1	609	554	17	1	572	1.0	3.0	0.0	1.5	-37	-6%	Pass
		A4055 Barry Rd	Corbett Rd	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0%	Pass
		Andrew Rd	B4267 Penlan Rd	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0%	Pass
		Andrew Rd	A4055 Cardiff Rd	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0%	Pass
		Andrew Rd	Corbett Rd	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0%	Pass
		A4055 Cardiff Rd	B4267 Penlan Rd	428	5	4	437	352	12	5	369	3.8	2.3	0.4	3.4	-68	-16%	Pass
		A4055 Cardiff Rd	A4055 Barry Rd	898	23	0	921	841	26	0	868	1.9	0.7	0.0	1.8	-53	-6%	Pass
		A4055 Cardiff Rd	Andrew Rd	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0%	Pass
		A4055 Cardiff Rd	Corbett Rd	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0%	Pass
		Corbett Rd	B4267 Penlan Rd	2	0	0	2	1	0	0	1	0.8	0.0	0.0	0.8	-1	-47%	Pass
		Corbett Rd	A4055 Barry Rd	1	0	0	1	0	0	0	0	1.0	0.4	0.0	0.9	-1	-73%	Pass
		Corbett Rd	Andrew Rd	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0%	Pass
		Corbett Rd	A4055 Cardiff Rd	3	0	0	3	0	0	0	0	2.0	0.0	0.0	2.0	-3	-87%	Pass
3	Merrie Harrirer 2	A4055 Cardiff Rd North	B4267 Redlands Rd	412	7	1	420	390	11	2	402	1.1	1.2	0.8	0.9	-18	-4%	Pass
		A4055 Cardiff Rd North	A4055 Cardiff Rd South	385	27	3	415	383	13	4	399	0.1	3.2	0.5	0.8	-16	-4%	Pass
		B4267 Redlands Rd	A4055 Cardiff Rd North	786	6	1	793	639	19	1	660	5.5	3.8	0.0	4.9	-133	-17%	Pass
		B4267 Redlands Rd	A4055 Cardiff Rd South	63	2	2	67	47	2	1	50	2.1	0.4	0.8	2.3	-17	-26%	Pass
		A4055 Cardiff Rd South	A4055 Cardiff Rd North	540	22	3	565	553	18	4	575	0.5	0.8	0.4	0.4	10	2%	Pass
		A4055 Cardiff Rd South	B4267 Redlands Rd	96	6	3	105	78	2	1	80	2.0	1.9	1.7	2.6	-25	-23%	Pass
4	Murch Road	A4055 Cardiff Rd North	Murch Rd	77	1	1	79	55	2	2	59	2.7	0.6	0.8	2.5	-20	-26%	Pass
		A4055 Cardiff Rd North	A4055 Cardiff Rd South	436	31	4	471	446	14	3	464	0.5	3.5	0.6	0.3	-7	-2%	Pass
		A4055 Cardiff Rd North	Millbrook Rd	25	0	0	25	20	1	0	21	1.0	1.4	0.0	0.8	-4	-16%	Pass
		Murch Rd	A4055 Cardiff Rd North	109	2	3	114	109	3	2	114	0.0	0.9	0.9	0.0	0	0%	Pass
		Murch Rd	A4055 Cardiff Rd South	83	3	0	86	81	2	0	83	0.2	0.7	0.0	0.3	-3	-3%	Pass
		Murch Rd	Millbrook Rd	92	0	0	92	90	3	0	94	0.2	2.5	0.0	0.2	2	2%	Pass
		A4055 Cardiff Rd South	A4055 Cardiff Rd North	435	25	3	463	445	15	3	463	0.5	2.3	0.0	0.0	0	0%	Pass
		A4055 Cardiff Rd South	Murch Rd	28	0	0	28	26	1	0	27	0.3	1.2	0.0	0.2	-1	-3%	Pass
		A4055 Cardiff Rd South	Millbrook Rd	11	0	0	11	11	0	0	11	0.0	0.7	0.0	0.1	0	2%	Pass
		Millbrook Rd	A4055 Cardiff Rd North	51	1	0	52	52	1	0	53	0.1	0.2	0.0	0.1	1	2%	Pass
		Millbrook Rd	Murch Rd	35	2	0	37	38	1	0	39	0.5	0.7	0.0	0.4	2	6%	Pass
		Millbrook Rd	A4055 Cardiff Rd South	22	0	0	22	20	0	0	21	0.4	0.7	0.0	0.3	-1	-6%	Pass

				PM Peak														
Node No.	Junction Name	From Arm	To Arm	Observed Data				Modelled Data				GEH				Flow Criteria		Validation Criteria
				Lights (Car+LGV)	HGV	Bus	Total	Lights (Car+LGV)	HGV	Bus	Model Total	Lights (Car+LGV)	HGV	Bus	Model Total	Abs Diff	% Diff	
1	Barrons Court	A4055 North	A4160 South	873	9	1	883	866	16	0	882	0.2	2.1	1.4	0.0	-1	0%	Pass
		A4055 North	A4055 Barry Road	517	12	1	530	523	12	1	536	0.3	0.1	0.0	0.3	6	1%	Pass
		A4055 North	A4160 North (Penarth Rd)	67	4	0	71	67	1	0	68	0.0	1.8	0.0	0.4	-3	-5%	Pass
		A4160 South	A4055 North	491	3	1	495	492	10	0	501	0.0	2.7	1.4	0.3	6	1%	Pass
		A4160 South	A4055 Barry Road	148	1	0	149	141	2	0	143	0.6	1.0	0.0	0.5	-6	-4%	Pass
		A4160 South	A4160 North (Penarth Rd)	227	4	6	237	230	5	4	239	0.2	0.6	1.0	0.1	2	1%	Pass
		A4055 Barry Road	A4055 North	691	17	1	709	634	13	0	647	2.2	1.1	1.4	2.4	-62	-9%	Pass
		A4055 Barry Road	A4160 South	126	1	0	127	123	3	0	125	0.3	1.2	0.0	0.2	-2	-1%	Pass
		A4055 Barry Road	A4160 North (Penarth Rd)	157	3	0	160	152	3	0	156	0.4	0.1	0.0	0.4	-5	-3%	Pass
		A4160 North (Penarth Rd)	A4055 North	152	9	0	161	160	3	0	164	0.6	2.2	0.0	0.2	3	2%	Pass
		A4160 North (Penarth Rd)	A4160 South	319	1	6	326	309	6	5	321	0.5	2.8	0.4	0.3	-5	-2%	Pass
		A4160 North (Penarth Rd)	A4055 Barry Road	263	2	0	265	247	6	0	252	1.0	1.9	0.0	0.8	-13	-5%	Pass
2	Merrie Harrier 1	B4267 Penlan Rd	A4055 Barry Rd	196	3	1	200	192	5	0	197	0.3	0.9	1.4	0.2	-3	-1%	Pass
		B4267 Penlan Rd	Andrew Rd	0	2	1	3	0	0	0	0	0.0	2.0	1.4	2.4	-3	-100%	Pass
		B4267 Penlan Rd	A4055 Cardiff Rd	316	5	3	324	314	7	5	326	0.1	0.7	1.0	0.1	2	1%	Pass
		A4055 Barry Rd	B4267 Penlan Rd	58	1	1	60	60	1	1	62	0.2	0.0	0.0	0.2	2	3%	Pass
		A4055 Barry Rd	Andrew Rd	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0%	Pass
		A4055 Barry Rd	A4055 Cardiff Rd	823	14	0	837	850	19	0	869	0.9	1.3	0.0	1.1	32	4%	Pass
		A4055 Barry Rd	Corbett Rd	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0%	Pass
		Andrew Rd	B4267 Penlan Rd	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0%	Pass
		Andrew Rd	A4055 Cardiff Rd	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0%	Pass
		Andrew Rd	Corbett Rd	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0%	Pass
		A4055 Cardiff Rd	B4267 Penlan Rd	264	5	4	273	252	4	3	259	0.7	0.5	0.5	0.9	-14	-5%	Pass
		A4055 Cardiff Rd	A4055 Barry Rd	769	18	0	787	717	14	0	731	1.9	1.0	0.0	2.0	-56	-7%	Pass
		A4055 Cardiff Rd	Andrew Rd	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0%	Pass
		A4055 Cardiff Rd	Corbett Rd	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0%	Pass
		Corbett Rd	B4267 Penlan Rd	1	0	0	1	0	0	0	0	1.4	0.0	0.0	1.4	-1	-100%	Pass
		Corbett Rd	A4055 Barry Rd	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0%	Pass
		Corbett Rd	Andrew Rd	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0	0%	Pass
		Corbett Rd	A4055 Cardiff Rd	1	0	0	1	0	0	0	0	1.4	0.0	0.0	1.4	-1	-100%	Pass
3	Merrie Harrirer 2	A4055 Cardiff Rd North	B4267 Redlands Rd	568	7	1	576	566	13	2	581	0.1	1.9	0.8	0.2	5	1%	Pass
		A4055 Cardiff Rd North	A4055 Cardiff Rd South	572	12	2	586	595	13	3	611	1.0	0.3	0.6	1.0	25	4%	Pass
		B4267 Redlands Rd	A4055 Cardiff Rd North	514	9	1	524	486	9	0	495	1.2	0.1	1.3	1.3	-29	-6%	Pass
		B4267 Redlands Rd	A4055 Cardiff Rd South	94	1	1	96	90	2	0	92	0.4	0.9	1.4	0.4	-4	-4%	Pass
		A4055 Cardiff Rd South	A4055 Cardiff Rd North	519	14	3	536	479	9	3	491	1.8	1.4	0.1	2.0	-46	-8%	Pass
		A4055 Cardiff Rd South	B4267 Redlands Rd	91	2	1	94	81	2	1	83	1.1	0.3	0.3	1.1	-11	-11%	Pass
4	Murch Road	A4055 Cardiff Rd North	Murch Rd	128	3	2	133	151	3	1	155	1.9	0.3	0.8	1.9	22	17%	Pass
		A4055 Cardiff Rd North	A4055 Cardiff Rd South	539	13	2	554	577	12	2	592	1.6	0.3	0.2	1.6	38	7%	Pass
		A4055 Cardiff Rd North	Millbrook Rd	25	1	0	26	26	0	0	26	0.1	0.6	0.0	0.0	0	0%	Pass
		Murch Rd	A4055 Cardiff Rd North	94	3	1	98	89	2	2	92	0.5	1.0	0.5	0.6	-6	-6%	Pass
		Murch Rd	A4055 Cardiff Rd South	72	1	0	73	68	2	0	69	0.5	0.6	0.0	0.4	-4	-5%	Pass
		Murch Rd	Millbrook Rd	42	0	0	42	33	1	0	34	1.5	1.3	0.0	1.3	-8	-20%	Pass
		A4055 Cardiff Rd South	A4055 Cardiff Rd North	469	12	3	484	479	10	2	491	0.4	0.6	0.6	0.3	7	1%	Pass
		A4055 Cardiff Rd South	Murch Rd	46	0	0	46	41	1	0	42	0.7	1.5	0.0	0.5	-4	-8%	Pass
		A4055 Cardiff Rd South	Millbrook Rd	7	0	0	7	6	0	0	6	0.5	0.5	0.0	0.4	-1	-15%	Pass
		Millbrook Rd	A4055 Cardiff Rd North	66	0	0	66	54	1	0	55	1.5	1.3	0.0	1.4	-11	-16%	Pass
		Millbrook Rd	Murch Rd	81	0	0	81	66	1	0	67	1.7	1.5	0.0	1.6	-14	-17%	Pass
		Millbrook Rd	A4055 Cardiff Rd South	58	1	0	59	46	1	0	46	1.7	0.3	0.0	1.7	-13	-21%	Pass

APPENDIX D

ANPR Journey Time Calculations

(available electronically)

Journey Time Validation

Overall Base AM Validation Summary							
Extract			Journey Time (s)		Difference (s)	% Difference	Validation Criteria
No.	Route	Length (m)	Modelled Travel Time(sec)	ANPR_Survey Travel Time(sec)			
1	NB	2210	902	857	45	5%	pass
2	SB	2210	331	311	20	7%	pass

Overall Base AM Validation Summary							
Extract			Journey Time (s)		Difference (s)	% Difference	Validation Criteria
No.	Route	Length (m)	Modelled Travel Time(sec)	ANPR_Survey Travel Time(sec)			
1	NB	2210	330	274	57	21%	pass
2	SB	2210	629	748	120	16%	fail

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London,

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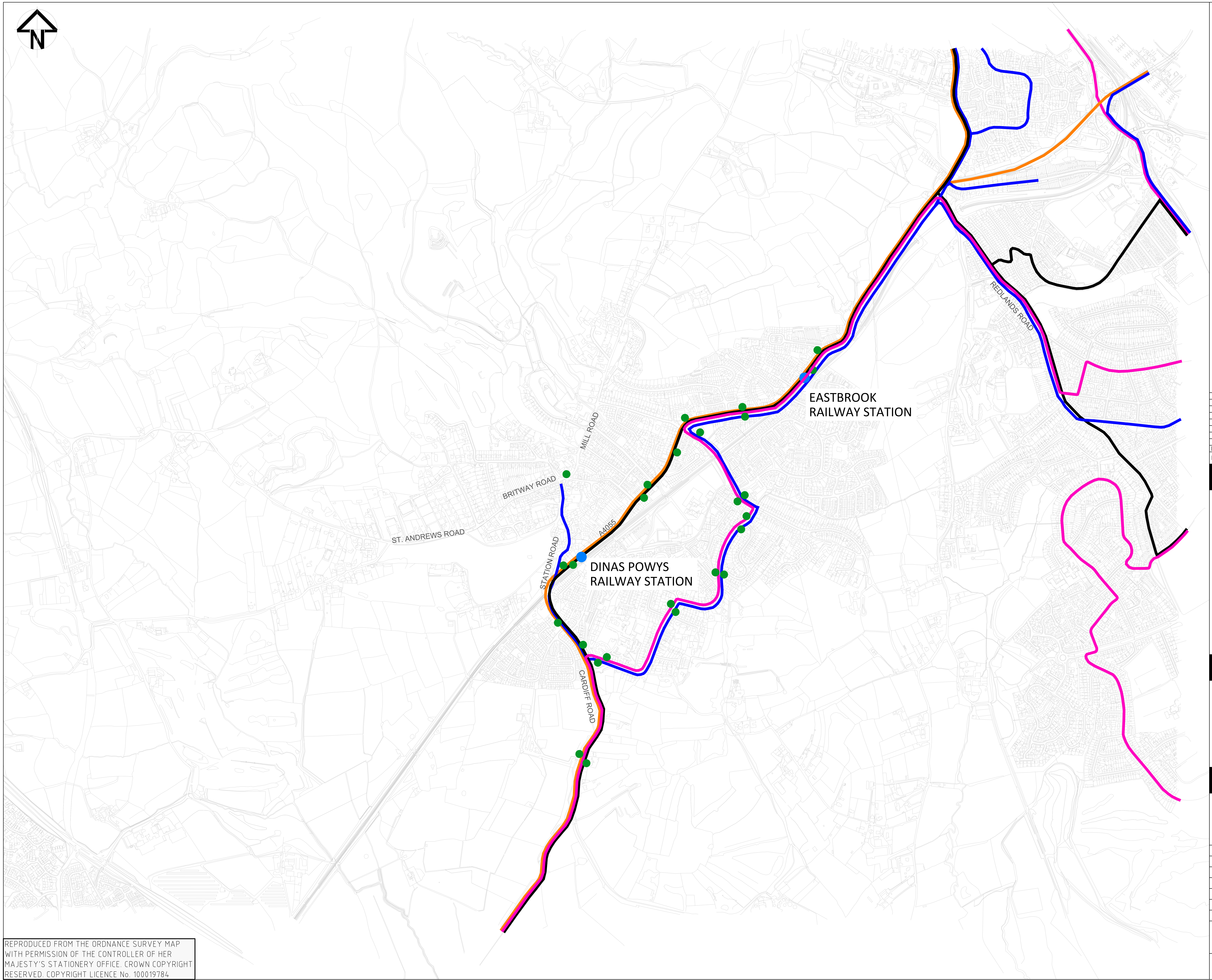
APPENDIX D

Multi-Modal Option



NOTES:

● RAILWAY STATION
● BUS STOPS
BUS SERVICES:
▬ 95, 95A, 95B
▬ 93
▬ 304
▬ 89A

P01	20FEB18	FOR INFORMATION PURPOSES ONLY	MS	MT	GH
Rev	Date	Description	Drawn	Check	Approv

Client

VALE OF
GLAMORGAN

PROJECT:
Dinas Powys
WelTAG S2

Site

Address
City

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TITLE:

EXISTING PUBLIC TRANSPORT ROUTES

Designed	R. ELLIS	Signed	Date 20FEB2018
Drawn	M. SMITH	Signed	Date 20FEB2018
Checked	M. THOMAS	Signed	Date 20FEB2018
Approved	G. HARRIS	Signed	Date 20FEB2018
Scale:	NA	Datum:	AOD
Original Size:	A1	Grid:	OS
Suitability Code:	S2	Project Number:	10015022

Suitability Description:
INFORMATION PURPOSES
NOT FOR CONSTRUCTION

Drawing Number:
10015022-ARC-XX-XX-DR-HE-0012

Revision:
P01

Print Date: 2018-03-15 09:41:24

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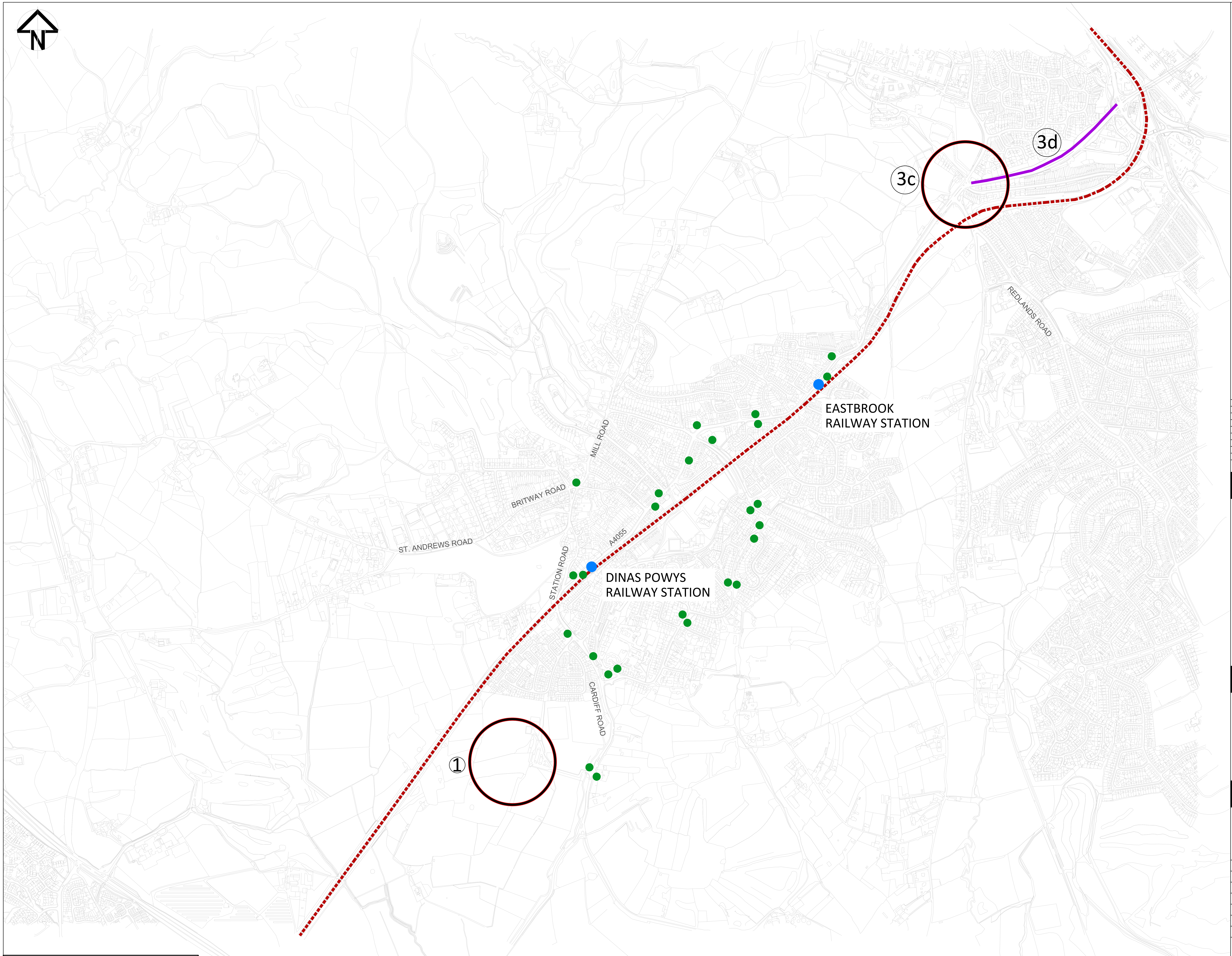

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NOTES:

1. BUS BASED PARK & RIDE
2. RAIL ENHANCEMENTS:
   - 🟥 VALE OF GLAMORGAN LINE SERVICE ENHANCEMENT
   - ● RAIL WAY UPGRADE
3. BUS ENHANCEMENT:
   - 3a BUS STOP ENHANCEMENT
   - 3b MERRIER HARRIER JUNCTION
   - 3c MERRIER HARRIER JUNCTION TO BARONS COURT JUNCTION BUS LANE

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Client

VALE OF
GLAMORGAN

PROJECT:
Dinas Powys
WelTAG S2

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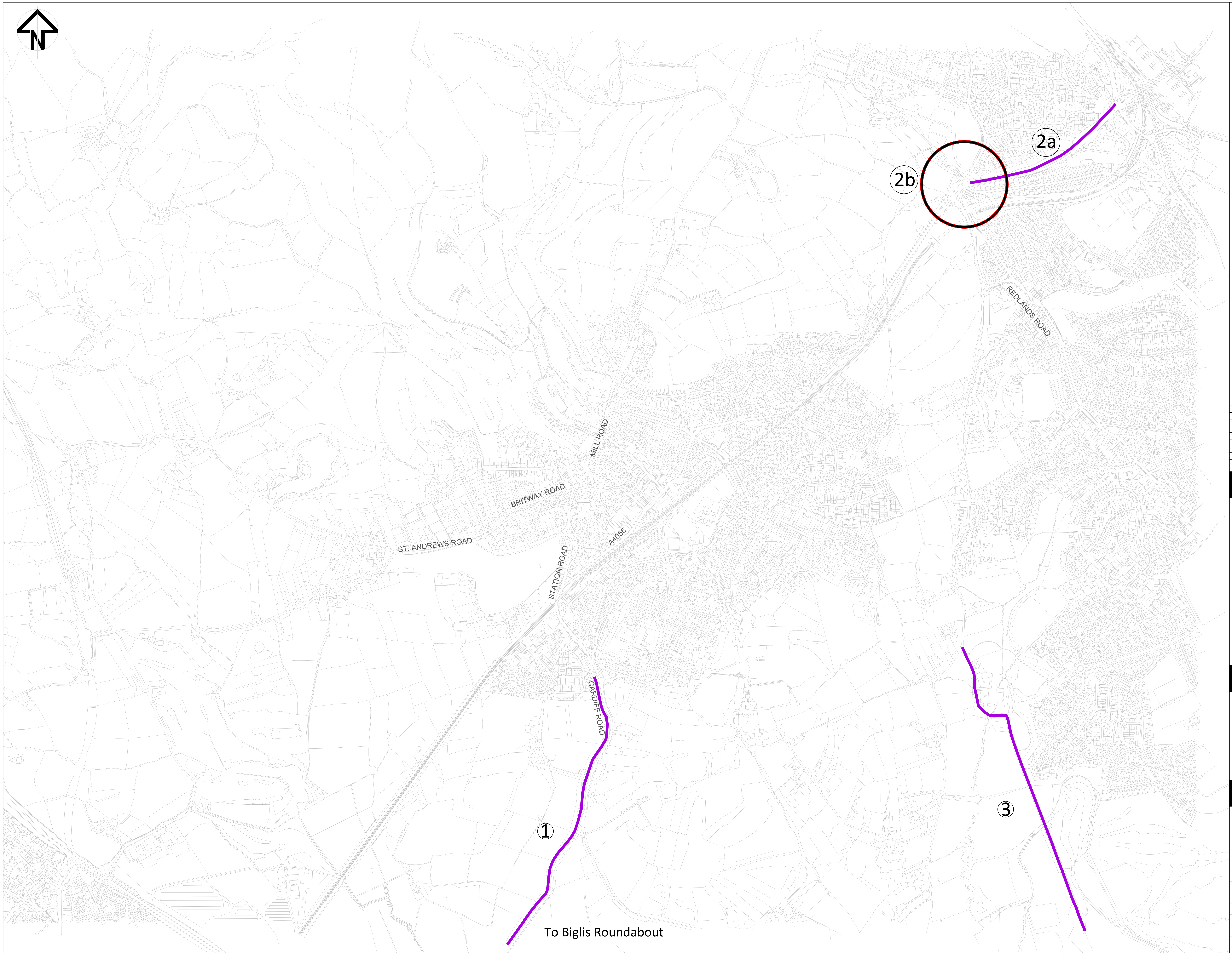
TITLE:

PROPOSED PUBLIC
TRANSPORT ROUTES

Designed	R. ELLIS	Signed	Date 20FEB2018
Drawn	M. SMITH	Signed	Date 20FEB2018
Checked	M. THOMAS	Signed	Date 20FEB2018
Approved	G. HARRIS	Signed	Date 20FEB2018
Scale:	NA	Datum:	AOD
Original Size:	A1	Grid:	OS
Suitability Code:	S2	Project Number:	10015022

Suitability Description:
INFORMATION PURPOSES
NOT FOR CONSTRUCTION

Drawing Number: 10015022-ARC-XX-XX-DR-HE-0013
Revision: P01



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NOTES:

1. BARRY TO DINAS POWYS CYCLE ROUTE
2A. MERRIER HARRIER JUNCTION TO BARONS COURT JUNCTION
2B. MERRIER HARRIER JUNCTION
3. DINAS POWYS TO PENARTH CONNECTIONS

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Client

VALE OF
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PROJECT:
Dinas Powys
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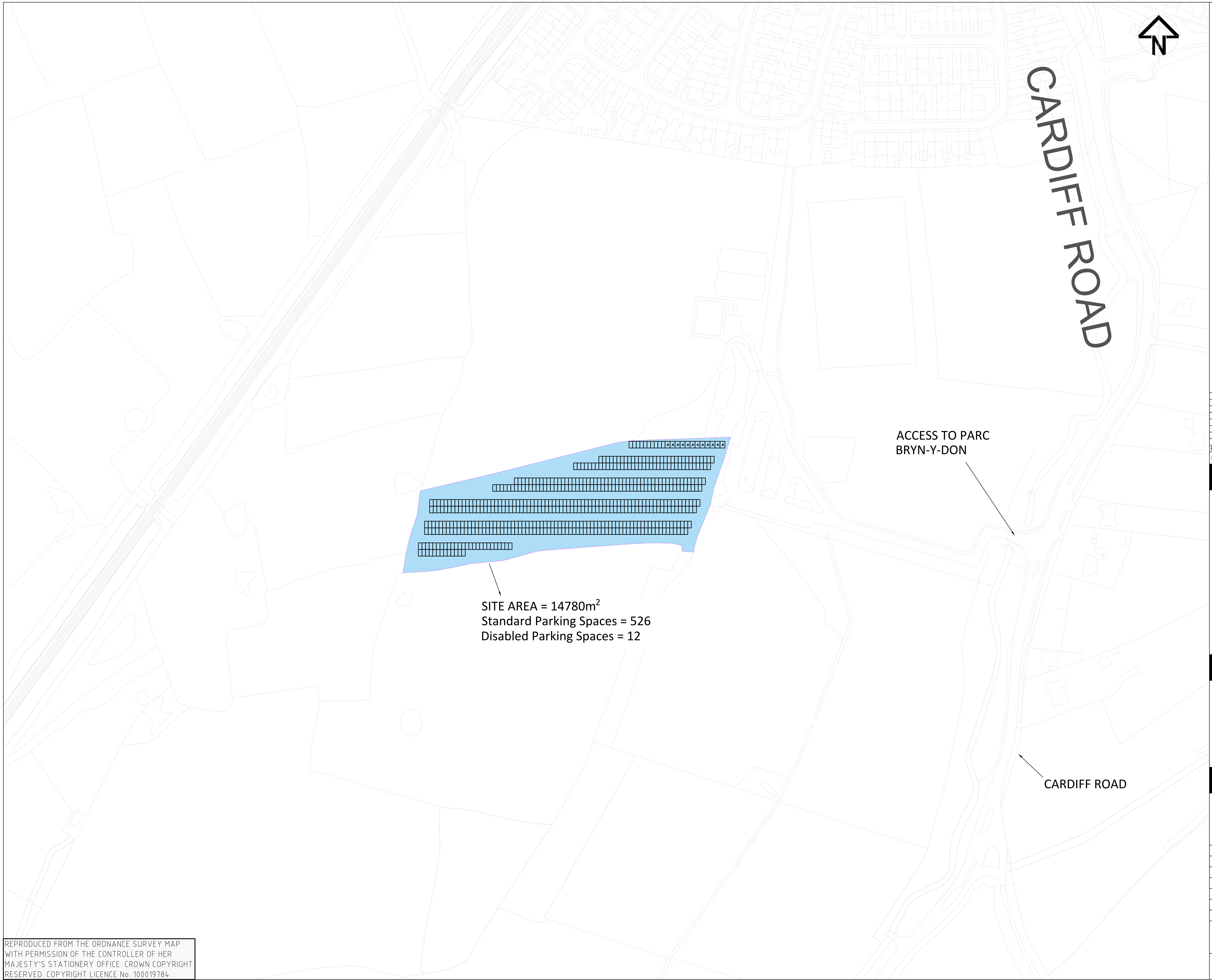
TITLE:

PROPOSED WALKING & CYCLING ROUTES

Designed	R. ELLIS	Signed	Date 20FEB2018
Drawn	M. SMITH	Signed	Date 20FEB2018
Checked	M. THOMAS	Signed	Date 20FEB2018
Approved	G. HARRIS	Signed	Date 20FEB2018
Scale:	NA	Datum:	AOD
Original Size:	A1	Grid:	OS
Suitability Code:	S2	Project Number:	10015022

Suitability Description:
INFORMATION PURPOSES
NOT FOR CONSTRUCTION

Drawing Number: 10015022-ARC-XX-XX-DR-HE-0014	Revision: P01



SITE AREA = 14780m^2
Standard Parking Spaces = 526
Disabled Parking Spaces = 12

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NOTES:

Rev	Date	Description	Drawn	Check	Approv
P1.0	06/03/18	FIT FOR INFORMATION	RE	MT	GH

Client

VALE OF
GLAMORGAN

PROJECT:
Dinas Powys
WelTAG Stage 2
Appraisal

Civic Offices
Barry

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TITLE:

PROPOSED PARK AND RIDE AREA

Designed	R. ELLIS	Signed	Date 06MAR18
Drawn	M. SMITH	Signed	Date 06MAR18
Checked	M. THOMAS	Signed	Date 06MAR18
Approved	G. HARRIS	Signed	Date 06MAR18
Scale:	1:1250	Datum:	AOD
Original Size:	A1	Grid:	OS
Suitability Code:	S2	Project Number:	10015022

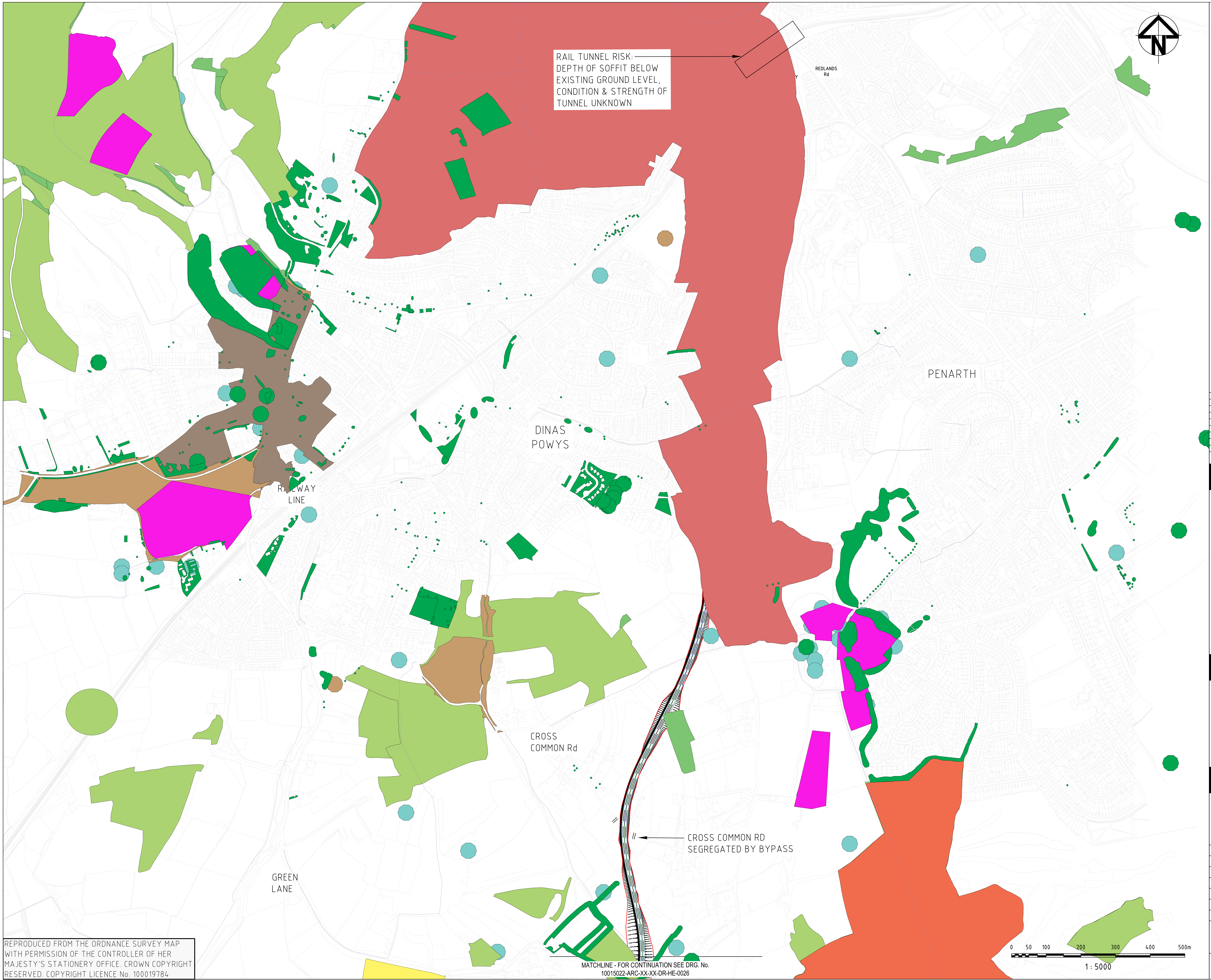
Suitability Description:
CONCEPT DESIGN
FIT FOR INFORMATION

Drawing Number:
10015022-ARC-XX-XX-DR-HE-0015

Revision:
P1.0

APPENDIX E

Blue Bypass Alignment



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NOTES:

LEGEND:

🟪 SCHEDULED MONUMENT
🟪 MINERAL SAFEGUARDING SAND & GRAVEL
🟩 SPECIAL LANDSCAPE AREAS
🟩 MINERAL SAFEGUARDING LIMESTONE 2
🟩 PUBLIC OPEN SPACE
🟧 MINERAL SAFEGUARDING LIMESTONE 1
🟫 SAND AND GRAVEL WHARF
🟨 SITE OF IMPORTANCE FOR NATURE CONSERVATION
🟩 ANCIENT WOODLAND
🟦 ARCHAEOLOGY
🟪 CADW PARKS AND GARDENS
🟫 CONSERVATION AREA
🟧 LDP FLOODING FCA
🟨 LDP GREEN WEDGE
🟩 LDP SINC
🟥 LOCAL NATURE RESERVE
🟩 LISTED BUILDINGS
🟪 PUBLIC RIGHT OF WAY
🟥 REGISTERED COMMON LAND

P01	06.07.18	FOR INFORMATION	MS	CBM	NW
Rev	Date	Description	Drawn	Check	Approv

Client

VALE OF GLAMORGAN

VALE of GLAMORGAN
BRO MORGANNWG

PROJECT:
Dinas Powys
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TITLE:

BLUE ALIGNMENT WITH ENVIRONMENTAL CONSTRAINTS SHEET 1 OF 2

Designed	C.B. MALIN	Signed	Date 06JUL2018
Drawn	M. SMITH	Signed	Date 06JUL2018
Checked	C.B. MALIN	Signed	Date 06JUL2018
Approved	M. FRY	Signed	Date 06JUL2018
Scale:	AS SHOWN	Datum:	AOD
Original Size:	A1	Grid:	OS
Suitability Code:	S2	Project Number:	10015022

Suitability Description:
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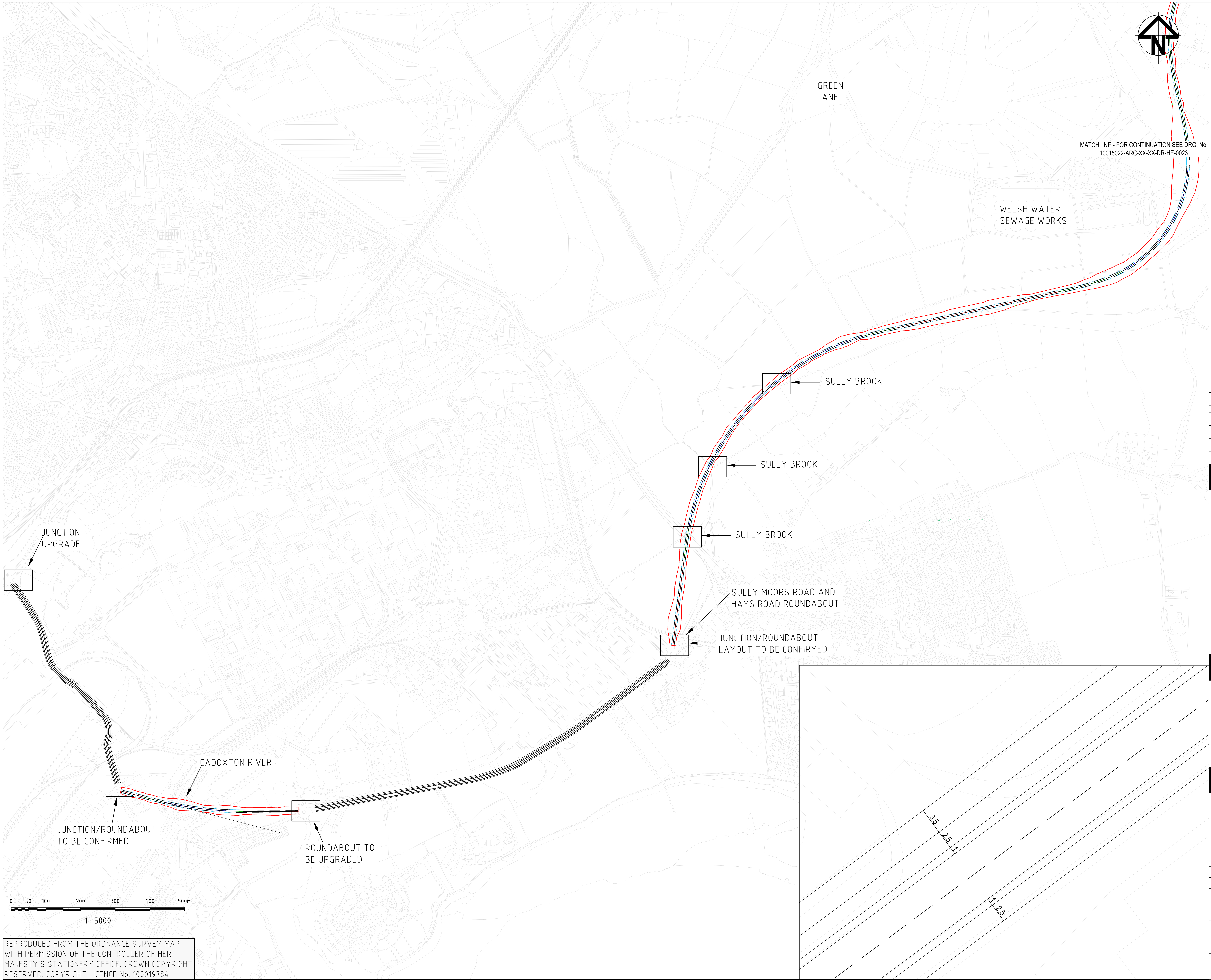
Drawing Number:
10015022-ARC-XX-XX-DR-HE-0025

Revision:
P01



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P01	06.07.18	FOR INFORMATION	MS	CBM	NW

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TITLE:

BLUE ALIGNMENT
SHEET 2 OF 2

Designed	C.B. MALIN	Signed	Date 06JUL2018
Drawn	M. SMITH	Signed	Date 06JUL2018
Checked	C.B. MALIN	Signed	Date 06JUL2018
Approved	N. WESTWOOD	Signed	Date 06JUL2018
Scale:	AS SHOWN	Datum:	AOD
Original Size:	A1	Grid:	OS
Suitability Code:	S2	Project Number:	10015022

Suitability Description:
FIT FOR INFORMATION

Drawing Number:
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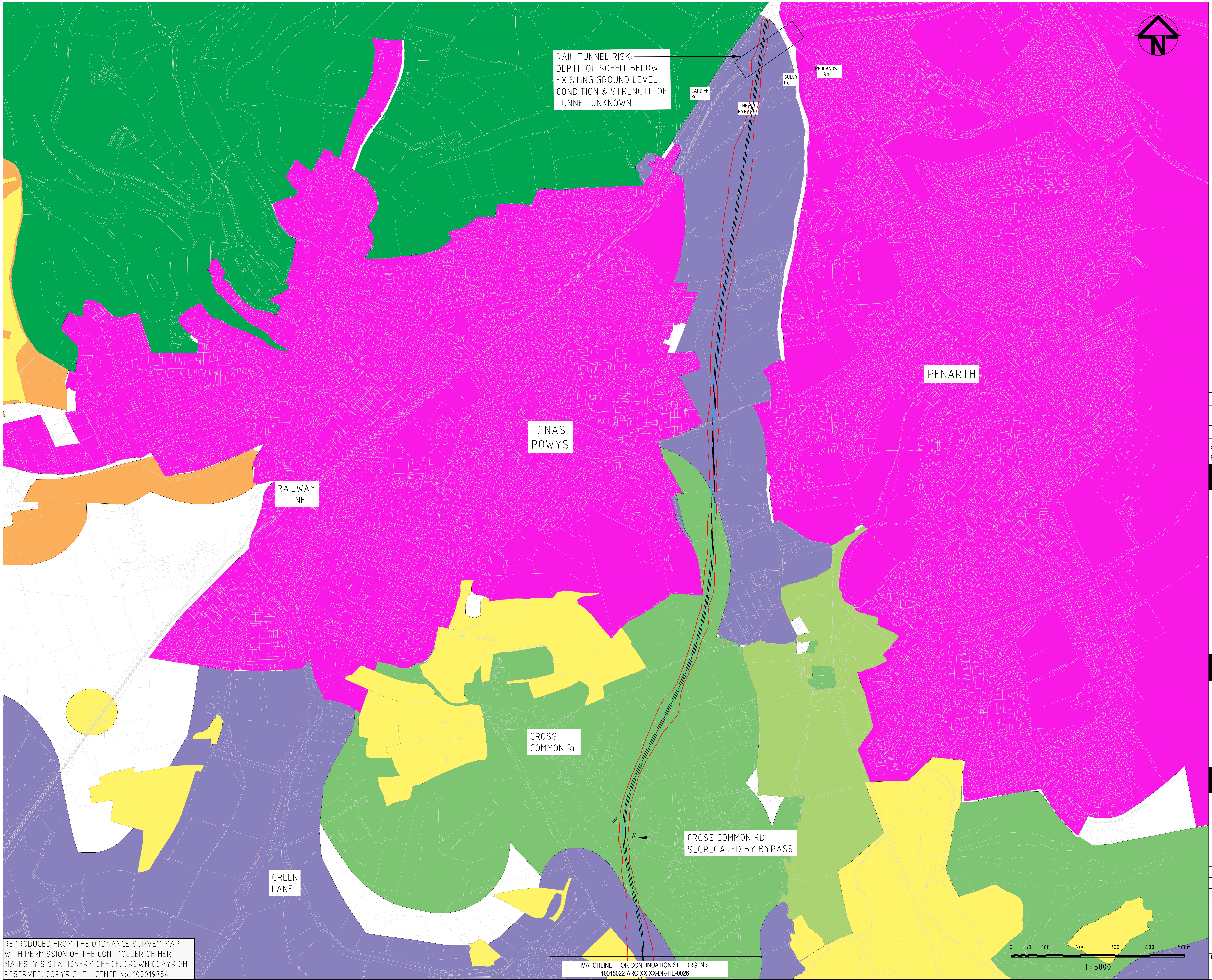
Revision:
P01



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NOTES:

LEGEND:

- 🟫 LDP SAND & GRAVEL WHARF
- 🟫 LDP EDUCATION
- 🟩 ANCIENT WOODLAND
- 🟩 LDP SLA
- 🟩 LDP MINERAL SAFEGUARDING LIMESTONE 2
- 🟩 LDP PUBLIC OPEN SPACE
- 🟨 LDP HOUSING MIXED
- ⬜ NRW COMMON LAND
- 🟨 LDP SINC
- 🟧 LDP MINERAL SAFEGUARDING LIMESTONE 1
- 🟧 LDP DORMANT MINERAL SITE
- 🟥 PUBLIC RIGHT OF WAY
- 🟥 LDP PROPOSED NATIONAL CYCLE ROUTE
- 🟪 LDP SETTLEMENTS
- 🟪 C1
- 🟪 LDP MINERAL SAFEGUARDING SAND & GRAVEL
- 🟦 AQMA
- 🟦 LDP TRANSPORT CYCLING

Rev	Date	Description	Drawn	Check	Approv
P01	06.07.18	FOR INFORMATION	MS	CBM	NW

Client

VALE OF
GLAMORGAN

PROJECT:
Dinas Powys
WelTAG S2

Site — VALE OF GLAMORGAN

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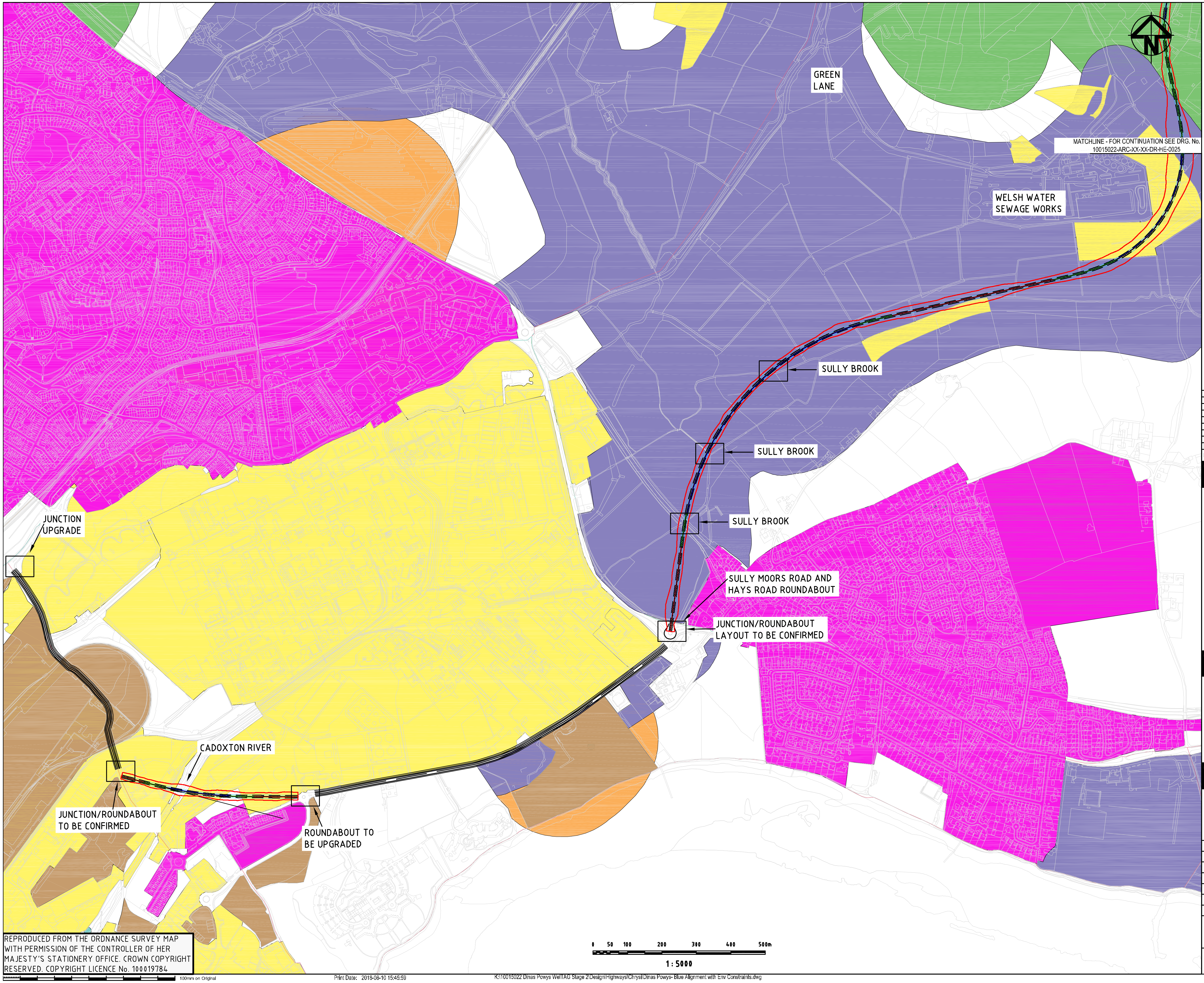
TITLE:

BLUE ALIGNMENT WITH ENVIRONMENTAL CONSTRAINTS
SHEET 1 OF 2

Designed	C.B. MALIN	Signed	Date 06JUL2018
Drawn	M. SMITH	Signed	Date 06JUL2018
Checked	C.B. MALIN	Signed	Date 06JUL2018
Approved	M. FRY	Signed	Date 06JUL2018
Scale:	AS SHOWN	Datum:	AOD
Original Size:	A1	Grid:	OS
Suitability Code:	S2	Project Number:	10015022

Suitability Description:
FIT FOR INFORMATION

Drawing Number:	Revision:
10015022-ARC-XX-XX-DR-HE-0025	P01



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NOTES:

LEGEND:

🟫	LDP SAND & GRAVEL WHARF
🟫	LDP EDUCATION
🟩	ANCIENT WOODLAND
🟩	LDP SLA
🟩	LDP MINERAL SAFEGUARDING LIMESTONE 2
🟩	LDP PUBLIC OPEN SPACE
🟨	LDP HOUSING MIXED
⬜	NRW COMMON LAND
🟨	LDP SINC
🟧	LDP MINERAL SAFEGUARDING LIMESTONE 1
🟧	LDP DORMANT MINERAL SITE
🟥	PUBLIC RIGHT OF WAY
🟥	LDP PROPOSED NATIONAL CYCLE ROUTE
🟪	LDP SETTLEMENTS
🟪	C1
🟪	LDP MINERAL SAFEGUARDING SAND & GRAVEL
🟦	AQMA
🟦	LDP TRANSPORT CYCLING

Rev	Date	Description	Drawn	Check	Approv
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Client

VALE OF
GLAMORGAN

PROJECT:
Dinas Powys
WelTAG S2

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TITLE:

BLUE ALIGNMENT WITH ENVIRONMENTAL CONSTRAINTS SHEET 2 OF 2

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APPENDIX F

Economic Appraisal

Economic Appraisal

Project	**Dinas Powys Transport Network WelTAG Study: Stage Two**	Date	**31st August 2018**
Subject	**Transport User Benefits and Indicative BCR**	Ref	**Version 0.8**

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1 Introduction

1.1 Purpose of the Technical Note

1.1.1 Arcadis has been commissioned by Vale of Glamorgan Council to develop and appraise potential options for improving the strategic transport network around the village of Dinas Powys.

1.1.2 The purpose of this report is to provide a detailed overview of the methodology used to provide an initial assessment of the economic case for providing a bypass around Dinas Powys. This work is at WelTAG Stage Two and the objective is to prepare an outline business case and determine if there is any merit in the proposals for a bypass and whether they justify further investigations and development through a WelTAG Stage Three study.

1.1.3 In a WelTAG study the proposed interventions are assessed on the basis of their contribution towards meeting the objectives set and an assessment of their social and cultural, environmental and economic impacts. This technical note reports on the direct economic impacts of a bypass as measured by the impact on the journey times and costs of people using the bypass. It also considers the likely changes in accidents through the provision of the bypass. The Outline Business Case report considers all the other impacts.

1.1.4 Preliminary cost estimates have been used to derive an initial benefit cost ratio (BCR) for the scheme. In a WelTAG Stage Three these costs would be further refined. Further work would also consider the wider economic impacts of providing a bypass to Dinas Powys and the impact on the scheme of proposed new housing and employment in the area.

1.2 Study Area

1.2.1 The study area covers the A4055 Cardiff Road from the Biglis roundabout to Barons Court Junction as set out in the Outline Business Case report. The length of the corridor is 5.198 km. The following junctions are also included in the study area:

- Milbrook Road/A4055/Murch Road Junction
- Merrie Harrier Junction
- A4055/Station Road
- B4267/ Llandough Hill Junction
- Leckwith Road B4267 / Pen-Y-Turnpike Road Junction
- Britway Road/ Mill Road Junction

1.3 Observed Conditions

1.3.1 The traffic surveys undertaken and the observed conditions are reported in the Impacts Assessment Report.

2 Green Alignment for Assessment

2.1 Introduction

2.1.1 The primary alignment assessed in this study is the Green alignment. This alignment is shown on figures and described fully in the Outline Business Case report. It is based on the following:

- Alignment complies with the Design Manual for Roads and Bridges and contains no departures for 60mph speed limit (100kph design speed) single carriageway - Carriageway width of 3.65m per lane + 1m hardstrips (total carriageway width of 9.3m) plus verge width of 2.5m either side of the carriageway.
- A 3.5m wide cycleway is included to one side of the bypass.
- Total cross section width of 17.8m + earthworks slopes where required.
- The alignment has been developed to fit into the landscape and where possible avoid constraints as provided by the Vale of Glamorgan Council.
- The vertical alignment is based on 5m OS Contours which have the accuracy to +/- 2m.
- Earthworks are assumed to be 1 in 3 embankment and cutting slopes – to be confirmed at a later stage subject to ground investigation and the materials present.
- Outfall points for drainage are not known at this stage - costs have been estimated.
- It is assumed that access along Cross Common Road will be terminated, and no direct through route will be allowed. A junction of the proposed bypass with Green Lane will be incorporated into the design.

2.1.2 It should be noted that further surveys, investigations and design will be required in WelTAG Stage Three in order to confirm its accuracy.

2.2 Green Alignment

2.2.1 The Green alignment provides a new road to the east of Dinas Powys. This alignment does not change the layout of the Merrie Harrier Junction but rather there is a new roundabout provided to the south west of the existing Merrie Harrier Junction. This roundabout has connections to Cardiff Road, Redlands Road and the new bypass.

2.2.2 This alignment allows for access to remain at all existing arms at the Merrie Harrier Junction, including the one-way system through Andrew Road. This provides minimal disruption to the existing Merrie Harrier Junction itself while allowing traffic to reach the new bypass. There would also be a new roundabout at the southern end of the new bypass which is used to connect Cardiff Road with the new bypass.

3 Economic Appraisal Inputs

3.1 Introduction

3.1.1 The tools used to derive the initial economic benefits were:

- The DfT's Transport User Benefits Appraisal Tool TUBA, version 1.9.11. This software was used to estimate the direct user and provider benefits in terms of travel time savings and vehicle operating costs.
- DfT's computer program COBALT (COst and Benefit to Accidents-Light Touch,) version 2013.2, was used to calculate the accident benefits.

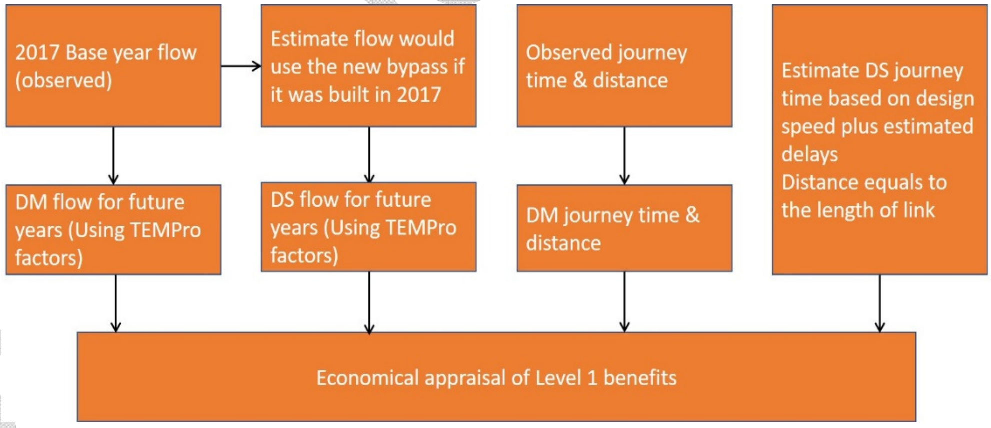
3.1.2 The inputs into the TUBA software are the number of trips using the current and proposed new routes, the journey times along both routes and the journey distance along both routes. These are required, as a minimum, for the opening year of the scheme and a future year, usually 15 years after opening. The information is required by time period, as journey times and trip numbers vary across the day.

3.1.3 This TUBA analysis has been carried out using trip forecasts for 2023, 2036 and 2051. The time periods used are the standard TUBA time periods. These are:

- AM peak period (07.00 – 10.00)
- Interpeak period (10.00 – 16.00)
- PM peak period (16.00 – 19.00)

3.1.4 The following sections set out the method used in order to calculate the necessary inputs to TUBA and the key assumptions made. The situation with only the current route is known as the do-minimum (DM). The situation with the new bypass is called the do-something (DS). The process for producing the inputs for TUBA are set out in Figure 3.1 below.

Figure 3.1 Inputs of Economic Appraisal



3.2 Trips

3.2.1 Traffic flow data in the base year (2017) has been extracted from the MCC data for the study corridor as described in the Impacts Appraisal Report. Base year flows on each section are summarised in Table 3.1. The data was extracted for the following time periods:

- 08.00-09.00 AM peak hour
- An average hour between 10.00 and 16.00
- 17.00 – 18.00 PM peak hour

Table 3.1 Base year (2017) Traffic Flows (Vehicles per hour)

Links	Direction	Length	AM	IP	PM
Section 1	SB	676	774	769	976
Section 1	NB	676	993	880	915
Section 2	SB	341	316	338	518
Section 2	NB	341	602	338	293
Section 3	EB	752	1	1	1
Section 3	WB	752	0	0	4
Section 4	EB	382	544	460	802
Section 4	WB	382	872	560	517
Section 5	EB	291	5	3	0
Section 5	WB	291	0	0	0
Section 6	SB	1490	519	640	674
Section 6	NB	1490	662	642	670
Section 7	EB	325	144	208	263
Section 7	WB	325	298	220	199
Section 8	EB	342	116	130	252
Section 8	WB	342	132	77	74
Section 9	SB	337	561	594	712
Section 9	NB	337	523	548	579
Section 10	SB	435	503	537	739
Section 10	NB	435	509	517	538
Section 11	SB	410	94	104	173
Section 11	NB	410	312	129	138
Section 12	SB	1260	589	620	896
Section 12	NB	1260	813	617	660
Section 13	SB	1000	699	648	894
Section 13	NB	1000	808	656	697

3.2.2 It is assumed that following the opening of a bypass (Section 14 as shown in Figure 3.2), the majority of people who travel between the Biglis roundabout and the Merrie Harrier Junction would use the new route. It is assumed that people who currently make an intermediate stop along the current route would continue to use that route. People who drive straight through Dinas Powys would divert to the new route as it would provide a quicker journey time.

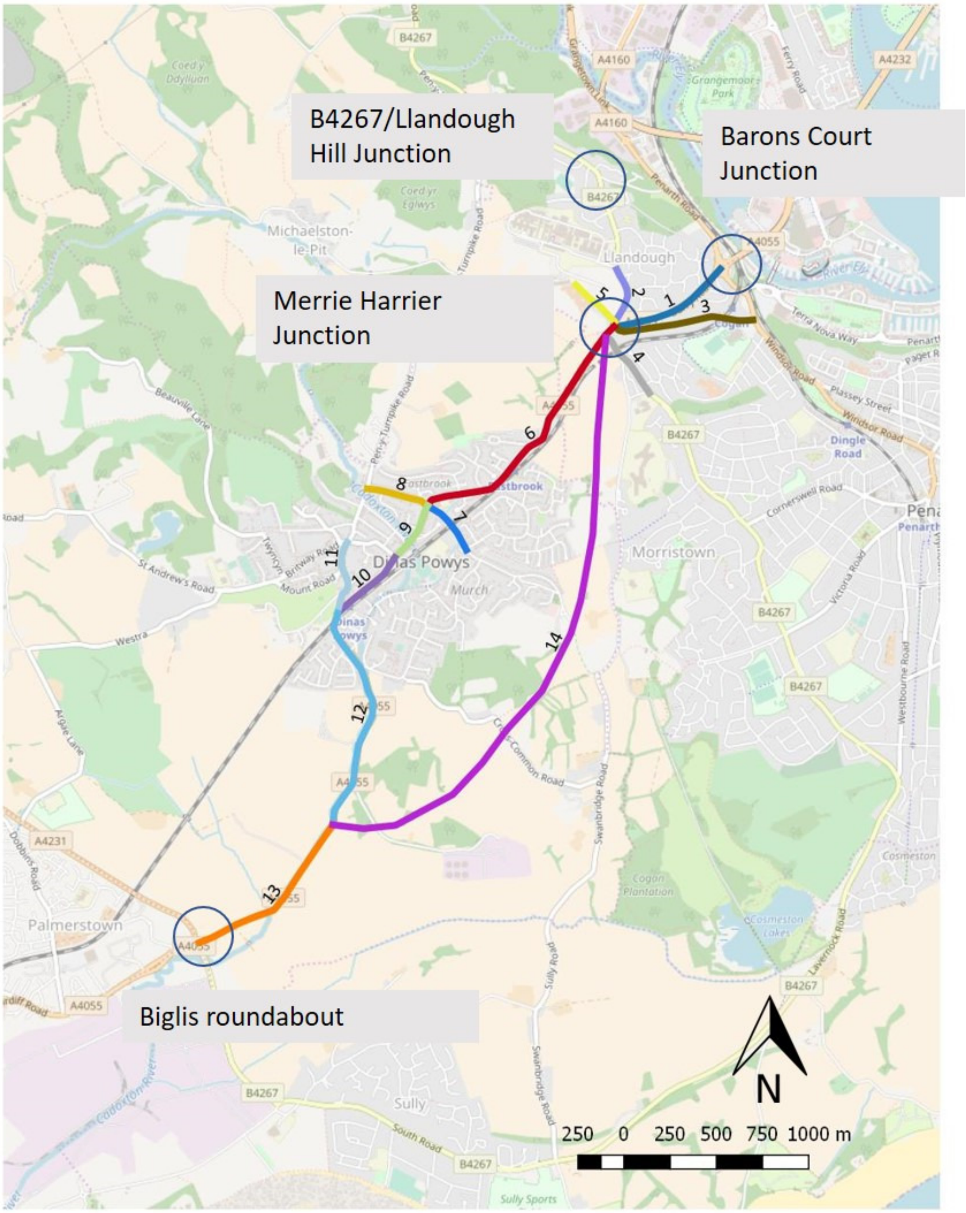
Northbound

3.2.3 Judged by the location, the northbound trips which would utilise the new bypass are those trips recorded at the Biglis roundabout (camera 018, 020, 022) and then at either the Merrie Harrier Junction (camera 011, 013), Barons Court Junction (camera 005, 007, 009) or B4267/ Llandough Hill Junction (camera 003). The trip distribution from Biglis roundabout northbound is shown in Table 3.2. The flows that might use bypass are highlighted in orange.

Table 3.2 Northbound Trip Distribution

From Biglis roundabout (Number of vehicles by time period | %)												
	Milbrook Road/ A4055/ Murch Road Junction		Merrie Harrier Junction		Barons Court Junction		B4267/ Llandough Hill		Leckwith Road B4267/ Pen-Y-Turnpike Road		Britway Road/ Mill Road	
AM	12	2%	13	2%	303	51%	35	6%	226	38%	11	2%
IP	230	5%	454	9%	3144	62%	87	2%	954	19%	200	4%
PM	21	4%	46	9%	340	65%	6	1%	87	17%	22	4%

Figure 3.2 Road Sections including Bypass



Southbound

3.2.4 The southbound trips which are anticipated to be attracted to the new bypass are those travelling from the following directions and reaching the Biglis junction:

- Merrie Harrier Junction (camera 012, 014)
- Barons Court Junction (camera 006, 008, 010)
- B4267/ Llandough Hill Junction (camera 04)

3.2.5 According to the observations from the ANPR survey, there were no vehicles recorded driving from the B4267/Llandough Hill Junction to Biglis roundabout (Table 3.3).

Table 3.3 Southbound Trip Distribution – B4267/ Llandough Hill Junction

From B4267/Llandough Hill (Number of vehicles by time period | %)						
	Merrie Harrier Junction		Barons Court Junction		Leckwith Road B4267 / Pen-Y-Turnpike Road	
AM	3	25%	3	25%	6	50%
IP	79	24%	98	30%	151	46%
PM	9	20%	18	39%	19	41%

3.2.6 The trip distributions from the other two junctions are provided in Table 3.4 and Table 3.5.

Table 3.4 Southbound Trip Distribution – from Barons Court Junction

From Barons Court Junction (Number of vehicles by time period | %)												
	Biglis Roundabout		Milbrook Road/ A4055/ Murch Road Junction		Merrie Harrier Junction (Camera 11/13)		B4267/ Llandough Hill (Camera 03)		Leckwith Road B4267/ Pen-y-Turnpike Road		Britway Road/ Mill Road	
AM	242	45%	24	4%	257	48%	2	0%	3	1%	9	2%
IP	2452	43%	490	9%	2312	40%	86	1%	255	4%	158	3%
PM	319	39%	47	6%	390	47%	9	1%	35	4%	28	3%

Table 3.5 Southbound Trip Distribution – from Merrie Harrier Junction

From Merrie Harrier Junction (Number of vehicles by time period | %)														
	Biglis Roundabout		Milbrook Road/A4055/ Murch Road Junction		Merrie Harrier Junction		Barons Court Junction		Leckwith Road B4267 / Pen-Y-Turnpike Road		B4267/Llandough Hill		Britway Road / Mill Road	
AM	21	3%	9	1%	13	2%	394	65%	112	19%	51	8%	4	1%
IP	279	6%	230	5%	265	6%	2676	62%	703	16%	110	3%	73	2%
PM	23	5%	20	4%	57	12%	259	56%	77	17%	16	3%	10	2%

3.2.7 As noted above, it is assumed that people who currently make an intermediate stop along the current route would continue to use that route. As identified during the busy hours (i.e. Northbound morning peak, Southbound evening peak), the median journey time is about 18 minutes between Biglis roundabout and Barons Court Junction. It is 10 minutes during the other time periods.

3.2.8 The data also shows many people spent much longer on trips between these two locations, which means they are likely to have stopped somewhere in Dinas Powys on their journey. It is unlikely that these people will change their route. Based on these observations, it was assumed that anyone who spent longer than 30 minutes stopped at Dinas Powys and will continue to use the current route (i.e. A4055) even if the bypass was available. Table 3.6 shows the proportions of trips with a journey time of longer than 30 minutes.

Table 3.6 Journey time is longer than 30 minutes between Biglis roundabout and Barons Court Junction (Number of vehicles)

	Northbound (Number of Observations)		**%**	**Southbound (Number of Observations)**		**%**
Time Period	**Total**	**JT> 30min**		**Total**	**JT> 30min**	
AM period	302	4	1%	242	2	1%
IP period	3144	469	15%	2452	255	10%
PM period	340	62	18%	319	38	12%

3.2.9 The estimation of traffic flows by direction has been made through the following methodology:

- Establish the number of trips on the relevant segments; in this case for northbound trips, only flows on Section 6 needs to be considered. For southbound trips, two sections are considered - Section 1 and Section 4.
- Using the distributions shown in Table 3.2 to Table 3.5, calculate the number of vehicles which will use the full length of A4055 between Biglis roundabout and Merrie Harrier junction. These are the trips that may potentially use the new bypass.
- Remove the trips that stop in Dinas Powys by applying the factors listed in Table 3.6. This provides the estimate of the number of trips using the bypass in the do-something (with bypass) scenario. These flows are shown in Table 3.7 and Table 3.8.
- Finally, we have factored up base trips to future years.

3.2.10 The base year traffic has been factored up to future years using the NTEM 7.2 growth factors. The NTEM 7.2 growth factors were obtained from the Trip End Model Presentation Program (TEMPro) Version 7.2 provided by the Department for Transport, using the option which provides growth factors for links rather than matrices.

3.2.11 TEMPro calculates the change in the number of trips based on the changes in trip rates per person, the number of people living in the area and the demographic profile of the population. The population estimates used in TEMPro are provided by the ONS. In this case the Vale of Glamorgan was selected as the study area. Origin/Destination type factors for car drivers were selected through TEMPro. The average of the origin and destination factors is applied to the base year link flows to derive future year estimates for 2023, 2036 and 2051. The estimated flows are provided in Appendix A.

Table 3.7 Estimation of the Split of Trips between A4055 and Bypass – Northbound

	Flow on Section 13 Northbound (Vehicles per hour)	**% Trips using bypass**	**% Trips stopping in Dinas Powys**	**Trips from Biglis roundabout to Merrie Harrier Junction (Vehicles per hour)**	
				Via Bypass	**Via A4055**
AM	808	59%	1%	472	5
IP	656	73%	15%	407	72
PM	697	75%	18%	429	94

Table 3.8 Estimation of the Split of Trips between A4055 and Bypass – Southbound

	Flow on Section 1 Southbound (Vehicles per hour)	Flow on Section 4 Southbound (Vehicles per hour)	% Trips using bypass		% Trips stopping in Dinas Powys	Trips from Merrie Harrier Junction to Biglis roundabout (Vehicles per hour)	
			From Section 1	From Section 4		Via Bypass	Via A4055
AM	774	872	45%	3%	1%	371	4
IP	769	560	43%	6%	10%	328	36
PM	976	517	39%	5%	12%	358	49

Table 3.9 NTEM 7.2 Growth Factors

Growth Factor (from TEMPro)	AM	IP	PM
2031	1.05	1.06	1.05
2036	1.12	1.15	1.12
2051	1.21	1.22	1.20

3.3 Distance

The distance between the Merrie Harrier Junction and the Biglis roundabout is 4,500m via A4055, and 4,542m using the new bypass (with a further 499m from Merrie Harrier junction to Barons Court. The distance for the do-minimum, without scheme scenario, is the current distance for the A4055 scheme. For the do-something, with scheme scenario, the length of the new bypass was used.

3.4 Time

3.4.1 The Travel time for the without scheme scenario uses the median of observed speed by time period.

3.4.2 The journey time between the Biglis roundabout and Merrie Harrier Junction via the new bypass will be 5 minutes, under the assumption that the speed is 50 mph plus one-minute for the total junction delay. As shown in Table 3.10, which compares this with the do-minimum journey time between the Biglis roundabout and Merrie Harrier Junction. This will save 10 minutes for northbound journey in the morning peak and southbound journey in the evening peak. The time savings in other time periods will be 3 minutes.

3.4.3 For the DM the current year journey times via A4055 was used in all the assessment years. This provides a conservative estimate of the benefits of the bypass as, in future years, the rise in traffic will cause the DM journey times to rise as the delays at junctions along the route will increase.

Table 3.10 Journey Time

	Northbound		Southbound	
	DM	DS	DM	DS
AM	14 mins	5 mins	8 mins	5 mins
IP	8 mins		8 mins	
PM	8 mins		16 mins	

3.5 Annulisation Factors

3.5.1 After obtaining the peak hour flows for each time period as described previously, a set of factors has been calculated to convert these to the number of vehicles travelling in the relevant TUBA time period over the whole year. These are known as the annualisation factors. The annualisation factors are calculated through following steps:

- For the AM periods, expanding the flows in the selected hours to corresponding time period using the MCC data. i.e. AM: 0800 – 0900 to 0700 – 1000.
- For IP period, multiply the average hourly flow by 6 hours (1000 – 1600).
- For the PM peak periods, expand the flows in the selected hours to corresponding time period using the MCC data. PM: 1700 – 1800 to 1600 – 1900.
- Multiply by 253 to get the number of working days in the year.

Table 3.11 Annualisation Factors

Factor Type	Expanding Factor	Annulisation Factor
AM: 8-9 Weekday to 7-10 All Day	2.91	729
IP: 10-16 Average Weekday to 10-16 All Day	6	1518
PM: 17-18 Weekday to 16-19 All Day	2.95	749

3.6 Sub-mode Split

3.6.1 The flow data is further split into five sub-mode categories, these being car, LGV, OGV1, OGV2 and bus. The proportion for each mode is calculated based on the proportions observed in the MCC data.

Table 3.12 Sub-mode Split

Time period	Directions	CAR	LGV	OGV1	OGV2	BUS
AM	Northbound	86%	11%	2%	1%	0%
	Southbound	78%	15%	4%	1%	2%
IP	Northbound	83%	13%	3%	1%	1%
	Southbound	83%	12%	3%	1%	1%
PM	Northbound	91%	7%	1%	0%	1%
	Southbound	92%	7%	1%	0%	1%

3.7 Purpose Splits

3.7.1 A set of standard purpose splits by sub-mode, as provided in the WebTAG Databook is used in TUBA. This is reproduced below in Table 3.13.

Table 3.13 WebTAG Standard Purpose Splits

Sub-mode	Purpose	AM	PM	IP
Car	Business	17%	12%	17%
Car	Commuting	44%	41%	12%
Car	Other	39%	47%	72%

Sub-mode	Purpose	AM	PM	IP
LGV Personal	Business	0%	0%	0%
LGV Personal	Commuting	0%	0%	0%
LGV Personal	Other	100%	100%	100%
LGV Freight	Business	100%	100%	100%
LGV Freight	Commuting	0%	0%	0%
LGV Freight	Other	0%	0%	0%
OGV1	Business	100%	100%	100%
OGV1	Commuting	0%	0%	0%
OGV1	Other	0%	0%	0%
OGV2	Business	100%	100%	100%
OGV2	Commuting	0%	0%	0%
OGV2	Other	0%	0%	0%
Bus	Business	1%	2%	2%
Bus	Commuting	18%	26%	7%
Bus	Other	80%	72%	92%

4 Economic Appraisal Assumptions

4.1 Introduction

4.1.1 There are three levels of economic analysis applied to the assessment of transport schemes:

- Level 1: this includes impacts which assume a fixed land use and excludes wider economic impacts.
- Level 2: this includes wider economic impacts but assumes fixed land use.
- Level 3: this includes analysis in which either land use changes are explicitly quantified, or supplementary economic modelling is conducted. Wider economic impacts are included.

4.1.2 In this report, we have carried out an analysis of Level 1 benefits plus accident impacts, which is considered appropriate to inform a WelTAG Stage Two assessment and determine whether the do-something warrants further detailed consideration.

4.1.3 The tools used to derive the Level 1 benefits were:

- The DfT's Transport User Benefits Appraisal Tool TUBA, version 1.9.11. This software was used to estimate the direct user and provider benefits in terms of travel time savings and vehicle operating costs.
- DfT's computer program COBALT (COst and Benefit to Accidents-Light Touch,) version 2013.2, was used to calculate the accident benefits

4.2 Travel Time and Vehicle Operating Cost Savings

4.2.1 TUBA provides a complete set of default economic parameters in its 'Standard Economics File'. This contains values of time, vehicle operating cost data, tax rates, economic growth rates and a range of other economic parameter values. For the TUBA 1.9.11 release used, the values in the economics file are consistent with those provided in the May 2018 WebTAG Databook.

4.2.2 The scheme parameters used in the appraisal are as follows:

- Base year – 2017
- Current Year – 2018
- Scheme Opening – 2023
- Design Year – 2036
- Final modelled year – 2051
- Horizon Year – 2082

4.2.3 The 'Horizon Year' has been set at the end of 2082, with the appraisal period taken as 60 years from the scheme opening.

4.3 Sensitivity Testing

4.3.1 Sensitivity tests have been undertaken to firstly understand the potential change in benefits if the assumptions regarding journey speeds were adjusted. The results of these tests are shown in Table 4.1 overleaf.

4.3.2 When the speed on the bypass is the same as the average speed on the existing route, then there are disbenefits from the bypass as the distance is longer. As the assumption of the average speed on the bypass rises, so does the value of the benefits of the scheme. The journey time on the bypass was calculated by using an average speed and then adding on an allowance for the time spent to go through the junctions at either end.

4.3.3 A sensitivity test has also been undertaken to understand the change in benefits if the South East Wales Traffic Model (SEWTM) model was used to derive growth factors for the area. The

SEWTM model contains more detailed information on the location and scale of major developments in the area than the DfT TEMPro growth factors.

4.3.4 The SEWTM modelled traffic flow do-minimum flows were provided for use in this study for the base year (2017) and design year (2036). The difference between SEWTM and TEMPro) is presented in Table 4.12. The complete traffic flows for the study corridor can be found in Appendix B.

4.3.5 TUBA requires flows for two modelled years between opening year (2023) and Horizon year (2082) inclusive, as the minimum inputs. Hence the modelled base year flow was interpolated assuming the growth between 2017 and 2036 was linear. In general, the forecast flows using SEWTM growth factors are higher than the forecast flows using TEMPro factors, except for northbound trips in IP and PM time periods. In particular, they are 45% higher for the southbound trips in the PM period. This may be a result of congestion in the SEWTM model leading to re-routing through Dinas Powys in the PM peak period.

4.3.6 The present value of the benefits, over 60 years, is £87m using the SEWTM growth factors when the speed on the bypass is assumed to be 50 mph and the junction delay assumed to be 1 minutes. This is £9m higher than the present value of the benefits, over 60 years, using the TEMPro growth factors.

Table 4.1 Traffic Flow on the Bypass: TEMPro vs SEWTM

	BASE- 2017			**BASE- 2017 (SEWTM)**		
	AM	**IP**	**PM**	**AM**	**IP**	**PM**
SB	371	328	358	435	400	522
NB	472	407	429	482	363	386
	2023 (TEMPro)			**2023 (SEWTM)**		
	AM	**IP**	**PM**	**AM**	**IP**	**PM**
SB	390	349	376	457	426	548
NB	496	433	451	507	386	406
	2036 (TEMPro)			**2036 (SEWTM)**		
	AM	**IP**	**PM**	**AM**	**IP**	**PM**
SB	416	377	401	511	483	577
NB	530	468	481	621	390	416

Table 4.2 Journey Time Sensitivity Tests

Journey Time on bypass	**Present Value of Benefits (PVB) weekdays only (£m)**
Same as DM speed	-156
55mph + 1mins	82.13
50mph + 1mins	78.03
50mph + 2mins	64.10
40mph + 1mins	66.20
40mph + 2mins	52.11
50MPH + 1 mins (SEWTM)	86.91

**PVB including accidents and indirect tax benefits as well as standard time benefits and VOCs*

4.3.7 It should be noted that the current analysis only considers the impacts on the users of the bypass. Drivers that remain on the existing road will benefit from a shorter journey times as there will be less traffic on the road and shorter delays at the current junctions. However, they will also experience an offsetting increase in their journey times through having to drive through the new roundabouts at either end of the bypass. Further assessment of the net impact of these junction delays is being undertaken using Vissim modelling and is reported in a separate technical appendix. A further stage of modelling of the bypass traffic should be undertaken further developing this modelling work if a Stage Three WelTAG study is undertaken.

4.3.8 Moreover, it must be remembered that the use of the current journey time on the existing route in future years will underestimate the actual journey time in the future if there is no bypass; this means that, on balance, the estimates of benefits shown in Table 4.1 may be an underestimate, although traffic growth may also impact on journey speeds on the bypass.

4.4 Estimation of Costs

4.4.1 The costs estimate for the Green Alignment have been produced following WebTAG guidelines. A detailed explanation is provided in the Outline Business Case report.[1] The cost estimates include risk and optimism bias. A risk item of 14% has been used to build up the cost for the alignment. An Optimism Bias level of 30%, which is averaged between the stage 1 (44%) and stage 2 (15%) from recommendations in TAG Unit 1.2 has also been used. Optimism bias is used in order to account for underestimation of costs in major projects. It is considered that the 30% is still valid due to the unknowns within the projects such as ground data, additional junctions and possible improvements required to existing junctions.

4.4.2 The cost estimate in 2017 factored costs is £36.96m. For the appraisal process, these costs are converted to 2010 calendar year values using the GDP deflators from the May 2018 WebTAG Databook. The following process was undertaken to achieve this:

- The costs are factored back to rebase them to 2010 calendar year values using the GDP deflators from the May 2018 WebTAG Databook.
- The costs estimates are then discounted using a discount rate of 3.5% for first 30 years then 3.0% thereafter.

4.4.3 As a cost profile has yet to be produced, it has been assumed that the costs are evenly spread over the period from the current year (2018) to the opening year (2023). The costs in 2010 market prices, discounted to 2010, are as follows:

Table 4.3 Final Cost Estimates (£m)

	Undiscounted Costs in 2017 factor costs	**2010 market prices discounted to 2010**
2018	6.16	4.96
2019	6.16	4.80
2020	6.16	4.63
2021	6.16	4.48
2022	6.16	4.32
2023	6.16	4.18
Total	**36.96**	**27.37**

4.4.4 The final cost of the schemes' Green Alignment in 2010 market prices, discounted to 2010, is £27.37m.

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[1] Cost estimates provided in 10015022-ARC-XX-XX-RP-HE-0001 - Dinas Powys WelTAG Study Stage Two

4.5 Accident Cost Savings

4.5.1 The DfT's program COBALT (COst and Benefit to Accidents-Light Touch) has been used to undertake the analysis of the impacts on accidents as part of the economic appraisal of the road scheme. The accident impact assessment has been performed using the method set out in the COBALT Manual[2]. It is used to forecast changes in the number of accidents and casualties and estimate the monetary value of these impacts.

4.5.2 The latest COBALT scheme parameter file used for the assessment is 2018.1 which was used in conjunction with the COBALT software version 2013.2.

4.5.3 The COBALT model calculates the number of accidents by looking at each link in the network in turn and multiplying the forecasts number of vehicle kilometres travelled along that link by the standard accident rates per vehicle kilometres for the roads of the same type as that link. The standard accident rates for each road type are contained within the COBALT software and come from analysis of historic data from throughout the UK. When summed over all the links in the network this gives the total predicted number of accidents in the network, first for the do-minimum situation and then for the do-something.

4.5.4 Standard valuations for fatal, serious and slight accidents are applied within the program to calculate the cost of these accidents in both the 'without' and 'with' scheme scenarios. The software then calculates the difference in the value and number of accidents between the do-minimum and do-something scenarios. The change in the value of accidents between the two scenarios are then annualised, interpolated and extrapolated over the 60-year appraisal period, and finally discounted to produce a 2010 present value of accident benefits in 2010 prices. This value can then be added to the values of the economic impacts assessed using the TUBA software.

4.6 Assumptions for COBALT

4.6.1 The accident rates used for this assessment are the default accident rates (national average) provided in the Tag Databook[3], which has a base year 2009.

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[2] https://www.gov.uk/government/publications/cobalt-software-and-user-manuals

[3] https://www.gov.uk/government/publications/webtag-tag-data-book-december-2017

5 Economic Appraisal Results

5.1 User and Provider Benefits

5.1.1 The Transport User Benefits Appraisal (TUBA) tool which calculates transport user benefits and indirect taxation has been used to estimate the direct economic benefits for the scheme.

5.1.2 The user and provider benefits for the scheme are reported in the TEE tables given below. These present the values for the test which uses TEMPro growth rates, an average a speed of 50 mph on the bypass and an additional total 1 minute of delay for the traffic using the bypass at the junctions at either end. Table 5.1 presents these benefits and distinguishes between benefits to business users and consumers.

Table 5.1 User and Provider Benefits (£m PVB 2010 prices discounted to 2010)

Present Value of Benefits 2010 prices (£m)		**Scheme Benefits**
Commuting	Travel Time	22.61
	Vehicle Operating Costs	0.82
Other consumers	Travel Time	26.60
	Vehicle Operating Costs	1.48
Business	Travel Time	21.32
	Vehicle Operating Costs	2.75
Total		**75.58**
Business benefits as % of total		**32%**

5.1.3 The scheme user and provider benefits are estimated at have a total discounted value in 2010 prices and values, appraised over 60 years, of £76 million.

5.1.4 Table 5.2 shows the effects of the scheme on public finances, taking into account the impact on the broad transport budget after allowing for changes in revenues. It also includes changes in the broader indirect tax revenues which accrue to the government.

Table 5.2 Public Accounts (Present Value Costs £m 2010 prices discounted to 2010)

Scheme Costs	**Green Alignment**
Investment Costs	27.37
Operator Costs	-
Revenue	-
Indirect Tax Revenue	3.44
Net impact	**30.81**

5.1.5 The net impact on the transport budget is estimated at £31m.

5.1.6 The indirect tax revenue values show a decrease in revenue to the wider public finances and, in accordance with WebTAG guidance, are included in the calculation of the Present Value of Benefits (PVB). The sign of the value in the PA table is reversed in the AMCB table because the PA table presents costs to the public accounts as positive values.

5.1.7 The AMCB tables combine the results from the TEE tables and the PA tables supplemented by information on accidents and environmental effects. The results from the appraisal of the impact on accidents is set out below.

5.2 Accident Cost Savings

5.2.1 Table 5.3 present the accident cost savings for the impacted links, which are based on the COBALT outputs, using default accident rates (national averages). These are for the 60-year assessment period (2023-2082). The savings are discounted to 2010 prices.

Table 5.3 Accident Benefits Summary (Cost in £m discounted to 2010)

		Without Scheme	**With Scheme**	**Total Savings (diff. of with and without scheme)**
Accident cost	Total (£m)	29.99	26.33	3.66
Accident Summary	Total	729	581	148
Casualty Summary	Total	970	801	169
	Fatal	5	7	-2
	Serious	89	79	10
	Slight	876	715	161

5.2.2 The results show positive scheme benefits with a reduction in total accident cost of £3.66m, over the 60-year period in 2010 prices. The table shows that the scheme results in fewer accidents overall but forecasts additional fatalities over the next 60 years (this would be due to having a higher speed road). However, there would be a significant reduction in the number of serious and slight accidents.

5.3 Analysis of Monetised Costs and Benefits Table

5.3.1 The Analysis of Monetised Costs and Benefits (AMCB) table combines the results from the TEE table and the PA table and supplements it with the information on accidents. A summary of the results for the scheme appraisal is set out in Table 5.4.

Table 5.4 AMCB Summary Table (prices in £m, discounted to 2010)

	Scheme Costs	**Green Alignment**
A	**Accidents**	3.66
B	**Economic efficiency: Commuting**	23.43
C	**Economic efficiency: Other**	28.08
D	**Economic efficiency: Business**	24.07
E	**Wider Public Finances (ITR)**	-2.19
F	**PVB** (A+B+C+D+E)	78.03
G	**PVC**	27.37
H	**Net Present Value** (F-G)	50.66
I	**Benefit Cost Ratio** (F/G)	2.9

6 Alternative Alignments

6.1 Introduction

6.1.1 The WelTAG study considers two alternative alignments, as set out in the main report. This section identifies the likely impact on the economic appraisal of these two alternative options.

6.2 Pink Alignment

6.2.1 The pink option allows for a roundabout to be incorporated into the proposed alignment. The roundabout has been based on a normal roundabout with an ICD (Inscribed Circle Diameter) of 45.2m to accommodate a potential new access onto it from Murch Road. It is assumed that a compliant access to the roundabout can be achieved although costs for developing this access have not been included within the estimates provided.

6.2.2 It is anticipated that the Pink alignment would lead to a slightly lower journey time on the bypass than the Green alignment. As such, the benefits of the option would be lower. The extent of possible delay would need to be tested in full and an alternative level of benefits calculated at the next stage.

6.3 Blue Alignment

6.3.1 The Blue alignment varies from the Green alignment on the southern part, where the blue route heads towards Sully Moors roundabout (instead of Biglis roundabout for the Green/ Pink alignment).

6.3.2 The likely level of traffic that might use the blue route compared to the existing corridor or the green route has been estimated using the following assumptions:

- Traffic that stops in Dinas Powys will not transfer to the blue route (as with the green route assumptions);
- Traffic that travels through Dinas Powys that has an origin or destination south or west of the Sully Moors roundabout would transfer to the Blue alignment as this would be a faster route than through Dinas Powys; and
- Traffic that travels to and from the west or north of Biglis roundabout will not transfer to the blue route unless the journey time is lower than the existing route through Dinas Powys.

6.3.3 The traffic analysis for the green alignment shows that of total traffic between the Biglis roundabout and Barons Court, 12.2% stops in Dinas Powys.

6.3.4 The ANPR data collected in May 2018 has been used to prepare matrices showing the origin and destination of vehicles travelling through the Biglis roundabout. The proportion of traffic travelling towards Dinas Powys on Cardiff Road from Biglis Roundabout that arrives from the Sully Moors roundabout to the south (and vice versa) has been calculated. Overall for the 12 hours, 12.9% of traffic travelling towards Dinas Powys arrives from the Sully Moors roundabout, and 12.5% coming from Dinas Powys goes to the Sully Moors roundabout. For the two-way flow, 12.6% of traffic is between these two points. Assuming that a similar proportion from Sully Moors roundabout stops in Dinas, this indicates that 11.1% of traffic on the A4055 Cardiff Road through Dinas Powys is going to and from the Sully Moors roundabout and travelling through Dinas – this traffic would be anticipated to transfer to the Blue alignment, leading to a reduction on Cardiff Road.

6.3.5 The distance and assumed average journey speed from Biglis Roundabout to the Barons Court junction via the various routes is set out in the table below. It is assumed that the average speed on the section of Sully Moors Road is 30mph given the speed limit of 40mph, but with a 1-minute delay at the roundabout junction.

Route	**Distance (Biglis Roundabout to Merrie Harrier)**	**Average Peak Hour Speed**	**Median Journey Time (not by Volume)**
Existing A4055 Cardiff Road	4,448m	11 mph (AM) 20 mph (PM)	8 mins outside peak 14 mins AM peak 16 mins PM peak
Green Alignment	4,490m	50 mph + 1 minute junction delay	5 mins
Blue Alignment	1,000m + 5,046m = 6,046m	1,000m at 30 mph + 5,046m at 50 mph + 2-minute junction delay	7 mins

6.3.6 In conclusion from the table above, based on these broad assumptions, the blue route may offer a reduced journey time for travel from the west and north of the Biglis roundabout and Barons Court compared to the do-minimum, particularly in the peak hours. However, it is a longer journey time than the Green alignment.

6.3.7 The difference in journey time outside of the peak hours is also marginal. Moreover, the distance of the Blue alignment is considerably longer than the existing route and involves travelling south before travelling north east. It is therefore considered unlikely that drivers would choose to divert to the blue route compared to travelling directly through Dinas Powys, even if there might be a journey time saving at peak times.

6.3.8 Overall, the traffic benefits of the Blue alignment are therefore anticipated to be significantly lower than the Green alignment for traffic, with only 11% of traffic through Dinas Powys assumed to transfer. Moreover, fuel costs will be higher for drivers and the cost of the Blue alignment is significantly higher, thus the benefit cost ratio will be considerably lower. Thus, in terms of providing a bypass which addresses the traffic congestion in Dinas Powys, the Blue alignment would be disadvantageous compared to the Green alignment and is considered unlikely to lead to a significant reduction in traffic through Dinas Powys.

6.3.9 It is acknowledged however that there may be other traffic benefits felt on the wider network in Barry and Sully/ Penarth, as well as development and regeneration benefits that cannot be quantified at this stage. The use of the SEWTM would be able to test the strategic traffic changes, whilst bearing in mind that this may not address the Dinas Powys issues.

7 Summary and Conclusions

7.1 Summary of Economic Appraisal

7.1.1 The Green alignment produces a total PVB of £78m and a cost of £27m. This results in a Net Present Value of £50m and a Benefit Cost Ratio of 2.9. This suggests that the scheme would represent high value for money.

7.1.2 These results do not reflect the longer journey times that would be experienced on the existing road in the do-minimum as a result of higher traffic levels, and in this respect underestimate the benefits from the scheme. However, they also do not reflect possible additional delays to existing users at the junctions at either end of the new bypass which would reduce the benefits of the bypass. Any increase in the cost of the scheme would further reduce the benefit cost ratio and the value for money for the scheme.

7.1.3 An analysis of the projected traffic flows through Dinas Powys suggests that the road will come under increasing pressure from increased traffic in the future. A full business case would need to further consider the impact on the Merrie Harrier and Barons Court junctions.

7.2 Sensitivity Test

7.2.1 By varying the assumptions regarding speed on the new bypass a range of results can be obtained to inform the likely economic performance of the scheme. Table 7.1 provides the range of BCRs from the testing of varying average speeds on the bypass and hence time savings. Unless otherwise stated the results are from the runs using the TEMPro growth factors.

Table 7.1 Sensitivity Test Benefit Cost Ratios

Journey Time on Bypass	PVB Weekdays Only (£m)	BCR
Same speed as on existing road	-156	0.0
55mph + 1mins	82.13	3.0
50mph + 1mins (core scenario)	**78.03**	**2.9**
50mph + 2mins	64.10	2.3
40mph + 1mins	66.20	2.4
40mph + 2mins	52.11	1.9
50mph + 1 mins (SEWTM growth)	86.91	3.2

Appendix A Traffic flows: TEMPro

Links	Direction	BASE- 2017 (Observed)			DM-2023			DM-2036			DM-2051		
		AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM
Section 1	SB	774	769	976	814	819	1025	869	885	1094	934	941	1169
Section 1	NB	993	880	915	1044	937	961	1114	1012	1025	1199	1077	1096
Section 2	SB	316	338	518	332	360	544	355	389	580	382	414	620
Section 2	NB	602	338	293	633	360	308	676	389	328	727	414	351
Section 3	EB	1	1	1	1	1	1	1	1	1	1	1	1
Section 3	WB	0	0	4	0	0	4	0	0	4	0	0	5
Section 4	EB	544	460	802	572	490	842	610	529	899	657	563	960
Section 4	WB	872	560	517	917	596	543	978	644	579	1053	685	619
Section 5	EB	5	3	0	5	3	0	6	3	0	6	4	0
Section 5	WB	0	0	0	0	0	0	0	0	0	0	0	0
Section 6	SB	519	640	674	546	681	708	582	736	755	627	783	807
Section 6	NB	662	642	670	696	683	704	743	738	751	799	786	802
Section 7	EB	144	208	263	151	221	276	162	239	295	174	255	315
Section 7	WB	298	220	199	313	234	209	334	253	223	360	269	238
Section 8	EB	116	130	252	122	138	265	130	149	282	140	159	302
Section 8	WB	132	77	74	139	82	78	148	89	83	159	94	89
Section 9	SB	561	594	712	590	632	748	629	683	798	677	727	853
Section 9	NB	523	548	579	550	583	608	587	630	649	631	671	693
Section 10	SB	503	537	739	529	572	776	564	618	828	607	657	885
Section 10	NB	509	517	538	535	550	565	571	595	603	615	633	644
Section 11	SB	94	104	173	99	110	182	105	119	194	113	127	207
Section 11	NB	312	129	138	328	137	145	350	148	155	377	157	165
Section 12	SB	589	620	896	619	660	941	661	713	1004	711	759	1073
Section 12	NB	813	617	660	855	657	693	912	710	740	982	755	790
Section 13	SB	699	648	894	735	689	939	784	745	1002	844	793	1070
Section 13	NB	808	656	697	850	698	732	907	754	781	975	802	835
Section 14	SB	371	328	358	390	349	376	416	377	401	448	402	429
Section 14	NB	472	407	429	496	433	451	530	468	481	570	498	514

Appendix B Traffic flows: SEWTM

		BASE- 2017			DS-2017			DM-2036			DS-2036		
Links	Direction	AM	IP	PM	AM	IP	PM	AM	IP	PM	AM	IP	PM
Section 1	SB	937	957	1426	937	957	1426	1093	1159	1590	1051	1101	1598
Section 1	NB	949	871	967	949	871	967	1217	944	1070	1065	1002	1084
Section 2	SB	338	277	566	338	277	566	376	322	602	379	319	634
Section 2	NB	399	312	292	399	312	292	550	364	285	448	359	327
Section 3	EB	0	0	0	0	0	0	0	0	0	0	0	0
Section 3	WB	0	0	0	0	0	0	0	0	0	0	0	0
Section 4	EB	601	650	1094	601	650	1094	695	794	1218	674	748	1226
Section 4	WB	580	551	736	580	551	736	826	639	717	651	634	825
Section 5	EB	0	0	0	0	0	0	0	0	0	0	0	0
Section 5	WB	0	0	0	0	0	0	0	0	0	0	0	0
Section 6	SB	585	683	1083	150	283	561	678	819	1065	169	325	629
Section 6	NB	786	729	737	304	366	350	820	798	747	341	420	392
Section 7	EB	126	186	311	126	186	311	150	232	375	141	214	348
Section 7	WB	233	197	182	233	197	182	221	217	249	261	227	204
Section 8	EB	110	39	110	110	39	110	183	86	132	123	45	123
Section 8	WB	38	24	22	38	24	22	35	80	6	43	28	25
Section 9	SB	466	549	750	31	149	228	525	593	759	35	171	256
Section 9	NB	723	596	637	241	233	251	721	632	669	271	268	281
Section 10	SB	386	516	741	-49	116	219	479	584	747	-55	133	246
Section 10	NB	638	537	576	156	174	190	705	562	589	175	200	213
Section 11	SB	66	53	127	66	53	127	80	65	121	74	61	142
Section 11	NB	214	59	57	214	59	57	373	73	68	240	68	64
Section 12	SB	452	569	867	17	169	345	559	649	867	19	194	387
Section 12	NB	852	596	633	370	233	247	1078	636	657	415	268	277
Section 13	SB	501	572	813	501	572	813	623	678	840	562	658	911
Section 13	NB	825	585	628	825	585	628	1064	628	677	926	673	704
Section 14	SB	0	0	0	435	400	522	0	0	0	511	483	577
Section 14	NB	0	0	0	482	363	386	0	0	0	621	390	416

APPENDIX G

WebTAG Assessment Sheets

TAG Journey Quality Impacts Worksheet

Factor	Sub-factor	Better	Neutral	Worse
Traveller Care	Cleanliness			
	Facilities			
	Information			
	Environment			
Travellers’ Views	-			
Traveller Stress	Frustration			
	Fear of potential accidents			
	Route uncertainty			

Reference Source

10015022-ARC-XX-XX-DR-HE-0004, 0005, 0006 and 0007 - Green Alignment
10015022-ARC-XX-XX-DR-HE-0008, 0009, 0010 and 0011 - Pink Alignment
WebTAG TAG unit A4-1 social impact appraisal, December 2017
DMRB 11.3.9.2 (travellers’ views) and 11.3.9.3 (traveller stress)

Summary Assessment Score

High beneficial (more than 10,000 users per day affacted).

Qualitative Comments

See the Stage Two Outline Business Case report.

TAG Security Impacts Worksheet

Security Indicator	Relative importance	Without scheme	With scheme
	(High/Medium/Low)	(Poor/Moderate/High)	(Poor/Moderate/High)
Site perimeters	Medium	Moderate	High
Entrances and exits	Medium	Moderate	Moderate
Formal surveillance	Medium	Poor	Moderate
Informal surveillance	Medium	Moderate	Moderate
Landscaping	Medium	Poor	High
Lighting and visibility	Medium	Poor	Moderate
Emergency call	Medium	Poor	Moderate

Approximate Number of Users Affected

High (more than 10,000 users per day affacted).

Reference Source

10015022-ARC-XX-XX-DR-HE-0004, 0005, 0006 and 0007 - Green Alignment
10015022-ARC-XX-XX-DR-HE-0008, 0009, 0010 and 0011 - Pink Alignment
WebTAG TAG unit A4-1 social impact appraisal, December 2017

Summary Assessment Score

Slight beneficial

Qualitative Comments

See Outline Business Case report.

TAG Severance Impacts Worksheet

Change in Severance	Population Affected			
	Dinas Powys			Total Affected
Large negative				-
Moderate negative				-
Slight negative				-
Neutral				-
Slight positive				-
Moderate positive	200 - 1000			**200 - 1000**
Large positive				-

Reference Source

GoogleMaps Data ©2018
10015022-ARC-XX-XX-DR-HE-0004, 0005, 0006 and 0007 - Green Alignment
10015022-ARC-XX-XX-DR-HE-0008, 0009, 0010 and 0011 - Pink Alignment
WebTAG TAG unit A4-1 social impact appraisal, December 2017
DMRB 11.3.8
SAPE19DT3-mid-2016-msoa-syoa-estimates_formatted **(https://www.ons.gov.uk/)**
SAPE19DT11-mid-2016-lsoa-population-density **(https://www.ons.gov.uk/)**

Summary Assessment Score

Moderate positive

Qualitative Comments

See Outline Business Case report.
2016 Dinas Powys population estimate **https://www.ons.gov.uk/**
https://gov.wales/docs/statistics/lsoamaps/lsoa.htm#Vale of Glamorgan
Significant reduction in traffic flow within built up area of Dinas Powys establishing a large imapct.
Existing flows are in excess of 8,000 vehicles and therefore applicable to DMRB 11.3.8 guidelines.
Estimated that between 200 - 1000 people will be affected within Dinas Powys.

TAG Biodiversity Impacts Worksheet

Step 2		Step 3				Step 4	Step 5
Area	**Description of feature/ attribute**	**Scale (at which attribute matters)**	**Importance (of attribute)**	**Trend (in relation to target)**	**Biodiversity and earth heritage value**	**Magnitude of impact**	**Assessment Score**
Severn Estuary Ramsar	Annex I habitats (including estuaries, Atlantic salt meadows and mudflats and sandflats not covered by seawater at low tide), its migratory fish populations (including salmon, sea trout and sea lamprey) and for its internationally important assemblage of waterfowl (including gadwall, dunlin and redshank). Located approximately 2km east of the scheme.	International	Qualifying feature of a internationally designated site so very high importance	Water quality improving. Quality of saltmarsh threatened. Water fowl population status varies but overall assemblage has declined from approx. 81,000 to 66,000 between 1992/93 and 2006/7	Very high	Neutral	Neutral
Severn Estuary Special Protection Area (SPA)	Internationally important bird populations (including the Annex I species Bewick's swan over winter as well as ringed plover, dunlin, pintail, redshank and curlew) and for regularly supporting at least 20,000 waterfowl. Located approx. 2km east of the scheme.	International	Qualifying feature of a internationally designated site so very high importance	Water fowl population status varies but overall assemblage has declined from approx. 81,000 to 66,000 between 1992/93 and 2006/7	Very high	Neutral	Neutral
Severn Estuary SAC	Annex I habitats (including estuaries, Atlantic salt meadows and mudflats and sandflats not covered by seawater at low tide) and Annex II species (including sea lamprey, river lamprey and twaite shad). Located approx. 2km east of the scheme	International	Qualifying feature of a internationally designated site so very high importance	Water quality improving. Quality of saltmarsh threatened.	Very high	Neutral	Neutral
Cog Moors SSSI	Large continuous damp mesotrophic (neutral) semi-natural grassland associated with stands of tall sedges and populations of uncommon plants (bulbous foxtail and pepper saxifrage). Located approx. 0.1km south of the scheme.	National	Qualifying feature of a nationally designated site so high importance	Habitats static with active management but pillwort lost from site.	High	Neutral	Neutral
Cosmeston Lakes SSSI	Cosmeston Lakes SSSI includes two lakes, created from flooded limestone quarries, which are connected by a narrow channel. These are eutrophic water bodies up to 10m deep, which support a range of submerged plants. One of the lakes is of special interest as the only known site in Wales for the presence of starry stonewort. Located approx. 1km south-east of the scheme.	National	Qualifying feature of a nationally designated site so high importance	Static with minimal management	High	Neutral	Neutral
Cosmeston Lakes Country Park local Nature Reserve	As above, a water vole population was released here in 2017.	County	Qualifying feature of a nationally designated site so high importance	Static with active management	High	Neutral	Neutral

Sites of Interest for Nature Conservations (SINCs)	Various SINCs within 2km of the scheme. Both routes pass in proximity to North of Cog Moors and Pop Hill SINCs. Embankment works may encroach on Pop Hill SINC boundary.	County	Designated at Local Authority Level	Unknown, dependent on further information on SINC designations	Medium	Intermediate negative	Moderate adverse
Ancient Woodland	Both route options pass in proximity to two areas of ancient woodland, one semi-natural, one restored. Embankments works likely to encroach on woodland edge and/or root protection zones.	Regional	Habitat of principal importance	In decline	Medium	Intermediate negative	Moderate adverse
Tree Preservation Orders (TPO)	Notable individual and groups of trees within the search area but none identified along either route.	County	Designated at Local Authority Level	Static	Low	Minor negative	Slight adverse
Priority Habitats	Running and standing open water, hedgerows, woodland, marshy grassland are crossed or are adjacent to both route options.	County	Potential habitat of principal importance under Environment (Wales) Act 2016	In decline	Up to Medium	Uncertainty remains pending further survey work	Dependent on further survey, minor adverse if present
Other natural habitats	Scrub, tall ruderals, improved grassland, arable fields are present along or adjacent to both route options	Local	Common habitats of some local biodiversity interest	Static	Low	Minor negative	Slight adverse
Hard structures	Roads and buildings are present along or adjacent to both route options.	Local	Common habitats with no nature conservation value (unless bat roost present - see bats)	N/A	Negligible	Minor negative	Neutral
Amphibians	Records of great crested newts. A range of suitable terrestrial foraging habitat available and at least 15 ponds within 500m offering potential breeding habitat. Both route options likely to lead to the loss of 3 ponds.	At least local, dependent on further survey work	Species of principal importance (great crested newt are European and UK Protected Species)	Declining	Up to medium (if great crested newt present)	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present
Badgers	No records. Potential for setts in woodland and hedgerows and foraging habitat available	At least local, dependent on further survey work	Protected under Protection of Badgers Act 1992	Static / maybe increasing	Low	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present
Bats	Records for *Myotis* sp., *Pipistrellus* sp. and unidentified bat species. Foraging and commuting habitat identified and potential for roosts in mature trees and buildings.	At least local, dependent on further survey work	European and UK protected species	Varies with species	Up to medium	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present
Birds	Records for a variety of species and suitable breeding habitat for both tree and ground nesting species. A variety of suitable foraging habitats.	At least local, dependent on further survey work	Protected during breeding season	Varies with species. Wintering birds are doing well but farmland birds are decreasing.	Up to medium	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present
Dormouse	Records and suitable habitat within hedgerows and woodland for breeding, foraging and hibernating individuals.	At least local, dependent on further survey work	European and UK protected species	In decline but decline may be levelling off	Up to medium	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present

Fish	Eel, bullhead and brown trout have been recorded and may be present in watercourses depending on their characteristics	At least local, dependent on further survey work	Species of principal importance	Varies with species	Low	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present
Hedgehog	Records and suitable habitat within hedgerows, woodland and field margins	At least local, dependent on further survey work	Species of principal importance	Uncertain but considered to be in decline	Low	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present
Invertebrates	Records and a variety of habitats will suit both aquatic and terrestrial species.	At least local, dependent on further survey work	Species of principal importance	Varies with species, but 21% species listed as Welsh priorities were declining, 25% were improving and 54% showed little change	Low	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present
Otter	No records. Otter may use the smaller watercourses/drainage ditches for commuting and/or dispersing.	At least local, dependent on further survey work	European and UK Protected species	Increasing nationally	Up to medium	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present
Reptile	Suitable habitat for grass snake, slow-worm and common lizard within hedgerows and field margins. No potential for adder identified at this stage.	At least local, dependent on further survey work	UK protected species	Declining	Up to medium	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present
Water vole	Water vole released at Cosmeston lakes, smaller watercourses may also be suitable depending on conditions.	At least local, dependent on further survey work	UK protected species	Declining	Up to medium	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present
Plants	Habitats may support some EWA Section 7 species and WCA Schedule 9 species.	At least local, dependent on findings of Phase 1 survey	Species of principal importance	Varies with species, but 53% flowering plants that are features of European designated sites are in decline in Wales whilst 43% are increasing.	Low	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present
Other	Field habitats may support brown hare.	At least local, dependent on detailed Phase 1 habitat survey	Brown hare are species of principal importance	Declining (brown hare)	Low	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present

Reference Sources

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Bryophyte Data for Great Britain and Ireland from the British Bryological Society held by BRC: data compiled post Atlas
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Summary Assessment Score

Up to moderate adverse impacts anticipated this stage.

Qualitative Comments

At this stage there is little to differentiate the routes except that the pink route may lead to greater habitat loss than the green route as proposals include three rather than one roundabout. Impacts on Pop Hill SINC will depend on the extent and type of works adjacent to its boundary but are likely to lead to the loss of some mature trees. It is likely that as a minimum compensatory tree planting would be required to off-set this loss. Aerial imagery and a ground truthing exercise identified the potential for both woodland, important hedgerows and priority habitats including rhos pasture but this would need to be verified through a Phase 1 habitat survey. Although impacts on ancient woodland are considered moderate it should be noted that this habitat cannot be recreated and therefore impacts should be considered as permanent. Further data including protected species surveys are required and potential mitigation activities should be recommended in an Ecological Impact Assessment.

TAG Landscape Impacts Worksheet - Eastern Option

	Step 2	**Step 3**				**Step 4**
Features	**Description**	**Scale it matters**	**Rarity**	**Importance**	**Substitutability**	**Impact**
Pattern	The landscape is characterised by a relativel small scale pattern of fields within an undulating lowland landscape. The landscape pattern is predominantly made up of pastoral fields bounded by hedgerows containing trees. Farms are scattered across the area which forms a green buffer between Dinas Powys and Penarth.	locally (tbc in next stage)	locally (tbc in next stage)	locally (tbc in next stage)	Road will provide new feature and interrupt the existing hedgerow field patterns. This will be difficult to replicate in short term due to time necessary to establish vegetation cover. Increased traffic in area and long distance views will also be interrupted.	**Moderate adverse: F**ield patterns and open spaces disrupted, with loss of hedges. Road will replace existing narrow lanes. Mitigations difficult without diminishing local landscape character. **Additional mitigation:** Landscape design along route, retain or planting of new hedges to integrate with the landscape pattern, design of road sympathetic to local landscape character.
Tranquillity	Generally open landscape with minor hedgerowed lanes that are tranquil and sheltered. Urban edge of Dinas Powys is intrusive in parts, however the green fringe on the north-eastern edge of Dinas Powys provides a subtle integration of urban edge and farmland. PRoWs links across the landscape with some open long distance views across the landscape particularly from elevated land along the western edge of Penarth.	locally (tbc in next stage)	locally (tbc in next stage)	locally (tbc in next stage)	Difficult due to road dividing the landscape and and severing the green fringe. Increased traffic in area, long distance views interrupted.	**Moderate adverse:** Traffic and road through the landscape will reduce tranquillity, although its proximity to the urban edge of Dinas Powys will be a consideration. **Additional mitigation:** Good landscape (screening) and lighting design to integrate into the landscape and minimise night time landscape impact.

Cultural	Agricultural landscape with mature woodlands and hedgerows are features in the landscape. Largely intact survival of historical fieldscape of elongated strip fields on Pop Hill. However, the urban sprawl of Dinas Powys and Penarth has largely obscured earlier fieldscapes and patterns of settlement throughout the rest of the area.	locally (tbc in next stage)	locally (tbc in next stage)	locally (tbc in next stage)	Difficult due to loss of historic field patterns and landscape features.	**Moderate adverse:** setting of historic rural landscape patterns will deteriorate, loss of hedges and some woodland. **Additional mitigation:** Landscape design along route, retain and / or plant new hedges.
Landcover	Agricultural landscape and floodplain with hedgerows with trees and some mature woodlands.	locally (tbc in next stage)	locally (tbc in next stage)	locally (tbc in next stage)	Difficult due to severance of field patterns and hedgerows as well as loss of some woodland. Road will create new feature in landscape.	**Moderate adverse:** loss of fields, fields will be divided and made smaller, loss of hedges. **Additional mitigation:** Landscape design along route, retain or plant new hedges.

Summary of character	Agricultural and urban fringe landscape set within a predominantly green buffer between Dinas Powys and Penarth. Undulating and open with mostly uniterrupted views. Wooded areas and hedgerow lined field patterns set the landscape character with scatered farms and views to the urban fringes of Dinas Powys and Penarth.	locally (tbc in next stage)	locally (tbc in next stage)	locally (tbc in next stage)	Difficult in short term due to time necessary to establish vegetation cover, increased traffic and new feature in the low lying and undulating landscape.	**Moderate adverse**: Road will reduce tranquillity in floodplain landscape, particularly where the road is on raised embankment. Traffic will increase, farmland will be lost, previously unlit green wedge will be lit, long distance views will be interrupted. **Additional mitigation:** Landscape design along route, retain or planting of new hedges, design of road sympathetic to local landscape character. Good landscape design (screening) and lighting design to minimise night time landscape impact.

Reference Sources

Site visit January 2018

Step 5 - Summary Assessment Score

Moderate adverse

Qualitative Comments

Proposed Eastern Option of elevated road infrastructure will degrade landscape character in Ely River Valley, long distance views and night time setting,

TAG Historic Environment Impacts Worksheet

	Step 2	Step 3			Step 4
Feature	**Description**	**Scale it matters**	**Significance**	**Rarity**	**Impact**
Form	The historic resource of the study area is characterised predominately by agricultural land comprising both arable and pasture to the east, south east of Dinas Powys and west of Penarth. Surrounding this agricultural land are the built up urban settlements of Dinas Powys and Lower Penarth. There is an one area of Registered Common Land, eight Listed Buildings (seven Grade II and one Grade II*), there is one Scheduled Monument (Cogan Deserted Medieval Village) seperated in to three pockets within 500m of the proposed Green and Pink Alignment. There are no Registered Parks and Gardens, Conservation Areas, World Heritage Sites, Historical Landscapes or Registered Battlefields located within 500m of the proposed Green and Pink alignments. The designated heritage assets are mainly associated with domestic buildings. There are mutiple 'known' archaelogical sites (Roman, Medieval and Post-Medival features) located within 500m of the proposed Green and Pink alignments. There is potential for as yet unidentified buried archaeolgical assets to be present within the proposed Green and Pink alignment footprint.	The protection and enhancement of heritage assets is of national concern as set out in the Planning Policy Wales, which sets out to conserve heritage assets in a manner appropriate to their significance.	The Grade II* Listed Building is of National Significance. The Grade II Listed Buildings and the Scheduled Monuments are of Regional Significance. There is potential for unidentified buried archaelogical features of unknown significance.	NYA	The proposed alignments have the potential to have a 'slight adverse' impact on 'unknown' non-designated heritate assets.The proposed alignments have the potential to directly impact on buried archealogical remains which could result in the permanent and irreversible loss of assets. **Slight adverse.**
Survival	NYA	The protection and enhancement of heritage assets is of national concern as set out in the Planning Policy Wales, which sets out to conserve heritage assets in a manner appropriate to their significance. The survival of heritage assets is a contributing factor to its significance.	The Grade II* Listed Building is of National Significance. The Grade II Listed Buildings and the Scheduled Monuments are of Regional Significance. There is potential for unidentified buried archaelogical features of unknown significance.	NYA	The proposed alignments would not have an effect on the survival of the designated assets. The proposed alignments may have a 'slight adverse' effect on the survival of unidentified buried archaelogical remains within the route of the scheme, however, this is not quantifiable at this stage. **Slight adverse.**
Condition	NYA	The protection and enhancement of heritage assets is of national concern as set out in the Planning Policy Wales, which sets out to conserve heritage assets in a manner of appropriate to their significance. The condition of heritage assets contributes to their signifcance and sensitivity to impacts.	The condition of designated and non-designated assets is important as, if in good condition, they can inform our understanding of the history of the region and contribute to the economic wellbeing of the local area.	NYA	NYA
Complexity	Eight of the Listed Buildings within 500m of the proposed Alignments are located within the Green Wedge between Dinas Powys and Lower Penarth. The remaining designated assets are not overly complex and represent medieval ruins to the west of Lower Penarth. The Dinas Powys Conservation Area is located approximately 1km west of the proposed alignments.	The protection and enhancement of heritage assets is of national concern as set out in the Planning Policy Wales, which sets out to conserve heritage assets in a manner appropriate to their signficance. The complexity of assets, including individually complex assets or groups of assets contributes to their significance.	NYA	NYA	NYA
Context	Eight of the Listed Buildings within 500m of the proposed Alignments are located within the Green Wedge between Dinas Powys and Lower Penarth. The remaining designated assets are not overly complex and represent medieval ruins to the west of Lower Penarth. The Dinas Powys Conservation Area is located approximately 1km west of the proposed alignments.	The context and setting of most cultural heritage assets is a material consideration at the local and national policy level.	The context of Listed Buildings (excluding the Grade II* Listed Building) and the Scheduled Monument are regionally significant. The context of the archaelogical features both 'known' and 'unknown' has not been assessed and the significance is therefore unkown.	NYA	The effect on the context of the Scheduled Monument and Listed Buildings are likely to be neutral. The effect on the context of the Dinas Powys Conservation Area has the potential to be slight beneficial due to diverting traffic from travelling through the centre of Dinas Powys on to the by-pass (Green and Pink Alignment). Due to the lack of assessment on the archaeological features the effect of the alignments on the non-designated archaelogical features 'known' and 'unknown' is still to be determined. **Slight Adverse**
Period	St Peter's Church (Grade II*) is of a Medieval date. The Listed Buildings are of a Post Medieval date. Cogan Deserted Medieval Village is of Medieval date. Non-designated archaelogical features within 500m of the routes are ranged primarily of Medieval to the Post-Medieval period.	Period does not necessarily determine the importance of the historic resource although, it can affect it. Policies within the Local and Regional Plans make reference to the safeguarding and enhancement of cultural heritage assets. The protection of designated assets and areas regardless of their period is of national concern as set out in the Planning Policy Wales.	The range of periods of the designated heritage assets are primarily of a Early Medieval / Medieval date. The non-designated buried archaelogical features within the area are important in understanding the development of the surrounding area on a local and regional level.	NYA	The proposed alignments would not have an affect on the periods of heritage assets and areas. **Neutral**

Reference Sources

Historic Wales, Archwilio , Vale of Glamorgan Interactive Constraints Map, Vale of Glamorgan Website, British Listed Buildings Website

Step 5 - Summary Assessment Score

Slight adverse

Qualitative Comments

At this stage there is little to differentiate the Green and Pink Alignments impact on the Historic Environment due to both routes having near identical alignment profiles. Slight adverse impact on the buried archaeological features located along either Alignment. Neutral impacts on the settings of the Listed Buildings and Scheduled Monument. Slight beneficial impact on the Conservation Area as a result of the Green and Pink Alignment, as it is anticipated this would divert traffic from the centre of Dinas Powys.

TAG Townscape Impacts Worksheet

	Step 2	Step 3					Step 4
Features	**Description**	**Scale it matters**	**Rarity**	**Importance**	**Substitutability**	**Changes in Without-scheme case**	**Impact**
Layout	The area of townscape is characterised around the large village of Dinas Powys which is situated along the A4055 (Cardiff Road) between Cardiff and Barry. The residential area of Dinas Powys is laid out around cul de sac roads making them free of through traffic. There are isolated individual properties located within the surrounding agricultural landscape to the south and east of Dinas Powys.	Local scale.	NYA	Locally Important. Dinas Powys Conservation Area to be considered as Regionally Important.	Heritage buildings could not be substituted.	Further adverse effects forecast as the traffic volumes along A4055 (Cardiff Road) would continue to increase.	As the proposed Pink and Green alignments are both linear and by-pass Dinas Powys, the Pink and Green alignment would not result in a significant change in the layout of the townscape. **Neutral effect**
Density and mix	Buildings in the townscape are low density residential buildings. Residential buildings are predominately located in the village of Dinas Powys. There are isolated residential buildings within the surrounding landscape, with the surrounding landscape being predominantely composed of agricultural land, which reduce the density of development.	Local scale.	NYA	Locally Important. Dinas Powys Conservation Area to be considered as Regionally Important.	Heritage buildings could not be substituted.	Further adverse effects forecast as the traffic volumes along A4055 (Cardiff Road) would continue to increase.	As the proposed Pink and Green alignments are both linear and by-pass the village of Dinas Powys, the Pink and Green alignment would not result in a significant change in the density and mix of the townscape. **Neutral effect**
Scale	The built up area is predominatly composed of residential housing which is considered of small scale with development mostly two storeys in height. Within the surrounding area there are isolated properties with large grounds, open agricultural land and recreational areas.	Local scale.	NYA	Locally Important. Dinas Powys Conservation Area to be considered as Regionally Important.	Heritage buildings could not be substituted.	Further adverse effects forecast as the traffic volumes along A4055 (Cardiff Road) would continue to increase.	As the proposed Pink and Green alignments are both linear and by-pass the village of Dinas Powys, the Pink and Green alignment would not result in a significant change in the scale of the townscape. **Neutral effect**
Appearance	The Dinas Powys Conservation Area is notable for its architecture from three phases of developing which reflects the expansion of the village (pre-1880s, 1880s to 1930s, late 20th Century. Roadside stone walls, including the stone retaining wall running along the west side of the main road and surrounding the churchyard. Trees, hedges and other greenery soften the townscape and add to the area's rural appearance. Development is mostly two storeys in height, most houses are detached or semi-detached. Key purpose built commerical, religious or community buildings stand out of virtue of their bulk and size (e.g. the two non-conformist chapels, the parish hall and the bank at no.1 Elm Grove Road). St.Peter's Chuch and The Mount House stand out in the townscape.	Local scale.	NYA	Locally Important. Dinas Powys Conservation Area to be considered as Regionally Important.	Heritage buildings could not be substituted.	Further adverse effects forecast as the traffic volumes along A4055 (Cardiff Road) would continue to increase.	As the proposed Pink and Green alignment are both linear and by-pass the village of Dinas Powys. The Pink and Green alignment would not result in a significant change in the appearance of the townscape. **Neutral effect**
Human interaction	Dinas Powys is a mainly residential area bisected by the A4055 (Cardiff Road) which runs through the centre of the village. Amenities es are located around the village centre and include a post office, a range of small independent shops, public houses, restaurants and community facilities. In addition there are shops, a pharmacy, garages and small supermarkets.	Local scale.	NYA	Locally Important. Dinas Powys Conservation Area to be considered as Regionally Important.	Heritage buildings could not be substituted.	Further adverse effects forecast as the traffic volumes along A4055 (Cardiff Road) would continue to increase. Open space will be lost or become less safe to use because of heavier traffic associated with the Green and Pink alignments. Increased noise and disturbance in housing and open space. Foot and cycle path routes may improve cycle and pedestrian access.	The proposed Pink and Green alignment are both linear and by-pass the village of Dinas Powys. The Pink and Green alignment would not result in a significant change in the human interaction of the townscape, however the access and quanitity of open space between Dinas Powys (Murch) and Lower Penarth would likely be negatively impacted by the development of a by-pass. **Slight Adverse effect**

Cultural	The historical buildings within Dinas Powys contribute to the heritage feel of the Dinas Powys Conservation Area. The surrounding area has isolated Scheduled Monuments, Listed Buildings and a Registered Park and Garden within the surrounding agricultural landscape, contributing to the historical heritage feel of the area.	Local scale.	NYA	Locally Important. Dinas Powys Conservation Area to be considered as Regionally Important.	Heritage buildings could not be substituted.	Further adverse effects forecast as the traffic volumes along A4055 (Cardiff Road) would continue to increase.	The proposed Pink and Green alignment are both linear and by-pass the village of Dinas Powys. The Pink and Green alignment would not result in a significant change in the cultural aspect of the townscape. However, with the alignment by-passing Dinas Powys, this would divert traffic away from the village which would enhance its overall heritage feel. **Slight beneficial effect**
Land use	Land use within the area is divided between areas of residential settlement (Dinas Powys, Lower Penarth and small groups/individual propoerties) and areas of agricultural land, comprising both arable and pasture. Additionally, the Cog Moors Wastewater Treatement Works is located to the south east of Dinas Powys. The village of Dinas Powys is located along the A4055 (Cardiff Road). There are areas for recreation including a golf course, vineyard and hotel.	Local scale.	NYA	Locally Important. Dinas Powys Conservation Area to be considered as Regionally Important.	Heritage buildings could not be substituted.	Further adverse effects forecast as the traffic volumes along A4055 (Cardiff Road) would continue to increase.	As the proposed Pink and Green alignment are both linear and by-pass the village of Dinas Powys. The Pink and Green alignment would not result in a significant change in the land use of the townscape. **Neutral effect**
Summary of character	The primary features of the townscape are roads and the residential area of Dinas Powys and Lower Penarth. There are built designated heritage assets within Dinas Powys including notable architecture from three phases of development reflecting the expansion of the village: pre-1880s, 1880s to 1930s, late 20th century. Prevalence of local limestone in the construction of pre-1880 buildings and use of red and buff brick in the post-railway 1880-1930 development. Furthmore a series of medieval field systems operate within the area between Dinas Powys, Lower Penarth and Cog Moors.	Local scale.	NYA	Locally Important. Dinas Powys Conservation Area to be considered as Regionally Important.	Heritage buildings could not be substituted.	Further adverse effects forecast as the traffic volumes along A4055 (Cardiff Road) would continue to increase.	The proposed Pink and Green alignment are both linear and by-pass the village of Dinas Powys. The Pink and Green alignment would not result in a significant change in the townscape character of Dinas Powys and Lower Penarth. However, with the alignment by-passing Dinas Powys, this would divert traffic away from the village which would enhance its overall heritage feel. Loss of the field systems surrounding Dinas Powys may have an impact in the character setting of the townscape. **Neutral effect**

Reference Sources

Google Earth Aerial Photography; OS maps; Vale of Glamorgan Local Development Plan Interactive Map (2017), Vale of Glamorgan - Dinas Powys Conservation Area Appraisal and Management Plan (2009)

Step 5 - Summary Assessment Score

Neutral to Slight Adverse effect

Qualitative Comments

Area assessed; Dinas Powys village using the Vale of Glamorgan Dinas Powys Conservation Area Appraisal and Management Plan (2009). Both the Pink and Green alignment will cross the through the area of green space and field systems (Green Wedge) between Dinas Powys and Lower Penarth, which may have a potential slight adverse impact on the setting of the Dinas Powys rural townscape feel. Both routes by-pass Dinas Powys and are unlikely to have any direct and indirect impacts on the townscape of the village.

TAG Water Environment Impacts Worksheet

Description of study area/ summary of potential impacts	Key environmental resource	Features	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Surface Water									
Study area: Surface Water	Rivers River Cadoxton WFD Ref: GB110058026420 WFD - Moderate Overall Status - Moderate Ecol. Condition - Good Chemical Condition	Biodiversity Aesthetics Cultural Heritage Value to economy	River Cadoxton WFD - Moderate Overall Status Other small watercourses within the area - Unknown Quality	Regional	Medium	NYA	Medium	Slight Adverse	Low Signficance
Pollution to River Cadoxton from construction		Water Quality	River Cadoxton WFD - Moderate Overall Status Other small watercourses within the area - Unknown Quality	Regional	Low	NYA	Medium	Slight Adverse	Low Signficance
Pollution to River Cadoxton from routine runoff		Water Quality	River Cadoxton WFD - Moderate Overall Status Other small watercourses within the area - Unknown Quality	Regional	Low	NYA	Medium	Negligible	Insignificant
Pollution to River Cadoxton from accidential spillage		Water Quality	River Cadoxton WFD - Moderate Overall Status Other small watercourses within the area - Unknown Quality	Regional	Low	NYA	Medium	Slight Adverse	Low Signficance
Impact to the Cadoxton Flood Plain	Flood Plain	Conveyance of flood flows Flood flow routes Surface water flooding	Presence of Flood Zones C2 (e.g. areas without significant flood defence infrastructure) and Flood Zone B (e.g. areas known to have flooded in the past).	Local	Low	NYA	NYA	Slight Adverse / Negligible	Low Signficance / Insignificant
Ground Water									
Pollution to Groundwater from construction	Groundwater Thaw & Cadoxtan Jurassic Lias WFD Ref: GB41002G201400 WFD - Good Overall Status - Good Quantitative Condition - Good Chemical Condition	Water Quality	WFD - Good status in terms of both Quantity - Good Chemical - Good	Regional	High	NYA	High	Slight Adverse	Low Signifcance
Pollution to Groundwater from routine runoff		Water Quality	WFD - Good status in terms of both Quantity - Good Chemical - Good	Regional	High	NYA	High	Negligible	Insignificant
Pollution to Groundwater from accidental spillage		Water Quality	WFD - Good status in terms of both Quantity - Good Chemical - Good	Regional	High	NYA	High	Slight Adverse	Low Significance

Reference Sources

Natural Resources Wales, Cycle 2 Rivers and Waterbodies WFD Data (2018)
Natural Resources Wales, Flood Risk Map (2018)
MAGIC, Defra (2018)
Department for Transport (DfT) Transport Appraisal Guidance (TAG) Unit A3 - Envionmental Impact Appraisal (2017)

Summary Assessment Score

Green and Pink Alignment - Slight Adverse

Qualitative Comments

The potential impacts to the 'main rivers' and ordinary water courses concerns a possible accidental spillage, construction activities and routine run-off. This potential impact requires further investigation as the River Cadoxton has achieved a 'moderate' WFD score. Following further investigations, mitigation measures may be required as part of the design. A construction environmental management plan should be put in place during the construction of the Alignment which will minimise the risk of pollution to watercourses during construction. Three ordinary watercourses are crossed as part of both the Green and Pink alignment. Sections of the route cross the floodplain to the south west of the proposed alignments in a Flood Zone C2/B. The floodplain is associated with the Cadoxton River, NRW flood maps shows that flood risk is high to moderate in the areas where the alignment interacts with the floodplain. Potential effects include for the loss of floodplain storage volume and impediment of floodplain flow paths. To mitigate, there may be a need to provide compensation storage, culverts through embankments to maintain continuity of flow conveyance. Any new crossings of smaller watercourses also has the potential to impact flood risk, careful design of crossings should avoid impacts/mitigate risks.

TAG Journey Quality Impacts Worksheet

Factor	Sub-factor	Better	Neutral	Worse
Traveller Care	Cleanliness	▨		
	Facilities	▨		
	Information	▨		
	Environment	▨		
Travellers’ Views	-		▨	
Traveller Stress	Frustration		▨	
	Fear of potential accidents	▨		
	Route uncertainty	▨		

Reference Source

WebTAG TAG unit A4-1 social impact appraisal, December 2017
10015022-ARC-XX-XX-DR-HE-0002 Proposed Park & Ride Area
10015022-ARC-XX-XX-DR-HE-0012 Existing Public Transport Routes
10015022-ARC-XX-XX-DR-HE-0013 Proposed Public Transport Routes
10015022-ARC-XX-XX-DR-HE-0014 Proposed Walking & Cycling Routes

Summary Assessment Score

Moderate beneficial (between 500 - 10,000 users per day affacted).

Qualitative Comments

See the Stage Two Outline Business Case report.

TAG Security Impacts Worksheet

Security Indicator	Relative importance	Without scheme	With scheme
	(High/Medium/Low)	(Poor/Moderate/High)	(Poor/Moderate/High)
Site perimeters	Low	Moderate	High
Entrances and exits	n/a	Moderate	High
Formal surveillance	High	Moderate	High
Informal surveillance	High	Moderate	Moderate
Landscaping	Medium	Poor	High
Lighting and visibility	Medium	Moderate	High
Emergency call	Medium	Poor	High

Approximate Number of Users Affected

Moderate (between 500 - 10,000 users per day affacted).

Reference Source

WebTAG TAG unit A4-1 social impact appraisal, December 2017
10015022-ARC-XX-XX-DR-HE-0002 Proposed Park & Ride Area
10015022-ARC-XX-XX-DR-HE-0012 Existing Public Transport Routes
10015022-ARC-XX-XX-DR-HE-0013 Proposed Public Transport Routes
10015022-ARC-XX-XX-DR-HE-0014 Proposed Walking & Cycling Routes

Summary Assessment Score

Moderate beneficial (between 500 - 10,000 users per day affacted).

Qualitative Comments

See Outline Business Case report.

TAG Severance Impacts Worksheet

Change in Severance	Population Affected			
	Dinas Powys			**Total Affected**
Large negative	0			**0**
Moderate negative	0			**0**
Slight negative	0			**0**
Neutral	0			**0**
Slight positive	200 to 1000			**200 to 1000**
Moderate positive	0			**0**
Large positive	0			**0**

Reference Source

GoogleMaps Data ©2018
10015022-ARC-XX-XX-DR-HE-0002 Proposed Park & Ride Area
10015022-ARC-XX-XX-DR-HE-0012 Existing Public Transport Routes
10015022-ARC-XX-XX-DR-HE-0013 Proposed Public Transport Routes
10015022-ARC-XX-XX-DR-HE-0014 Proposed Walking & Cycling Routes
DMRB 11.3.8
SAPE19DT3-mid-2016-msoa-syoa-estimates_formatted **(https://www.ons.gov.uk/)**
SAPE19DT11-mid-2016-lsoa-population-density **(https://www.ons.gov.uk/)**

Summary Assessment Score

Slight positive

Qualitative Comments

See Outline Business Case report.

TAG Water Environment Impacts Worksheet

Description of study area/ summary of potential impacts	Key environmental resource	Features	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Surface Water									
Study area: Surface Water	Rivers River Cadoxton WFD Ref: GB110058026420 WFD - Moderate Overall Status - Moderate Ecol. Condition - Good Chemical Condition	Biodiversity Aesthetics Cultural Heritage Value to economy	River Cadoxton WFD - Moderate Overall Status Other small watercourses within the area - Unknown Quality	Regional	Medium	NYA	Medium	Slight Adverse	Low Signficance
Pollution to River Cadoxton from construction		Water Quality	River Cadoxton WFD - Moderate Overall Status Other small watercourses within the area - Unknown Quality	Regional	Low	NYA	Medium	Slight Adverse	Low Signficance
Pollution to River Cadoxton from routine runoff		Water Quality	River Cadoxton WFD - Moderate Overall Status Other small watercourses within the area - Unknown Quality	Regional	Low	NYA	Medium	Negligible	Insignificant
Pollution to River Cadoxton from accidential spillage		Water Quality	River Cadoxton WFD - Moderate Overall Status Other small watercourses within the area - Unknown Quality	Regional	Low	NYA	Medium	Slight Adverse	Low Signficance
Impact to the Cadoxton Flood Plain	Flood Plain	Conveyance of flood flows Flood flow routes Surface water flooding	Presence of Flood Zones C2 (e.g. areas without significant flood defence infrastructure) and Flood Zone B (e.g. areas known to have flooded in the past).	Local	Low	NYA	NYA	Slight Adverse / Negliglible	Low Signficance / Insignificant
Ground Water									
Pollution to Groundwater from construction	Groundwater Thaw & Cadoxtan Jurassic Lias WFD Ref: GB41002G201400 WFD - Good Overall Status - Good Quantitative Condition - Good Chemical Condition	Water Quality	WFD - Good status in terms of both Quantity - Good Chemical - Good	Regional	High	NYA	High	Slight Adverse	Low Signifcance
Pollution to Groundwater from routine runoff		Water Quality	WFD - Good status in terms of both Quantity - Good Chemical - Good	Regional	High	NYA	High	Negligible	Insignificant
Pollution to Groundwater from accidental spillage		Water Quality	WFD - Good status in terms of both Quantity - Good Chemical - Good	Regional	High	NYA	High	Slight Adverse	Low Significance

Reference Sources

Natural Resources Wales, Cycle 2 Rivers and Waterbodies WFD Data (2018)
Natural Resources Wales, Flood Risk Map (2018)
MAGIC, Defra (2018)
Department for Transport (DfT) Transport Appraisal Guidance (TAG) Unit A3 - Envionmental Impact Appraisal (2017)

Summary Assessment Score

Multi-modal option - Slight Adverse

Qualitative Comments

The potential impacts to the 'main rivers' and ordinary water courses concerns a possible accidental spillage, construction activities and routine run-off. This potential impact requires further investigation as the River Cadoxton has achieved a 'moderate' WFD score. Following further investigations, mitigation measures may be required as part of the design. A construction environmental management plan should be put in place during the construction of the Multi-modal option which will minimise the risk of pollution to watercourses during construction. Three ordinary watercourses are crossed as part of both the Multi-modal options (however, these upgrades would utilise the exisiting infrastructure present). Sections of the Multi-modal option are located in floodplain to the south of Dinas Powys in Flood Zones C2/B. The floodplain is associated with the Cadoxton River. Potential effects include for the loss of floodplain storage volume and impediment of floodplain flow paths if significant works are to take place on the existing transport links. Any new crossings of smaller watercourses also has the potential to impact flood risk, careful design of crossings should avoid impacts/mitigate risks.

TAG Historic Environment Impacts Worksheet

	Step 2	Step 3			Step 4
Feature	**Description**	**Scale it matters**	**Significance**	**Rarity**	**Impact**
Form	The historic resource of the study area is characterised predominately by agricultural land comprising both arable and pasture to the east, south east of Dinas Powys and west of Penarth. Surrounding this agricultural land are the built up urban settlements of Dinas Powys and Lower Penarth. There is an one area of Registered Common Land, eight Listed Buildings (seven Grade II and one Grade II*), there is one Scheduled Monument (Cogan Deserted Medieval Village) seperated in to three pockets within 500m of the Multi-modal option. There are no Registered Parks and Gardens, Conservation Areas, World Heritage Sites, Historical Landscapes or Registered Battlefields located within 500m of the Multi-modal option. The designated heritage assets are mainly associated with domestic buildings. There are multiple 'known' archaeological sites (Roman, Medieval and Post-Medival features) located within 500m of the Multi-modal option.	The protection and enhancement of heritage assets is of national concern as set out in the Planning Policy Wales, which sets out to conserve heritage assets in a manner appropriate to their significance.	The Grade II* Listed Building is of National Significance. The Grade II Listed Buildings and the Scheduled Monuments are of Regional Significance. There is potential for unidentified buried archaelogical features of unknown significance.	NYA	The proposed Multi-modal option is unlikely to have any impact on 'known' and 'unknown' designated heritage assets and non-designated heritate assets.The proposed Multi-modal option is unlikely to have any potential direct impact on buried archealogical remains. **Neutral**.
Survival	NYA	The protection and enhancement of heritage assets is of national concern as set out in the Planning Policy Wales, which sets out to conserve heritage assets in a manner appropriate to their significance. The survival of heritage assets is a contributing factor to its significance.	The Grade II* Listed Building is of National Significance. The Grade II Listed Buildings and the Scheduled Monuments are of Regional Significance. There is potential for unidentified buried archaelogical features of unknown significance.	NYA	The Multi-modal option would not have an effect on the survival of the designated assets. The proposed Multi-modal option is unlikely to have any potential direct impact on buried archealogical remains. **Neutral.**
Condition	NYA	The protection and enhancement of heritage assets is of national concern as set out in the Planning Policy Wales, which sets out to conserve heritage assets in a manner appropriate to their significance. The condition of heritage assets contributes to their signifcance and sensitivity to impacts.	The condition of designated and non-designated assets is important as, if in good condition, they can inform our understanding of the history of the region and contribute to the economic wellbeing of the local area.	NYA	NYA
Complexity	Eight of the Listed Buildings within 500m of the Multi-modal option are located within the Green Wedge between Dinas Powys and Lower Penarth. The remaining designated assets are not overly complex and represent medieval ruins to the west of Lower Penarth. The Dinas Powys Conservation Area is located in close proximity to the multi-modal option.	The protection and enhancement of heritage assets is of national concern as set out in the Planning Policy Wales, which sets out to conserve heritage assets in a manner appropriate to their signficance. The complexity of assets, including individually complex assets or groups of assets contributes to their significance.	NYA	NYA	NYA
Context	Eight of the Listed Buildings within 500m of the Multi-modal option are located within the Green Wedge between Dinas Powys and Lower Penarth. The remaining designated assets are not overly complex and represent medieval ruins to the west of Lower Penarth. The Dinas Powys Conservation Area is located in close proximity to the multi-modal option.	The context and setting of most cultural heritage assets is a material consideration at the local and national policy level.	The context of Listed Buildings (excluding the Grade II* Listed Building) and the Scheduled Monument are regionally significant. The context of the archaelogical features both 'known' and 'unknown' has not been assessed and the significance is therefore unkown.	NYA	The effect on the context of the Scheduled Monument and Listed Buildings are likely to be neutral. The effect on the context of the Dinas Powys Conservation Area has the potential to be slight beneficial due to the Multi-modal option potentially reducing traffic through Dinas Powy due to the ultisation of the upgraded public transport routes. The proposed Multi-modal option is unlikely to have any potential direct impact on buried archealogical remains. **Neutral.**
Period	St Peter's Church (Grade II*) is of a Medieval date. The Listed Buildings are of a Post Medieval date. Cogan Deserted Medieval Village is of Medieval date. Non-designated archaelogical features within 500m of the Multi-modal options are ranged primarily of Medieval to the Post-Medieval period.	Period does not necessarily determine the importance of the historic resource although, it can affect it. Policies within the Local and Regional Plans make reference to the safeguarding and enhancement of cultural heritage assets. The protection of designated assets and areas regardless of their period is of national concern as set out in the Planning Policy Wales.	The range of periods of the designated heritage assets are primarily of a Early Medieval / Medieval date. The non-designated buried archaelogical features within the area are important in understanding the development of the surrounding area on a local and regional level.	NYA	The Multi-modal option would not have an affect on the periods of heritage assets and areas. **Neutral**.

Reference Sources

Historic Wales, Archwilio , Vale of Glamorgan Interactive Constraints Map, Vale of Glamorgan Website, British Listed Buildings Website

Step 5 - Summary Assessment Score

Neutral

Qualitative Comments

Neutral impact on the buried archaelogical features. Neutral impacts on the settings of the Listed Buildings and Scheduled Monument. Slight beneficial impact on the Conservation Area, as it is anticipated that the Multi-modal option would reduce traffic through the centre of Dinas Powys as individuals may opt to use the enhanced public transport routes.

TAG Townscape Impacts Worksheet

	Step 2	Step 3					Step 4
Features	**Description**	**Scale it matters**	**Rarity**	**Importance**	**Substitutability**	**Changes in Without-scheme case**	**Impact**
Layout	The area of townscape is characterised around the large village of Dinas Powys which is situated along the A4055 (Cardiff Road) between Cardiff and Barry. The residential area of Dinas Powys is laid out around cul de sac roads making them free of through traffic. There are isolated individual properties located within the surrounding agricultural landscape to the south and east of Dinas Powys.	Local scale.	NYA	Locally Important. Dinas Powys Conservation Area to be considered as Regionally Important.	Heritage buildings could not be substituted.	Further adverse effects forecast as the traffic volumes along A4055 (Cardiff Road) would continue to increase.	The Multi-modal option would not result in a significant change in the layout of the townscape. **Neutral effect**
Density and mix	Buildings in the townscape are low density residential buildings. Residential buildings are predominately located in the village of Dinas Powys. There are isolated residential buildings within the surrounding landscape, with the surrounding landscape being predominantely composed of agricultural land, which reduce the density of development.	Local scale.	NYA	Locally Important. Dinas Powys Conservation Area to be considered as Regionally Important.	Heritage buildings could not be substituted.	Further adverse effects forecast as the traffic volumes along A4055 (Cardiff Road) would continue to increase.	The Multi-modal option would not result in a significant change in the density and mix of the townscape. **Neutral effect**
Scale	The built up area is predominatly composed of residential housing which is considered of small scale with development mostly two storeys in height. Within the surrounding area there are isolated properties with large grounds, open agricultural land and recreational areas.	Local scale.	NYA	Locally Important. Dinas Powys Conservation Area to be considered as Regionally Important.	Heritage buildings could not be substituted.	Further adverse effects forecast as the traffic volumes along A4055 (Cardiff Road) would continue to increase.	The Multi-modal option would not result in a significant change in the scale of the townscape. **Neutral effect**
Appearance	The Dinas Powys Conservation Area is notable for its architecture from three phases of developing which reflects the expansion of the village (pre-1880s, 1880s to 1930s, late 20th Century. Roadside stone walls, including the stone retaining wall running along the west side of the main road and surrounding the churchyard. Trees, hedges and other greenery soften the townscape and add to the area's rural appearance. Development is mostly two storeys in height, most houses are detached or semi-detached. Key purpose built commerical, religious or community buildings stand out of virtue of their bulk and size (e.g. the two non-conformist chapels, the parish hall and the bank at no.1 Elm Grove Road). St.Peter's Chuch and The Mount House stand out in the townscape.	Local scale.	NYA	Locally Important. Dinas Powys Conservation Area to be considered as Regionally Important.	Heritage buildings could not be substituted.	Further adverse effects forecast as the traffic volumes along A4055 (Cardiff Road) would continue to increase.	The Multi-modal option would not result in a significant change in the appearance of the townscape. **Neutral effect**
Human interaction	Dinas Powys is a mainly residential area bisected by the A4055 (Cardiff Road) which runs through the centre of the village. Amenities are located around the village centre and include a post office, a range of small independent shops, public houses, restaurants and community facilities. In addition there are shops, a pharmacy, garages and small supermarkets.	Local scale.	NYA	Locally Important. Dinas Powys Conservation Area to be considered as Regionally Important.	Heritage buildings could not be substituted.	Further adverse effects forecast as the traffic volumes along A4055 (Cardiff Road) would continue to increase. Foot and cycle path routes may improve cycle and pedestrian access.	The Multi-modal option would potentially result in a slight change in the cultural aspect of the human interaction. The Multi-modal option would potentially result in an increase of individuals utilising the upgraded public transport systems. This would potentially reduce traffic through the village with the enhanced public transport and potentially increase public use of the proposed walking and cycling routes. **Slight beneficial**

Cultural	The historical buildings within Dinas Powys contribute to the heritage feel of the Dinas Powys Conservation Area. The surrounding area has isolated Scheduled Monuments, Listed Buildings and a Registered Park and Garden within the surrounding agricultural landscape, contributing to the historical heritage feel of the area.	Local scale.	NYA	Locally Important. Dinas Powys Conservation Area to be considered as Regionally Important.	Heritage buildings could not be substituted.	Further adverse effects forecast as the traffic volumes along A4055 (Cardiff Road) would continue to increase.	The Multi-modal option would not result in a significant change in the cultural aspect of the townscape. The Multi-modal option would potentially result in an increase of individuals utilising the upgraded public transport systems. This would potentially reduce traffic through the village which would enhance its overall cultural feel. **Neutral effect**
Land use	Land use within the area is divided between areas of residential settlement (Dinas Powys, Lower Penarth and small groups/individual propoerties) and areas of agricultural land, comprising both arable and pasture. Additionally, the Cog Moors Wastewater Treatement Works is located to the south east of Dinas Powys. The village of Dinas Powys is located along the A4055 (Cardiff Road). There are areas for recreation including a golf course, vineyard and hotel.	Local scale.	NYA	Locally Important. Dinas Powys Conservation Area to be considered as Regionally Important.	Heritage buildings could not be substituted.	Further adverse effects forecast as the traffic volumes along A4055 (Cardiff Road) would continue to increase.	The Multi-modal option would not result in a significant change in the land use of the townscape. **Neutral effect**
Summary of character	The primary features of the townscape are roads and the residential area of Dinas Powys and Lower Penarth. There are built designated heritage assets within Dinas Powys including notable architecture from three phases of development reflecting the expansion of the village: pre-1880s, 1880s to 1930s, late 20th century. Prevalence of local limestone in the construction of pre-1880 buildings and use of red and buff brick in the post-railway 1880-1930 development. Furthmore a series of medieval field systems operate within the area between Dinas Powys, Lower Penarth and Cog Moors.	Local scale.	NYA	Locally Important. Dinas Powys Conservation Area to be considered as Regionally Important.	Heritage buildings could not be substituted.	Further adverse effects forecast as the traffic volumes along A4055 (Cardiff Road) would continue to increase.	The proposed Multi-modal option utilises the existing railway and bus route transport infrastructure within and surrounding Dinas Powys. Additionally, the proposed walking and cycle routes would use the existing road and pathway network within and surrounding Dinas Powys. The Multi-modal option would not result in a significant change in the townscape character of Dinas Powys and Lower Penarth. The Multi-modal option would potentially result in an increase of individuals utilising the upgraded public transport systems. This would potentially reduce traffic through the village which would enhance its overall heritage feel. **Neutral effect**

Reference Sources

Google Earth Aerial Photography; OS maps; Vale of Glamorgan Local Development Plan Interactive Map (2017), Vale of Glamorgan - Dinas Powys Conservation Area Appraisal and Management Plan (2009)

Step 5 - Summary Assessment Score

Neutral effect - Slight beneficial

Qualitative Comments

Area assessed; Dinas Powys village using the Vale of Glamorgan Dinas Powys Conservation Area Appraisal and Management Plan (2009). The Multi-Modal option will have a neutral impact on the area within and surrounding Dinas Powys. The Multi-modal option will have the potential to increase human interaction through the proposed improvement of public transport (Bus and Railway) and the proposed walking and cycle routes. The Multi-modal option is unlikely to have any direct and indirect impacts on the townscape of the village.

TAG Journey Quality Impacts Worksheet

Factor	**Sub-factor**	**Better**	**Neutral**	**Worse**
Traveller Care	Cleanliness		▨	
	Facilities		▨	
	Information		▨	
	Environment		▨	
Travellers’ Views	-	▨		
Traveller Stress	Frustration	▨		
	Fear of potential accidents	▨		
	Route uncertainty	▨		

Reference Source

10015022-ARC-XX-XX-DR-HE-0023, 0024, 0025 and 0026
WebTAG TAG unit A4-1 social impact appraisal, December 2017
DMRB 11.3.9.2 (travellers’ views) and 11.3.9.3 (traveller stress)

Summary Assessment Score

Moderate (between 500 - 10,000 users per day affacted).

Qualitative Comments

See the Stage Two Outline Business Case report.

TAG Security Impacts Worksheet

Security Indicator	Relative importance	Without scheme	With scheme
	(High/Medium/Low)	(Poor/Moderate/High)	(Poor/Moderate/High)
Site perimeters	Medium	Moderate	High
Entrances and exits	Medium	Moderate	Moderate
Formal surveillance	Medium	Poor	Moderate
Informal surveillance	Medium	Moderate	Moderate
Landscaping	Medium	Poor	High
Lighting and visibility	Medium	Poor	Moderate
Emergency call	Medium	Poor	Moderate

Approximate Number of Users Affected

500 - 10,000 users anticipated to be affected per day.

Reference Source

10015022-ARC-XX-XX-DR-HE-0023, 0024, 0025 and 0026
WebTAG TAG unit A4-1 social impact appraisal, December 2017

Summary Assessment Score

Slight beneficial

Qualitative Comments

See Outline Business Case report.

TAG Severance Impacts Worksheet

Change in Severance	Population Affected			
	Dinas Powys			**Total Affected**
Large negative				**-**
Moderate negative				**-**
Slight negative				**-**
Neutral	200 - 1000			**200 - 1000**
Slight positive				
Moderate positive				**-**
Large positive				**-**

Reference Source

GoogleMaps Data ©2018
10015022-ARC-XX-XX-DR-HE-0023 - Blue Alignment - Sheet 1 Of 2
10015022-ARC-XX-XX-DR-HE-0024 - Blue Alignment - Sheet 2 Of 2
DMRB 11.3.8
SAPE19DT3-mid-2016-msoa-syoa-estimates_formatted **(https://www.ons.gov.uk/)**
SAPE19DT11-mid-2016-lsoa-population-density **(https://www.ons.gov.uk/)**

Summary Assessment Score

Neutral

Qualitative Comments

See Outline Business Case report.
2016 Dinas Powys population estimate **https://www.ons.gov.uk/**
https://gov.wales/docs/statistics/lsoamaps/lsoa.htm#Vale of Glamorgan
Existing AADT flows along the A4055 Cardiff Road are in excess of 8,000 vehicles and therefore applicable to DMRB 11.3.8 guidelines.

TAG Biodiversity Impacts Worksheet

Step 2		Step 3				Step 4	Step 5
Area	**Description of feature/ attribute**	**Scale (at which attribute matters)**	**Importance (of attribute)**	**Trend (in relation to target)**	**Biodiversity and earth heritage value**	**Magnitude of impact**	**Assessment Score**
Severn Estuary Ramsar	Annex I habitats (including estuaries, Atlantic salt meadows and mudflats and sandflats not covered by seawater at low tide), its migratory fish populations (including salmon, sea trout and sea lamprey) and for its internationally important assemblage of waterfowl (including gadwall, dunlin and redshank). Located approximately 2km east of the scheme.	International	Qualifying feature of a internationally designated site so very high importance	Water quality improving. Quality of saltmarsh threatened. Water fowl population status varies but overall assemblage has declined from approx. 81,000 to 66,000 between 1992/93 and 2006/7	Very high	Neutral	Neutral
Severn Estuary Special Protection Area (SPA)	Internationally important bird populations (including the Annex I species Bewick's swan over winter as well as ringed plover, dunlin, pintail, redshank and curlew) and for regularly supporting at least 20,000 waterfowl. Located approx. 2km east of the scheme.	International	Qualifying feature of a internationally designated site so very high importance	Water fowl population status varies but overall assemblage has declined from approx. 81,000 to 66,000 between 1992/93 and 2006/7	Very high	Neutral	Neutral
Severn Estuary SAC	Annex I habitats (including estuaries, Atlantic salt meadows and mudflats and sandflats not covered by seawater at low tide) and Annex II species (including sea lamprey, river lamprey and twaite shad). Located approx. 2km east of the scheme	International	Qualifying feature of a internationally designated site so very high importance	Water quality improving. Quality of saltmarsh threatened.	Very high	Neutral	Neutral
Cog Moors SSSI	Large continuous damp mesotrophic (neutral) semi-natural grassland associated with stands of tall sedges and populations of uncommon plants (Bulbous Foxtail and Pepper Saxifrage). The scheme runs directly through the southern field of the site.	National	Qualifying feature of a nationally designated site so high importance	Habitats static with active management but pillwort lost from site.	High	Major negative	Major adverse

Cosmeston Lakes SSSI	Cosmeston Lakes SSSI includes two lakes, created from flooded limestone quarries, which are connected by a narrow channel. These are eutrophic water bodies up to 10m deep, which support a range of submerged plants. One of the lakes is of special interest as the only known site in Wales for the presence of Starry Stonewort. Located approx. 0.7km south-east of the scheme.	National	Qualifying feature of a nationally designated site so high importance	Static with minimal management	High	Neutral	Neutral
Cwn Cydfin, Leckwith SSSI	A mixed deciduous woodland adjacent to saltings of the River Ely in a valley overlying Triassic Marls and Rhaetic rocks which are locally exposed in cliffs beside a tidal creek. The main trees are Pedunculate Oak, Ash, Elm, Maple with Hazel, Dogwood and Spindle. The ground flora is varied and especially rich alongside the streams. Located approximately 1.4km north of the scheme.	National	Qualifying feature of a nationally designated site so high importance	Static with minimal management	High	Neutral	Neutral
Cosmeston Lakes Country Park Local Nature Reserve	As above, a water vole population was released here in 2017.	County	Qualifying feature of a nationally designated site so high importance	Static with active management	High	Neutral	Neutral
Sites of Interest for Nature Conservations (SINCs)	Various SINCs within 2km of the scheme. The scheme passes through Cog Moors SINC which is designated for its species-rich Rhos pasture habitat.	County	Designated at Local Authority Level	Unknown, dependent on further information on SINC designations	Medium	Major negative	Moderate adverse
Ancient Woodland	The scheme passes through one area of restored ancient woodland.	Regional	Habitat of principal importance	In decline	Medium	Major negative	Moderate adverse
Tree Preservation Orders (TPO)	The scheme passes through a group of trees with preservation orders.	County	Designated at Local Authority Level	Static	Medium	Major negative	Moderate adverse
Priority Habitats	Running and standing open water, hedgerows, woodland, marshy grassland are crossed or are adjacent to the scheme.	County	Potential habitat of principal importance under Environment (Wales) Act 2016	In decline	Up to Medium	Uncertainty remains pending further survey work	Dependent on further survey, minor adverse if present

Other natural habitats	Scrub, tall ruderals, improved grassland, arable fields are present along or adjacent to the schemes	Local	Common habitats of some local biodiversity interest	Static	Low	Minor negative	Slight adverse
Hard structures	Roads and buildings are present along or adjacent to the scheme.	Local	Common habitats with no nature conservation value (unless bat roost present - see bats)	N/A	Negligible	Minor negative	Neutral
Amphibians	Records of great crested newts are present within 2km of the scheme. A range of suitable terrestrial foraging habitat available and at least 14 ponds within 500m offering potential breeding habitat. This route option is likely to lead to the loss of 2 ponds.	At least local, dependent on further survey work	Species of principal importance (great crested newt are European and UK Protected Species)	Declining	Up to medium (if great crested newt present)	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present
Badgers	No records. Potential for setts in woodland and hedgerows and foraging habitat available	At least local, dependent on further survey work	Protected under Protection of Badgers Act 1992	Static / maybe increasing	Low	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present
Bats	Records for *Myotis* sp., *Pipistrellus* sp. and unidentified bat species. Foraging and commuting habitat identified and potential for roosts in mature trees and buildings.	At least local, dependent on further survey work	European and UK protected species	Varies with species	Up to medium	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present
Birds	Records for a variety of species and suitable breeding habitat for both tree and ground nesting species. A variety of suitable foraging habitats.	At least local, dependent on further survey work	Protected during breeding season	Varies with species. Wintering birds are doing well but farmland birds are decreasing.	Up to medium	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present
Dormouse	Records and suitable habitat within hedgerows and woodland for breeding, foraging and hibernating individuals.	At least local, dependent on further survey work	European and UK protected species	In decline but decline may be levelling off	Up to medium	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present
Fish	Eel, bullhead and brown trout have been recorded and may be present in watercourses depending on their characteristics.	At least local, dependent on further survey work	Species of principal importance	Varies with species	Low	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present
Hedgehog	Records and suitable habitat within hedgerows, woodland and field margins.	At least local, dependent on further survey work	Species of principal importance	Uncertain but considered to be in decline	Low	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present

Invertebrates	Records and a variety of habitats will suit both aquatic and terrestrial species.	At least local, dependent on further survey work	Species of principal importance	Varies with species, but 21% species listed as Welsh priorities had declining populations, 25% had improving populations and 54% showed little change.	Low	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present
Otter	No records. Otter may use the smaller watercourses/drainage ditches for commuting and/or dispersing.	At least local, dependent on further survey work	European and UK Protected species	Increasing nationally	Up to medium	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present
Reptile	Suitable habitat for grass snake, slow-worm and common lizard within hedgerows and field margins. No potential for adder identified at this stage.	At least local, dependent on further survey work	UK protected species	Declining	Up to medium	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present
Water vole	Water vole released at Cosmeston lakes, smaller watercourses may also be suitable depending on conditions.	At least local, dependent on further survey work	UK protected species	Declining	Up to medium	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present
Plants	Habitats may support some EWA Section 7 species and WCA Schedule 9 species.	At least local, dependent on findings of Phase 1 survey	Species of principal importance	Varies with species, but 53% flowering plants that are features of European designated sites are in decline in Wales whilst 43% are increasing.	Low	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present
Other	Field habitats may support brown hare.	At least local, dependent on detailed Phase 1 habitat survey	Brown hare are species of principal importance	Declining (brown hare)	Low	Uncertainty remains pending further survey work	Dependent on further survey, slight adverse if present

Reference Sources

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RSPB Big Garden Birdwatch winter sightings in the UK in 2008
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UK Ladybird Survey data from iRecord
Bryophyte Data for Great Britain and Ireland from the British Bryological Society held by BRC; data complied post-Atlas

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Swift Inventory of Nest Sites in the UK, 2009-2014
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Great Crested Newt (Triturus cristatus) Sites in Wales to 2003
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Summary Assessment Score

Up to major adverse impacts anticipated this stage relating to proposals within a SSSI.

Qualitative Comments

Aerial imagery and a ground truthing exercise identified the potential for woodland, important hedgerows, watercourses and priority habitats including rhos pasture, but this would need to be verified through a Phase 1 habitat survey. Although impacts on ancient woodland are considered moderate it should be noted that this habitat cannot be recreated and therefore impacts should be considered as permanent. Impacts on Cog Moors SSSI will depend on the current condition of this unit of the site. It is likely that as a minimum grassland translocation and/or compensatory planting would be required to compensate for any habitat loss relating to both the SSSI and SINC. Further data including protected species surveys are required and potential mitigation activities should be recommended in an Ecological Impact Assessment.

TAG Historic Environment Impacts Worksheet

	Step 2	Step 3			Step 4
Feature	**Description**	**Scale it matters**	**Significance**	**Rarity**	**Impact**
Form	The study area in proximity to the Blue Alignment has an industrial character to the east of Barry, and the remainder of the study area is characterised predominately by agricultural land comprising both arable and pasture north of Sully, south east of Dinas Powys and west of Penarth. Surrounding this agricultural land are the built up urban settlements of Dinas Powys, Sully and Lower Penarth. 500m of the Blue Alignment there are 13 Listed Buildings (11 Grade II and two Grade II*), there are two Scheduled Monuments; Middleton Moated Site located approximately 50m north west of Sully and Cogan Deserted Medieval Village located west of Lower Penarth. There are no Registered Parks and Gardens, Conservation Areas, World Heritage Sites, Historical Landscapes or Registered Battlefields located within 500m of the Blue Alignment. The designated heritage assets are mainly associated with domestic buildings. There are mutiple 'known' archaelogical sites (Roman, Medieval and Post-Medival features) located within 500m of the Blue Alignment. There are six 'known' find spots located within the industrial zone of Barry. There is potential for as yet unidentified buried archaeolgical assets to be present within the Blue Alignment footprint.	The protection and enhancement of heritage assets is of national concern as set out in the Planning Policy Wales, which sets out to conserve heritage assets in a manner appropriate to their significance.	The Grade II* Listed Building are of National Significance. The Grade II Listed Buildings and the Scheduled Monuments are of Regional Significance. There is potential for unidentified buried archaelogical features of unknown significance.	NYA	The Blue Alignment has the potential to have a 'slight adverse' impact on 'unknown' non-designated heritate assets.The Blue Alignment has the potential to directly impact on buried archealogical remains which could result in the permanent and irreversible loss of assets. **Slight adverse.**
Survival	NYA	The protection and enhancement of heritage assets is of national concern as set out in the Planning Policy Wales, which sets out to conserve heritage assets in a manner appropriate to their significance. The survival of heritage assets is a contributing factor to its significance.	The Grade II* Listed Building are of National Significance. The Grade II Listed Buildings and the Scheduled Monuments are of Regional Significance. There is potential for unidentified buried archaelogical features of unknown significance.	NYA	The Blue Alignment would not have an effect on the survival of the designated assets. The Blue Alignment may have a 'slight adverse' effect on the survival of unidentified buried archaeological remains within the route of the scheme, however, this is not quantifiable at this stage. **Slight adverse.**
Condition	NYA	The protection and enhancement of heritage assets is of national concern as set out in the Planning Policy Wales, which sets out to conserve heritage assets in a manner of appropriate to their significance. The condition of heritage assets contributes to their signifcance and sensitivity to impacts.	The condition of designated and non-designated assets is important as, if in good condition, they can inform our understanding of the history of the region and contribute to the economic wellbeing of the local area.	NYA	NYA
Complexity	Eight of the Listed Buildings within 500m of the Blue Alignment are located within the Green Wedge between Dinas Powys and Lower Penarth, the remaining Listed Buildings are located along Hayes Road and west of Sully. The remaining designated assets are not overly complex and represent medieval ruins to the west of Lower Penarth. The Dinas Powys Conservation Area is located approximately 1km west of the Blue Alignment.	The protection and enhancement of heritage assets is of national concern as set out in the Planning Policy Wales, which sets out to conserve heritage assets in a manner appropriate to their signficance. The complexity of assets, including individually complex assets or groups of assets contributes to their significance.	NYA	NYA	NYA
Context	Eight of the Listed Buildings within 500m of the Blue Alignment are located within the Green Wedge between Dinas Powys and Lower Penarth, the remaining Listed Buildings are located along Hayes Road and west of Sully. The remaining designated assets are not overly complex and represent medieval ruins to the west of Lower Penarth. The Dinas Powys Conservation Area is located approximately 1km west of the Blue Alignment.	The context and setting of most cultural heritage assets is a material consideration at the local and national policy level.	The context of Listed Buildings (excluding the two Grade II* Listed Buildings) and the Scheduled Monuments are regionally significant. The context of the archaelogical features both 'known' and 'unknown' has not been assessed and the significance is therefore unkown.	NYA	The effect on the context of the Middleton Moated Site Scheduled Monuments has the potential to be slight adverse. The effect on the context of the Listed Buildings are likely to be neutral. The effect on the context of the Dinas Powys Conservation Area has the potential to be slight beneficial due to diverting traffic from travelling through the centre of Dinas Powys on to the by-pass. Due to the lack of assessment on the archaelogical features the effect of the Blue Alignments on the non-designated archaelogical features 'known' and 'unknown' is still to be determined. **Slight adverse**
Period	The dominant historic character of the area east of Barry is 20th century industrial. St Peter's Church (Grade II*) is of a Medieval date and Sully Hospital (Grade II*) is of Post-medieval date . The Listed Buildings are of a Post Medieval date. Cogan Deserted Medieval Village Scheduled Monument is of Medieval date. Non-designated archaelogical features within 500m of the routes are ranged primarily of Medieval to the Post-Medieval period.	Period does not necessarily determine the importance of the historic resource although, it can affect it. Policies within the Local and Regional Plans make reference to the safeguarding and enhancement of cultural heritage assets. The protection of designated assets and areas regardless of their period is of national concern as set out in the Planning Policy Wales.	The range of periods of the designated heritage assets are primarily of a Early Medieval / Medieval date. The non-designated buried archaelogical features within the area are important in understanding the development of the surrounding area on a local and regional level.	NYA	The Blue Alignment would not have an affect on the periods of heritage assets and areas. **Neutral**

Reference Sources

Historic Wales, Archwilio , Vale of Glamorgan Interactive Constraints Map, Vale of Glamorgan Website, British Listed Buildings Website

Step 5 - Summary Assessment Score

Slight adverse

Qualitative Comments

Slight adverse impact on the buried archaelogical features located along Blue Alignment. Neutral impacts on the settings of the Listed Buildings and Cogan Deserted Medieval Village Scheduled Monument, however there is potential for a slight adverse impact on the setting of the Middleton Moated Site. Slight beneficial impact on the Conservation Area as the Blue Alignment is anticipated to divert traffic from travelling through the centre of Dinas Powys.

TAG Landscape Impacts Worksheet - Eastern Option

	Step 2	**Step 3**				**Step 4**
Features	**Description**	**Scale it matters**	**Rarity**	**Importance**	**Substitutability**	**Impact**
Pattern	The landscape north of Sully is characterised by a relativelly small scale pattern of fields within an undulating lowland landscape. The landscape pattern is predominantly made up of pastoral fields bounded by hedgerows containing trees. Farms are scattered across the area which forms a green buffer between Dinas Powys and Penarth. The landscape to the east of Barry and west of Sully is characterised by the Barry industrial area within a lowland landscape.	Locally (tbc in next stage)	Locally (tbc in next stage)	Locally (tbc in next stage)	The Blue Alignment will provide a new feature and interrupt the existing hedgerow field patterns. This will be difficult to replicate in short term due to time necessary to establish vegetation cover. Increased traffic in area and long distance views will also be interrupted. The area east of Barry and west of Sully is already affected by exisiting buildings and infrastructure, landscape impacts are minimised.	**Moderate adverse: F**ield patterns and open spaces disrupted, with loss of hedges. The Blue Alignment will replace existing narrow lanes. Mitigations difficult without diminishing local landscape character. **Additional mitigation:** Landscape design along route, retain or planting of new hedges to integrate with the landscape pattern, design of road sympathetic to local landscape character.
Tranquillity	Generally open landscape with minor hedgerowed lanes that are tranquil and sheltered. Urban edge of Dinas Powys is intrusive in parts, however the green fringe on the north-eastern edge of Dinas Powys provides a subtle integration of urban edge and farmland. PRoWs links across the landscape with some open long distance views across the landscape particularly from elevated land along the western edge of Penarth.	Locally (tbc in next stage)	Locally (tbc in next stage)	Locally (tbc in next stage)	Difficult due to Blue Alignment dividing the landscape and and severing the green fringe. Increased traffic in area, long distance views interrupted.	**Moderate adverse:** Traffic and road through the landscape will reduce tranquillity, although its proximity to the urban edge of Dinas Powys will be a consideration. **Additional mitigation:** Good landscape (screening) and lighting design to integrate into the landscape and minimise night time landscape impact.
Cultural	Agricultural landscape with mature woodlands and hedgerows are features within the landscape. Largely intact survival of historical fieldscape of elongated strip fields on Pop Hill. However, the urban sprawl of Dinas Powys and Penarth has largely obscured earlier fieldscapes and patterns of settlement throughout the rest of the area. No significant cultural elements present to the area east of Barry and west of Sully.	Locally (tbc in next stage)	Locally (tbc in next stage)	Locally (tbc in next stage)	Difficult due to loss of historic field patterns and landscape features.	**Moderate adverse:** Setting of historic rural landscape patterns will deteriorate, loss of hedges and some woodland. **Additional mitigation:** Landscape design along route, retain and / or plant new hedges.
Landcover	Agricultural landscape and floodplain with hedgerows with trees and some mature woodlands.	Locally (tbc in next stage)	Locally (tbc in next stage)	Locally (tbc in next stage)	Difficult due to severance of field patterns and hedgerows as well as loss of some woodland. Road will create new feature in landscape.	**Moderate adverse:** loss of fields, fields will be divided and made smaller, loss of hedges. **Additional mitigation:** Landscape design along Blue Alignment, retain or plant new hedges.

Summary of character	Agricultural and urban fringe landscape set within a predominantly green buffer between Dinas Powys and Penarth. Undulating and open with mostly uniterrupted views. Wooded areas and hedgerow lined field patterns set the landscape character with scatered farms and views to the urban fringes of Dinas Powys and Penarth. The landscape to the east of Barry and west of Sully is characterised by the Barry industrial area within a lowland landscape.	Locally (tbc in next stage)	Locally (tbc in next stage)	Locally (tbc in next stage)	Difficult in short term due to time necessary to establish vegetation cover, increased traffic and new feature in the low lying and undulating landscape. The area east of Barry and west of Sully is already affected by exisiting buildings and infrastructure, landscape impacts are minimised.	**Moderate adverse**: Blue Alignment will reduce tranquillity in floodplain landscape, particularly where the road is on raised embankment. Traffic will increase, farmland will be lost, previously unlit green wedge will be lit, long distance views will be interrupted. **Additional mitigation:** Landscape design along Blue Alignment, retain or planting of new hedges, design of road sympathetic to local landscape character. Good landscape design (screening) and lighting design to minimise night time landscape impact.

Reference Sources

Site visit January 2018

Step 5 - Summary Assessment Score

Moderate adverse

Qualitative Comments

The Blue Alignment would degrade the landscape character of the area of route north of the settlement of Sully and north of Cog Moors Wastewater Treatment Works (WwTW) infrastructure with long distance views and night time setting.

TAG Townscape Impacts Worksheet

	Step 2	Step 3					Step 4
Features	Description	Scale it matters	Rarity	Importance	Substitutability	Changes in Without-scheme case	Impact
Layout	The area of townscape is characterised around the industrial area of east Barry, the residential settlement of Sully and the village of Dinas Powys which is situated along the A4055 (Cardiff Road) between Cardiff and Barry. The residential areas of Sully and Dinas Powys is laid out around cul de sac roads making them free of through traffic. There are isolated individual properties located within the surrounding agricultural landscape to the south and east of Dinas Powys.	Local scale.	NYA	Locally Important. Dinas Powys Conservation Area to be considered as Regionally Important.	Heritage buildings could not be substituted.	Further adverse effects forecast as the traffic volumes along A4055 (Cardiff Road) would continue to increase.	The proposed Blue alignment is linear and utilises the existing road network within Barry to the settlement of Sully. The Blue Route by-passes Dinas Powys. The Blue alignment would not result in a significant change in the layout of the townscape. **Neutral effect**
Density and mix	Buildings in the townscape are industrial facilties which form part of the industrial zone and low density residential buildings to the north east of Barry. Residential buildings are predominately located in the settlement of Sully and village of Dinas Powys. There are isolated residential buildings within the surrounding landscape, with the surrounding landscape being predominantely composed of agricultural land, which reduce the density of development.	Local scale.	NYA	Locally Important. Dinas Powys Conservation Area to be considered as Regionally Important.	Heritage buildings could not be substituted.	Further adverse effects forecast as the traffic volumes along A4055 (Cardiff Road) would continue to increase.	The proposed Blue alignment is linear and utilises the existing road network within Barry to the settlement of Sully. The Blue Route by-passes Dinas Powys. The Blue alignment would not result in a significant change in the density and mix of the townscape. **Neutral effect**
Scale	The built up area is predominatly composed of industrial facilities to the east of Barry and residential housing within Sully and Dinas Powys north east of Barry. The residential housing is considered of small scale with development mostly two storeys in height. Within the surrounding area there are isolated properties with large grounds, open agricultural land and recreational areas.	Local scale.	NYA	Locally Important. Dinas Powys Conservation Area to be considered as Regionally Important.	Heritage buildings could not be substituted.	Further adverse effects forecast as the traffic volumes along A4055 (Cardiff Road) would continue to increase.	The proposed Blue alignment is linear and utilises the existing road network within Barry to the settlement of Sully. The Blue Route by-passes Dinas Powys. The Blue alignment would not result in a significant change in the scale of the townscape. **Neutral effect**
Appearance	The Dinas Powys Conservation Area is notable for its architecture from three phases of developing which reflects the expansion of the village (pre-1880s, 1880s to 1930s, late 20th Century). The appearance of Dinas Powys is that of roadside stone walls, including the stone retaining wall running along the west side of the main road and surrounding the churchyard. Trees, hedges and other greenery soften the townscape and add to the area's rural appearance. Development in Dinas Powys and Sully is mostly two storeys in height, most houses are detached or semi-detached. Within Dinas Powys, key purpose built commerical, religious or community buildings stand out by virtue of their bulk and size (e.g. the two non-conformist chapels, the parish hall and the bank at no.1 Elm Grove Road). St.Peter's Chuch and The Mount House stand out in the townscape.	Local scale.	NYA	Locally Important. Dinas Powys Conservation Area to be considered as Regionally Important.	Heritage buildings could not be substituted.	Further adverse effects forecast as the traffic volumes along A4055 (Cardiff Road) would continue to increase.	The proposed Blue alignment is linear and utilises the existing road network within Barry to the settlement of Sully. The Blue Route by-passes Dinas Powys. The Blue alignment would not result in a significant change in the appearance of the townscape. **Neutral effect**

Human interaction	Dinas Powys is a mainly residential area bisected by the A4055 (Cardiff Road) which runs through the centre of the village. Amenities are located around the village centre and include a post office, a range of small independent shops, public houses, restaurants and community facilities. In addition there are shops, a pharmacy, garages and small supermarkets. The small settlement of Sully is located to the east of the industrial zone east of Barry.	Local scale.	NYA	Locally Important. Dinas Powys Conservation Area to be considered as Regionally Important.	Heritage buildings could not be substituted.	Further adverse effects forecast as the traffic volumes along A4055 (Cardiff Road) would continue to increase. Open space will be lost or become less safe to use because of heavier traffic associated with the Green and Pink alignments. Increased noise and disturbance in housing and open space. Foot and cycle path routes may improve cycle and pedestrian access.	The proposed Blue alignment is linear and utilises the existing road network within Barry to the settlement of Sully. The Blue Route by-passes Dinas Powys. The Blue alignment would not result in a significant change in the human interaction of the townscape. However, the access and quanitity of open space between Dinas Powys (Murch) and Lower Penarth would likely be negatively impacted by the development of a by-pass. **Slight adverse effect**
Cultural	The historical buildings within Dinas Powys contribute to the heritage feel of the Dinas Powys Conservation Area. The surrounding area of Barry, Sully and the agricultural landscape seperating Lower Penarth and Dinas Powys have isolated Scheduled Monuments, Listed Buildings and a Registered Park and Garden, contributing to the historical heritage feel of the area.	Local scale.	NYA	Locally Important. Dinas Powys Conservation Area to be considered as Regionally Important.	Heritage buildings could not be substituted.	Further adverse effects forecast as the traffic volumes along A4055 (Cardiff Road) would continue to increase.	The proposed Blue alignment is linear and utilises the existing road network within Barry to the settlement of Sully. The Blue Route by-passes Dinas Powys. The Blue alignment would not result in a significant change in the cultural aspect of the townscape. However, with the alignment by-passing Dinas Powys, this would divert traffic away from the village which would enhance its overall heritage feel. **Slight beneficial effect**
Land use	Land use within the area is divided between the area of industrial facilities south east of Barry, areas of residential settlements (Sully, Dinas Powys, Lower Penarth and small groups/individual propoerties) and areas of agricultural land, comprising both arable and pasture. Additionally, the Cog Moors Wastewater Treatement Works is located to the south east of Dinas Powys. The village of Dinas Powys is located along the A4055 (Cardiff Road). There are areas for recreation including a golf course, vineyard and hotel.	Local scale.	NYA	Locally Important. Dinas Powys Conservation Area to be considered as Regionally Important.	Heritage buildings could not be substituted.	Further adverse effects forecast as the traffic volumes along A4055 (Cardiff Road) would continue to increase.	The proposed Blue alignment is linear and utilises the existing road network within Barry to the settlement of Sully. The Blue Route by-passes Dinas Powys. The Blue alignment would not result in a significant change in the land use of the townscape. **Neutral effect**
Summary of character	The primary features of the townscape are roads and the residential area of Sully, Dinas Powys and Lower Penarth. There are built designated heritage assets within Dinas Powys including notable architecture from three phases of development reflecting the expansion of the village: pre-1880s, 1880s to 1930s, late 20th century. Prevalence of local limestone in the construction of pre-1880 buildings and use of red and buff brick in the post-railway 1880-1930 development. Furthmore a series of medieval field systems operate within the area between Dinas Powys, Lower Penarth and Cog Moors.	Local scale.	NYA	Locally Important. Dinas Powys Conservation Area to be considered as Regionally Important.	Heritage buildings could not be substituted.	Further adverse effects forecast as the traffic volumes along A4055 (Cardiff Road) would continue to increase.	The proposed Blue alignment is linear and utilises the existing road network within Barry to the settlement of Sully. The Blue Route by-passes Dinas Powys. The Blue alignment would not result in a significant change in the townscape character of south east Barry, Sully, Dinas Powys and Lower Penarth. However, with the alignment by-passing Dinas Powys, this would divert traffic away from the Dinas Powys village which would enhance its overall heritage feel. Loss of the field systems surrounding Dinas Powys may have an impact in the character setting of the townscape. **Neutral effect**

Reference Sources

Google Earth Aerial Photography; OS maps; Vale of Glamorgan Local Development Plan Interactive Map (2017), Vale of Glamorgan - Dinas Powys Conservation Area Appraisal and Management Plan (2009)

Step 5 - Summary Assessment Score

Neutral to Slight Adverse effect

Qualitative Comments

Area assessed; South east Barry, Sully and Dinas Powys village using the Vale of Glamorgan Dinas Powys Conservation Area Appraisal and Management Plan (2009). The Blue Alignment will cross the through the area of green space and field systems (Green Wedge) between Dinas Powys and Lower Penarth, which may have a potential slight adverse impact on the setting of the Dinas Powys rural townscape feel. The Blue Alignment by-passes Dinas Powys and is unlikely to have any direct and indirect impacts on the townscape of the village.

TAG Water Environment Impacts Worksheet

Description of study area/ summary of potential impacts	Key environmental resource	Features	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
Surface Water									
Study area: Surface Water	Rivers River Cadoxton WFD Ref: GB110058026420 WFD - Moderate Overall Status - Moderate Ecol. Condition - Good Chemical Condition	Biodiversity Aesthetics Cultural Heritage Value to economy	River Cadoxton WFD - Moderate Overall Status Other small watercourses within the area - Unknown Quality	Regional	Medium	NYA	Medium	Slight Adverse	Low Signficance
Pollution to River Cadoxton from construction		Water Quality	River Cadoxton WFD - Moderate Overall Status Other small watercourses within the area - Unknown Quality	Regional	Low	NYA	Medium	Slight Adverse	Low Signficance
Pollution to River Cadoxton from routine runoff		Water Quality	River Cadoxton WFD - Moderate Overall Status Other small watercourses within the area - Unknown Quality	Regional	Low	NYA	Medium	Negligible	Insignificant
Pollution to River Cadoxton from accidential spillage		Water Quality	River Cadoxton WFD - Moderate Overall Status Other small watercourses within the area - Unknown Quality	Regional	Low	NYA	Medium	Slight Adverse	Low Signficance
Impact to the Cadoxton Flood Plain	Flood Plain	Conveyance of flood flows Flood flow routes Surface water flooding	Presence of Flood Zones C2 (e.g. areas without significant flood defence infrastructure) and Flood Zone B (e.g. areas known to have flooded in the past).	Local	Low	NYA	NYA	Slight Adverse / Negliglible	Low Signficance / Insignificant
Ground Water									
Pollution to Groundwater from construction	Groundwater Thaw & Cadoxtan Jurassic Lias WFD Ref: GB41002G201400 WFD - Good Overall Status - Good Quantitative Condition - Good Chemical Condition	Water Quality	WFD - Good status in terms of both Quantity - Good Chemical - Good	Regional	High	NYA	High	Slight Adverse	Low Signifcance
Pollution to Groundwater from routine runoff		Water Quality	WFD - Good status in terms of both Quantity - Good Chemical - Good	Regional	High	NYA	High	Negligible	Insignificant
Pollution to Groundwater from accidental spillage		Water Quality	WFD - Good status in terms of both Quantity - Good Chemical - Good	Regional	High	NYA	High	Slight Adverse	Low Significance

Reference Sources

Natural Resources Wales, Cycle 2 Rivers and Waterbodies WFD Data (2018)
Natural Resources Wales, Flood Risk Map (2018)
MAGIC, Defra (2018)
Department for Transport (DfT) Transport Appraisal Guidance (TAG) Unit A3 - Envionmental Impact Appraisal (2017)

Summary Assessment Score

Blue Alignment - Slight Adverse

Qualitative Comments

The potential impacts to the 'main rivers' and ordinary water courses concerns a possible accidental spillage, construction activities and routine run-off. This potential impact requires further investigation as the River Cadoxton has achieved a 'moderate' WFD score. Following further investigations, mitigation measures may be required as part of the design. A construction environmental management plan should be put in place during the construction of the Blue Alignment which will minimise the risk of pollution to watercourses during construction. Approximately nine ordinary watercourses are crossed as part of Blue Alignment. The Blue Alignment croses the floodplain to the south of Dinas Powys and east of Barry in Flood Zone C2/B. The floodplain is associated with the Cadoxton River. NRW flood maps show that flood risk is high to moderate in the areas where the Blue Alignment interacts with the floodplain. Potential effects include for the loss of floodplain storage volume and impediment of floodplain flow paths. To mitigate, there may be a need to provide compensation storage, culverts through embankments to maintain continuity of flow conveyance. Any new crossings of smaller watercourses also has the potential to impact flood risk, careful design of crossings should avoid impacts/mitigate risks.

TAG Journey Quality Impacts Worksheet

Factor	**Sub-factor**	**Better**	**Neutral**	**Worse**
Traveller Care	Cleanliness			
	Facilities			
	Information			
	Environment			
Travellers' Views	-			
Traveller Stress	Frustration			
	Fear of potential accidents			
	Route uncertainty			

Reference Source

10015022-ARC-XX-XX-DR-HE-0004, 0005, 0006 and 0007 - Green Alignment
WebTAG TAG unit A4-1 social impact appraisal, December 2017
DMRB 11.3.9.2 (travellers' views) and 11.3.9.3 (traveller stress)
10015022-ARC-XX-XX-DR-HE-0002 Proposed Park & Ride Area
10015022-ARC-XX-XX-DR-HE-0012 Existing Public Transport Routes
10015022-ARC-XX-XX-DR-HE-0013 Proposed Public Transport Routes
10015022-ARC-XX-XX-DR-HE-0014 Proposed Walking & Cycling Routes

Summary Assessment Score

High beneficial (more than 10,000 users per day affacted).

Qualitative Comments

See the Stage Two Outline Business Case report.

TAG Security Impacts Worksheet

Security Indicator	Relative importance	Without scheme	With scheme
	(High/Medium/Low)	(Poor/Moderate/High)	(Poor/Moderate/High)
Site perimeters	Medium	Moderate	High
Entrances and exits	Medium	Moderate	High
Formal surveillance	High	Moderate	High
Informal surveillance	High	Moderate	Moderate
Landscaping	Medium	Poor	High
Lighting and visibility	Medium	Moderate	High
Emergency call	Medium	Poor	High

Approximate Number of Users Affected

High (more than 10,000 users per day affacted).

Reference Source

10015022-ARC-XX-XX-DR-HE-0004, 0005, 0006 and 0007 - Green Alignment
WebTAG TAG unit A4-1 social impact appraisal, December 2017
10015022-ARC-XX-XX-DR-HE-0002 Proposed Park & Ride Area
10015022-ARC-XX-XX-DR-HE-0012 Existing Public Transport Routes
10015022-ARC-XX-XX-DR-HE-0013 Proposed Public Transport Routes
10015022-ARC-XX-XX-DR-HE-0014 Proposed Walking & Cycling Routes

Summary Assessment Score

Moderate beneficial

Qualitative Comments

See Outline Business Case report.

TAG Severance Impacts Worksheet

Change in Severance	Population Affected			
	Dinas Powys			**Total Affected**
Large negative				**-**
Moderate negative				**-**
Slight negative				**-**
Neutral				**-**
Slight positive				**-**
Moderate positive	Up to 1000			**Up to 1000**
Large positive				

Reference Source

GoogleMaps Data ©2018
10015022-ARC-XX-XX-DR-HE-0004 - Green Alignment
10015022-ARC-XX-XX-DR-HE-0002 Proposed Park & Ride Area
10015022-ARC-XX-XX-DR-HE-0012 Existing Public Transport Routes
10015022-ARC-XX-XX-DR-HE-0013 Proposed Public Transport Routes
10015022-ARC-XX-XX-DR-HE-0014 Proposed Walking & Cycling Routes
DMRB 11.3.8
SAPE19DT3-mid-2016-msoa-syoa-estimates_formatted **(https://www.ons.gov.uk/)**
SAPE19DT11-mid-2016-lsoa-population-density **(https://www.ons.gov.uk/)**

Summary Assessment Score

Moderate beneficial

Qualitative Comments

See Outline Business Case report.
2016 Dinas Powys population estimate **https://www.ons.gov.uk/**
https://gov.wales/docs/statistics/lsoamaps/lsoa.htm#Vale of Glamorgan
>60% reduction in traffic flow within built up area of Dinas Powys establishing a large imapct.
Existing flows are in excess of 8,000 vehicles and therefore applicable to DMRB 11.3.8 guidelines.
Estimated that >1000 people will be affected within Dinas Powys and Barry.

DINAS POWYS TRANSPORT NETWORK

WelTAG Stage Two: Impacts Assessment Report

DRAFT NO STATUS

JANUARY 2019

Incorporating

Dinas Powys Transport Network

WelTAG Stage Two: Impacts Assessment Report

Author	EM
Checker	MF
Approver	JH
Report No	10015022-ARC-XX-XX-RP-TP-0002
Date	JANUARY 2019

VERSION CONTROL

Version	Date	Author	Changes
D01	21st March 2017	EM	WelTAG Stage One Draft for Consultation
D02	7th July 2017	EM	WelTAG Stage One Final Issue
D03	31st August 2018	EM	WelTAG Stage Two Draft for Consultation
D04	29th January 2019	MF	Draft No Status

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1 Introduction

1.1 Background

Arcadis Consulting (UK) Limited has been commissioned by Vale of Glamorgan Council to develop and appraise potential options for improving the strategic transport network encompassing corridors from the Biglis roundabout (Barry) through Dinas Powys, to Cardiff via Leckwith, Cogan and Penarth. The appraisal of options has been undertaken in accordance with the Welsh Government's latest version of WelTAG (December 2017[1]) including advice on the appraisal in relation to the Future Generations of Wales (2015) Act Well-being Goals[2].

1.2 Stage Two Impacts Assessment Report

This report is the Stage Two: Strategic Outline Business Case Impacts Assessment Report. The WelTAG guidance states that the WelTAG report should be supported by an Impacts Assessment Report. The Impacts Assessment Report *'is a live document which is maintained and grows throughout the five WelTAG stages. It becomes a permanent record of the appraisal work on the proposed transport intervention. It contains the detailed evidence behind the summary information provided to decision makers in the Stage reports.* As such, this report has been updated from the Stage One document to include new information available since the previous report was prepared. Notably, this includes traffic survey information collected as part of the Stage Two study.

1.3 Report Structure

The structure of this report is as follows:

- Chapter 2 presents a summary of the policy framework at the local, regional and national level;
- Chapter 3 presents the context of the study; and
- Chapter 4 summarises the data sources used within the study, in accordance with the WelTAG guidance.

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[1] https://beta.gov.wales/sites/default/files/publications/2017-12/welsh-transport-appraisal-guidance.pdf

[2] https://beta.gov.wales/sites/default/files/publications/2017-12/weltag-2017-supplementary-guidance-the-well-being-of-future-generations-wales-act-2015.pdf

2 Policy, Legislation and Background Documents

2.1 Overview

This section provides a summary of the policy and legislative framework and background studies and documents which provide the context for this study.

2.2 National Legislation

Active Travel (Wales) Act (2013)

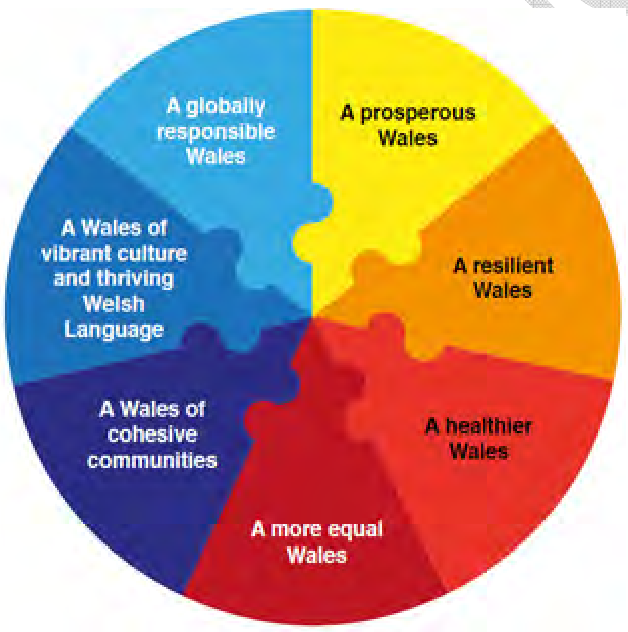
The Active Travel (Wales) Act came into force in 2013 and places a legal duty on local authorities to continuously improve infrastructure and routes for pedestrians and cyclists. The Act symbolises a landmark shift in policy direction to encourage and prioritise walking and cycling. The Act requires all local authorities to prepare maps of current access and identify potential future routes for use for active travel. The Act places a requirement upon all new road schemes and improvement schemes to consider the needs of pedestrians and cyclists at every stage, in particular during design. The Act aims to promote active travel by securing new and improved active travel routes and related facilities to enable people to partake in sustainable travel.

Well-being of Future Generations (Wales) Act 2015

The Well-being of Future Generations (Wales) Act (Welsh Government, 2015) strives to improve the social, economic, environmental and cultural well-being of Wales. The vision is that *'in 2050, Wales will be the best place to live, learn, work and do business'.*

The Act makes the public bodies listed in the Act consider the longer-term perspective, engage with people and communities and each other, prevent problems, and deliver a joined-up approach. The goals to represent what the long-term economic, social and environmental well-being of Wales are shown in Figure 1.

Figure 1 Well-being of Future Generations (Wales) Act – Well-being Goals[3]



The five ways of working as set out within the Act are shown in Figure 2.

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[3] https://gov.wales/docs/dsjlg/publications/150623-guide-to-the-fg-act-en.pdf

Figure 2 Well-being of Future Generations (Wales) Act – Five Ways of Working[4]

Long-term

The importance of balancing short-term needs with the needs to safeguard the ability to also meet long-term needs

Integration

Considering how the public body's well-being objectives may impact upon each of the well-being goals, on their objectives, or on the objectives of other public bodies

Involvement

The importance of involving people with an interest in achieving the well-being goals, and ensuring that those people reflect the diversity of the area which the body serves

Collaboration

Acting in collaboration with any other person (or different parts of the body itself) that could help the body to meet its well-being objectives

Prevention

How acting to prevent problems occurring or getting worse may help public bodies meet their objectives

Application to WelTAG

The latest WelTAG guidance has been developed in such a way to ensure that public funds are invested in a way that maximises contribution to the well-being of Wales, as set out in the Well-being of Future Generations (Wales) Act. The onus is specifically focused upon the delivery of sustainable development, of which will in turn contribute to the achievement of the well-being goals.

Environment (Wales) Act 2016

The Environment (Wales) Act 2016 puts in place the legislation needed to plan and manage Wales' natural resources in a more proactive, sustainable and joined-up way. It delivers the Programme for Government commitment to introduce new legislation for the environment. This positions Wales as a low carbon, green economy, ready to adapt to the impacts of climate change.

The act has been carefully designed to support and complement work to help secure Wales' long-term well-being, so that current and future generations benefit from a prosperous economy, a healthy and resilient environment and vibrant, cohesive communities. The key parts of the act of relevance to the study are:

- Part 1: Sustainable management of natural resources – enables Wales' resources to be managed in a more proactive, sustainable and joined-up way. It also helps to tackle the challenges faced and is focused on the opportunities Wales' resources provide.
- Part 2: Climate change – provides the Welsh Ministers with powers to put in place statutory emission reduction targets, including at least an 80% reduction in emissions by 2050 and carbon budgeting to support their delivery.

  This is considered vital within the context of existing UK and EU obligations and sets a clear pathway for decarbonisation. It also provides certainty and clarity for business and investment.
- Part 7: Flood & Coastal Erosion Committee and land drainage – clarifies the law for other environmental regulatory regimes including flood risk management and land drainage.

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[4] http://futuregenerations.wales/about-us/future-generations-act/

2.3 National Policy and Strategies

Wales Transport Strategy (One Wales: Connecting the Nation)

The Wales Transport Strategy (One Wales: Connecting the Nation) was published in 2008. It is a statutory document required by the Transport (Wales) Act 2006 (The Act).

The Wales Transport Strategy (WTS), published in 2008, sets out the Welsh Government's aim to improve transport, focusing upon how transport can play a key role in delivering the wider policy agenda of integrating transport with spatial planning, economic development, education, health, social services, environment and tourism, whilst meeting the strategic agenda and the implementation framework of the (then) Wales Spatial Plan. The vision of the WTS is '…*to promote sustainable transport networks that safeguard the environment while strengthening our country's economic and social life*.'

The Priorities of the WTS are:

Reducing greenhouse gas emissions and other environmental impacts

Improving public transport and better integration between modes

Improving links and access between key settlements and sites across Wales and strategically important all-Wales links

Enhancing international connectivity

Increasing safety and security

The WTS has three key sustainable transport themes and a number of desired outcomes, which underpin the strategy. The three themes underpinning the strategy are:

- Achieving a more effective and efficient transport system;
- Achieving greater use of the more sustainable and healthy forms of travel; and
- Minimising demand on the transport system.

During the past decade much has changed including the devolution of more powers to the Welsh Assembly; publication of overlapping legislation (Future Generations, Environment Act) while further changes are anticipated arising through delivery of Prosperity for All, from Local Government reforms; post-Brexit funding and relationships; the recently awarded Wales and Border rail franchise and; the devolution of further transport related responsibilities.

It is against this background that the Welsh Government is seeking to develop a new Wales Transport Strategy which recognises these recent changes and looks to address future opportunities and challenges.

A two tier approach to the replacement Wales Transport Strategy is proposed, comprising an overarching policy statement supported by a number of thematic policy statements, which is due to be published in May 2020.

The overarching policy statement will set out how transport will work to deliver the four key themes in Taking Wales Forward and deliver against the Priority areas set out in Prosperity for All. The overarching policy statement will be underpinned by a suite of thematic policy statements which together form a new Wales Transport Strategy. This would in turn, sit under the Economic Action Plan and the National Strategy.

The overarching statement will set out the Welsh Government's wider aims and objectives for the transport network in Wales. It will cover how they propose to take account of changes and crucially the wider

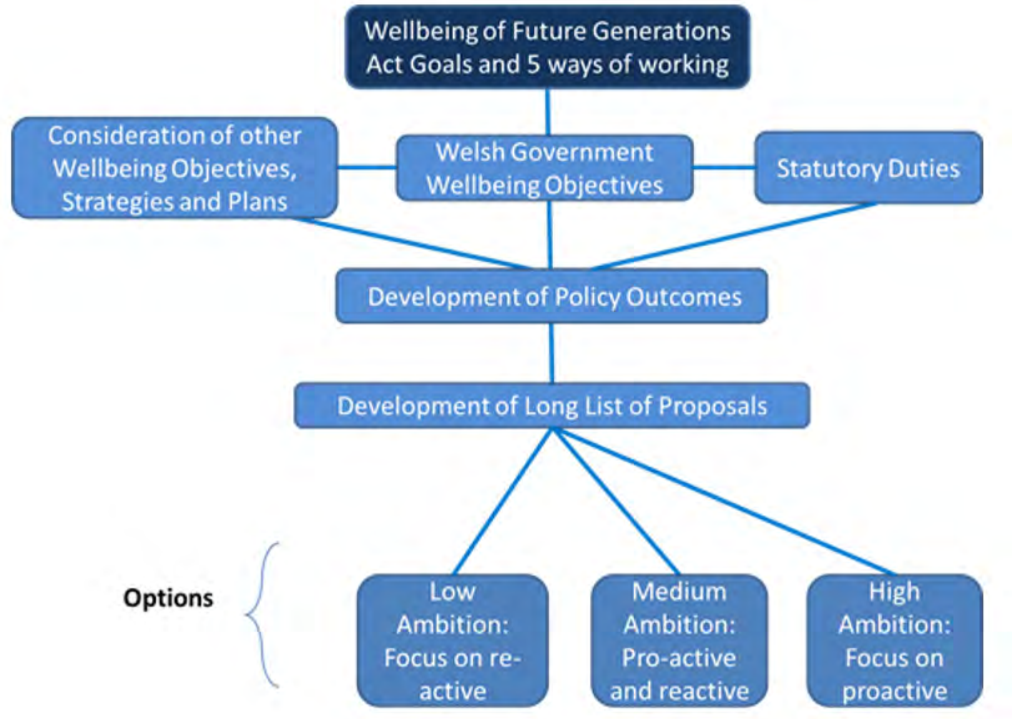
Government policy agenda in relation to land use planning, public service delivery, the mitigation of, and adaptation to, climate change and sustainable development.

Work will be taken forward on a number of ambitions low, medium and high ambition in accordance with Strategic Environmental Assessment requirements:

- The low ambition option is a reactive approach;
- The medium ambition is a mixture of pro-active and reactive approaches, such as making better use of the existing transport network and infrastructure; and
- The high ambition option is a proactive approach, one that considers a transport hierarchy in firstly reducing the need to travel by bringing services closer to people, secondly, the promotion of more sustainable travel methods and thirdly; where that is not possible making better use of the existing transport network.

The high level of ambition scenario will require a radical change in land use policies, planning and service delivery which is set out within the draft Economic Action Plan. The target to decarbonise 80% by 2050 may require this level of ambition, depending on the pathway Government adopts to reach this target. Moving to this position would require a different approach across government, with greater collaboration between economic development, transport and land use. It will also require us to be far more innovative in the measures taken forward. The framework is set out in Figure 3.

Figure 3 Wales Transport Strategy Development Framework



National Transport Finance Plan Update (2017)

The National Transport Finance Plan was first published in July 2015. The purpose of the plan is to provide the timescale for financing and delivering schemes, detail the estimated expenditure and identify the likely source of financing to enable delivery. The National Transport Finance Plan Update (2017) provides information on progress since publication and sets out a revised programme for the next three years and beyond. The plan includes both revenue and capital initiatives, ranging from specific schemes to others where further investigatory and development work is required. The relevant schemes to this study include:

- R2 – Deliver the actions set out in the Road Safety Framework for Wales (Safe Routes in Communities); Deliver the actions set out in the Road Safety Framework for Wales (Safe Routes in Communities – schools' specific funding); Deliver the actions set out in the Road Safety Framework for Wales (Road Safety Capital).
- AT1b – Ensure the Active Travel (Wales) Act 2-13 is delivered – Integrated Network Maps.
- AT1c – Ensure the Active Travel (Wales) Act 2013 is delivered – active travel schemes.
- AT2 – Deliver the actions set out in the Active Travel Action Plan.
- AT3 – Work with partners to deliver a programme of improvements to the National Cycle Network and that contribute to the objectives of the Active Travel Act.
- NEW 6 – Cardiff and Vale Coastal Sustainable Transport Package – developing an integrated transport package.
- RI14 – CP5 Access for All Programme: Undertake feasibility studies/ delivery options report for improved access at…Cadoxton station. From 16/17 develop additional accessibility projects.
- RI8 – Develop assessment criteria and, using those criteria, a prioritised list of station improvement proposals to draw down funding from relevant HLOS specific funds (as rail is non-devolved).
- RS1d – Engage with rail industry partners, stakeholders, and passengers to help develop and promote rail services including safety and security.
- BCT12 – Work with local authorities and bus operators to identify congestion and pinch points on the network that impact on bus reliability and punctuality and ensure that solutions are integrated into wider highway improvements programme.
- IT6 – Working with local authorities and Network Rail, identify a network of multi modal transport interchanges, park and ride and park and share hubs and develop a programme to implement.
- IT1 – Make grant funding available to local authorities for transport, including schemes that will help to improve access to employment sites, road safety schemes and schemes that will deliver the Welsh Government's wider priorities.
- IT7 – Work with Local Health Board, Wales Ambulance Services Trust, Community Health Councils, local government, the bus industry and the Community Transport Associations to deliver action plans setting out measures for improving access to healthcare.
- TI1 – Support innovation and the rollout of new technology, particularly where it can lead to development of safe and efficacious modes of transport.

The specific proposal relating to the study area is the new addition in the 2017 update of the Cardiff and Vale Coastal Sustainable Transport Package (NEW 6).

National Development Framework

The Wales Spatial Plan is being superseded by the new National Development Framework (NDF), which is currently under preparation. The NDF will set out a 20-year land-use framework for Wales and will:

- Set out where nationally important growth and infrastructure is needed and how the planning system - nationally, regionally and locally - can deliver it;
- Provide direction for Strategic and Local Development Plans (LDP) and support the determination of Developments of National Significance;
- Sit alongside Planning Policy Wales, which sets out the Welsh Government's planning policies and will continue to provide the context for land-use planning; and
- Support national economic, transport, environmental, housing, energy and cultural strategies and ensure they can be delivered through the planning system.

Whilst the detail of the NDF has not yet been published, the key point of note is that an additional layer of planning will be added into the system, with Strategic Development Plans (SDP) where appropriate acting a bridge between the NDF and LDPs. It is likely that the Cardiff Capital Region and Swansea Bay City Region will benefit from an SDP, which will support the determination of 'Developments of National Significance'. From a Vale of Glamorgan perspective, the Cardiff Airport and St Athan Enterprise Zone will potentially be defined as such a development within any Capital Region SDP. As such, improving connectivity from south Cardiff to the Enterprise Zone through Dinas Powys may have policy support.

2.4 Local Policy

Vale of Glamorgan Adopted LDP (2017)

The Vale of Glamorgan's LDP (2011- 2026) was adopted by the Council on 28th June 2017. The LDP sets out the vision, objectives, strategy and policies for managing development in the Vale of Glamorgan. It also seeks to identify the infrastructure that will be required to meet the growth anticipated in the Vale of Glamorgan up to 2026.

The relevant policies to the study area are those that relate to development in the South East Zone. The LDP strategy seeks to promote new development opportunities in the 'South East Zone' (which includes the urban settlements of Barry, Dinas Powys, Llandough (Penarth), Penarth and Sully. The South East Zone accommodates the majority of the Vale of Glamorgan's population and is said to benefit from a wide range of services and facilities including a choice of transport links to Cardiff and the wider region.

Barry is identified as a key settlement within the LDP Settlement Hierarchy. Penarth has been identified as a Service Centre Settlement and Dinas Powys a Primary Settlement. A number of specific area objectives have been identified, relevant to this study:

- Barry - Improve access to and within Barry, through strategic and local highway improvements and a range of sustainable transport measures, which will support regeneration whilst at the same time effectively managing congestion on the town's main arterial roads;
- Penarth - Promote Penarth as a 'sustainable transport town' by encouraging new and enhanced walking and cycling links within the town and between the town and adjoining residential and commercial areas, including Cardiff Bay, and facilitating park and ride provision; and
- Primary Settlement (Dinas Powys) - Promote sustainable transport measures and related facilities in order to reduce dependence on the private car.

Strategic Policies include SP7 for transportation. This identifies that sustainable transport improvements that serve the economic, social and environmental needs of the Vale of Glamorgan and promote the objectives of the South East Wales Regional Transport Plan (RTP) and the Local Transport Plan (LTP) will be favoured. The key priorities for the delivery of strategic transportation infrastructure include the following of relevance to the study area:

- A new Barry Island Link Road;
- Modernisation of the valley lines;
- Cycle routes at Barry Waterfront to Dinas Powys;
- Bus park and ride at Cosmeston, Penarth; and
- Bus priority measures at Merrie Harrier Cardiff Road Barry to Cardiff via Barry Road.

The policy states that priority will be given to schemes that improve highway safety and accessibility, public transport, walking and cycling.

The Plan notes how *'the South East Wales Transport Alliance (Sewta) Highway Strategy Study (2008) identifies the A4055 through Dinas Powys as a key problem area of the regional road network as a consequence of the scale of traffic and associated congestion. Barry Waterfront to Cardiff Link Road (Dinas Powys By-pass) was viewed as having dual benefits, helping to alleviate traffic congestion and improve road safety on the A4055 through Dinas Powys, while having the potential to improve access to the wider road network. Issues at the Cogan Spur and Merrie Harrier junctions, however, would be difficult to overcome.'*

'The RTP (2010) states that the scheme offers positive outcomes and should be subject to further development and evaluation within the investment programme. Whilst the Council supports this scheme in principle, it is considered unlikely that it will come to fruition during the Plan period, given the current economic climate and the Welsh Government's preference to make better use of the existing transport system and highway network via the enhancement of public transport routes and provision of new facilities for walking, cycling and rail. Accordingly, the proposed link road / bypass is not included within the LDP'.

Vale of Glamorgan LTP (2015)

The Vale of Glamorgan LTP has been established to recognise the diverse economic and social geography, and overlapping labour and housing markets, that exist throughout the Capital Region (which includes Vale of Glamorgan as well as Cardiff, in the vicinity of the study area).

Whilst acknowledging the requirement for a collaborative approach for the future development of the Capital Region, the LTP seeks to identify the sustainable transport measures required to ensure the Vale of Glamorgan Council adheres to current requirements and good practices to allow for a sustainable transport environment for the period 2015 to 2020, as well as looking forward to 2030.

The plan therefore seeks to secure better conditions for pedestrians, cyclists and public transport users and to encourage a modal shift away from the single occupancy car. The LTP also *'seeks to tackle traffic congestion by securing improvements to the strategic highway corridors for commuters who may need to travel by car'.*

The LDP strategic policy in relation to Transportation (SP7) reads as follows: *'Sustainable transport improvements that serve the economic, social and environmental needs of the Vale of Glamorgan and promote the objectives that can be found in the South East Wales RTP 2010 – 2015 will be favoured.' 'Priority will also be given to schemes that improve highway safety and accessibility, public transport, walking and cycling.'*

The plan highlights actions required including:

- In partnership with bus operators, negotiate expansion of current bus services, linking to key settlements and interchanges.
- Encourage use of community transport provision to sustain and entice bus operators/ community transport providers to take over once grown to acceptable sustainable level of patronage.
- To deliver existing safe routes in communities' schemes identified by schools and the public and encourage more schemes to come forward for consideration and implementation.
- In partnership with bus operators, negotiate expansion of current services, linking routes where there needs to be interchange and ensuring timings of connections are acceptable. Encourage use of integrated ticketing for services. Increase Community Transport to cater for demand.
- Provide bus priority for Dinas Powys to Cardiff corridor to include Penarth; and
- Deliver highway improvement schemes at key locations including Dinas Powys.

2.5 Background Documents

Highway Impact Assessment, Deposit LDP Background Paper (2013)

Capita Symonds was commissioned by the Vale of Glamorgan Council to undertake a capacity assessment of the impact of possible future LDP residential development sites on the strategic highway network. This formed part of the evidence base for the LDP. Within Dinas Powys, four proposed LDP residential sites were included within the assessment totalling 440 units.

Table 1 presents the link and junction capacity assessment results within the study area (based on Ratio of Flow to Capacity (RFC)/ degree of saturation) for the base year and the future year with the LDP proposals having taken place. The table shows that four junctions within the study area were identified as forecast to be over capacity in the future year, namely Cardiff Road/ Murch Road/ Millbrook Road; Merrie Harrier; Barons Court; and Leckwith Road/ Pen-y-Turnpike Road Priority junctions.

Table 1 Link and Junction Capacity Assessment Results

Link / Junction Name	2012 AM	2012 PM	2026 AM	2026 PM
Cardiff Road, Dinas Powys (North) (Link 209)	Within capacity	Within capacity	Within capacity	Within capacity
Barry Road, Barons Court SB (Link 207b)	Within capacity	Within capacity	Within capacity	Within capacity
Barry Road, Barons Court NB (Link 207)	Within capacity	Within capacity	Within capacity	Within capacity
Cardiff Road/ Murch Road/ Millbrook Road (Junction 8)	Over capacity	Over capacity	Over capacity	Over capacity
Merrie Harrier (Junction 9)	At capacity	At capacity	Over capacity	Over capacity
Barons Court (Junction 10)	At capacity	At capacity	Over capacity	Over capacity
Leckwith Road/ Pen-y-Turnpike Road Priority (Junction 12)	Within capacity	Within capacity	Over capacity	Over capacity

Final Sustainability Appraisal Report, Vale of Glamorgan LDP Document (June 2017)

The Sustainability Appraisal Report forms part of a series of documents for the Vale of Glamorgan LDP revised to reflect the changes made to the Deposit LDP and as a consequence of the September 2015 Focused Changes; and the Matters Arising Changes (September 2016) and Further Matters Arising Changes (February 2017) following the public examination of the LDP. The report identifies a range of sustainability issues for the Vale of Glamorgan, including the following:

- Access for all
    - Lack of provision for special needs groups, especially mobility impaired e.g. ramps, lifts, hearing loop systems, signage etc. in public buildings, streetscape and new housing developments;
    - Ageing population, therefore more people affected by mobility issues.
- Deprivation
    - Isolated areas of deprivation especially in Barry and Penarth;
    - Low economic activity (e.g. unemployed);
    - Low educational achievement (e.g. Gibbonsdown and Court);
    - Poor health (Barry, Penarth, St Athan and St Brides);
    - Income inequality.
- Climate change
    - Causes: pollution (pockets of pollution in the eastern Vale) from traffic and industry, over-reliance on energy generated from fossil fuels, loss of woodlands and countryside etc;
    - Consequences: increased risk of flooding, changes to farming practices (e.g. growing different crops), impact on biodiversity, economic impact, human lifestyle impact etc.

- Transport and accessibility
  - Congestion at peak times on key routes to Cardiff;
  - Inappropriate traffic management measures;
  - General lack of parking (e.g. town centres, new housing developments etc);
  - Insufficient public transport (especially in rural Vale);
  - Lack of provision for cyclists and pedestrians;
  - Lack of ‘park and ride’ and ‘park and share’ sites’
  - Increased car ownership;
  - Increased reliability on cars for access to goods and services;
  - Increasing commuter distances to work;
  - Environmental impact of vehicular traffic e.g. noise, emissions etc;
- Employment
  - Reliance on travel to work by car

Sustainable Transport Assessment (LDP Background Paper; 2013)

The Sustainable Transport Assessment forms part of a series of topic papers prepared by the Vale of Glamorgan Council as part of the evidence base used to inform the production of policies and site allocations for the LDP. This assessment sought to identify the sustainable transport measures required to create and ensure a sustainable transport environment in the Vale of Glamorgan.

The Vale of Glamorgan Council is committed to reducing the environment impact of its activities and as such seeks to provide transport infrastructure and transport services to assist the public to choose sustainable travel modes for all journeys where possible. This includes for all new developments to include off-road shared use walking/ cycling routes where possible and cycle signs on main roads where off-road facilities are not practical.

Walking and Cycling

A number of walking and cycling schemes are noted to have been funded / proposed in study area since the RTP Capital programme implementation began in April 2010, these include:

- Barry to Dinas Powys £30,000– Funding has been granted to carry out feasibility for a new pedestrian and cycling link from the McDonalds roundabout on Cardiff Road Barry to Dinas Powys;
- The Ash Path, Dinas Powys £25,000 – This funding is to allow the Council to negotiate with land owners to enable the provision of a shared footway / cycleway on public rights of way 25 and 28c to enable a link between Dinas Powys and Sully Road, Penarth;
- Opening up access to the Cross Common in Dinas Powys; and
- Footpath improvements linking Dinas Powys with Michaelston Le Pit.

It is considered necessary that the strategic route of Barry Waterfront to Dinas Powys is considered for improvement of the national cycle network in the Vale of Glamorgan.

Bus

The report notes that funding for bus services has declined. There has been a reduction of £8m of Grant throughout Wales despite the agreed objectives of increased patronage and improved services still standing. The objectives for bus services are as follows:

To provide and promote safe, attractive and accessible bus and community transport links to key regional centres and destinations.

To maximise opportunities to maintain and stimulate passenger growth.

To improve the quality and efficiency of bus and community transport services.

To address exclusion from the core network through the most appropriate mode, including the use of flexible bus services and community transport.

To encourage partnership working in information provision, ticketing and service provision.

To ensure buses and community transport play their full role within the Sewta Metro Plus integrated transport network.

To provide a foundation for bus infrastructure enhancement programmes.

The LDP supports Bus-Based Park & Ride initiatives as a transport planning tool that can be used to encourage car users to switch to public transport. It is noted that bus-based Park and Ride sites need to be large enough to significantly reduce car traffic on the target corridors. Essential factors to address in the design and implementation of Park and Ride sites include:

- Clear and conspicuous signposting;
- Ease of access to the site;
- Comparative Bus-Based Park & Ride and central area parking tariffs;
- The quality, frequency and reliability of the transit service;
- Journey time advantages over the car; and
- Site facilities, such as shelter, passenger information and security measures.

Dinas Powys to Cardiff Corridor and Merrie Harrier Cardiff Road Barry to Cardiff via Barry Road are considered necessary links for the development of bus priority measures. The Vale of Glamorgan Council has implemented one bus priority scheme on Cardiff Road to reach the Merrie Harrier junction. In order for buses to benefit further on the Dinas Powys to Cardiff corridor, further consideration should be given to Leckwith and/or Barry Road.

Sewta Rail Strategy (2013)

The Sewta Rail Strategy is a report prepared by Jacobs which sets out the investment which the combined local authorities in South East Wales believe is needed to ensure a robust and efficient rail network over the next 20 years. The strategy is planned to accommodate passengers in comfort and encourage growth of both rail passengers and freight in an environmentally sustainable form.

The Sewta vision for improving the rail network is shared by the Welsh Government and seeks to provide a more attractive transport option with a minimum frequency of half hourly services made up of higher capacity electric trains. The Cardiff Area Signalling Renewal project offers the scope to secure additional capacity at the core of the Valley Lines network, through an enhancement option which will require continued Welsh Government funding support.

Rail demand on the Valley Lines and elsewhere in South East Wales has been growing at a rate significantly above GDP. In order to avoid overcrowding at this high growth rate, significant short-term investment in additional rolling stock is needed as well as medium term rolling stock renewal through Valley Lines electrification. The rail strategy is based on provisions such as providing longer trains to accommodate passenger growth and improving the frequency of existing passenger services.

The strategy identifies various levels of investment, relevant to this study including:

- Additional rolling stock required to strengthen peak train to address passenger growth and to avoid overcrowding;
- Station enhancements including improved station facilities, information, security and access; and
- Frequency enhancements on existing lines, including improving the levels of service on selected routes to meet passengers' minimum service level expectations and encourage increased transfer of car trips to rail. Half hourly services along the Vale of Glamorgan Line and additional peak services to reduce overcrowding between Barry and Cardiff.

The study has found that demand exceeds peak capacity on the Vale of Glamorgan Line. Overcrowding is expected to curtail demand in the short term. The former Welsh Government National Transport Plan (2010-2015) proposed to increase the service frequency to half hourly. Recommendations found that train lengthening or frequency enhancement is implemented for as soon as possible.

Cardiff Capital Region Metro Study (2013)

The Metro Study sets out a strategic regional plan for developing the Metro, which *is 'a turn up and go integrated transport network that will connect over 70% of the population of the Cardiff City Region, developed in a way that enables and/or enhances developments at strategic sites, maximises economic benefits & facilitates regeneration'.*

The study identifies a number of relevant existing transport problems and key trends:

- Limited integration between rail and bus services;
- Problems many people in the region encounter in accessing work, education and healthcare because of lack of available, affordable transport;
- Limited public transport access to some of the region's major hospitals, schools and other public services; and
- The Vale of Glamorgan rail line generally has poor frequencies (with one train an hour).

The Metro's extent includes routes southwest of Cardiff through Dinas Powys (towards Barry before travelling northwest towards Maesteg. Bus/rail integration improvements at Barry Docks have been identified as an early Metro project that can be delivered incrementally from now until 2020. Improvements to public transport at Cardiff Airport are also highlighted.

Figure 4 Demand/ Capacity AM Peak Vale of Glamorgan Line

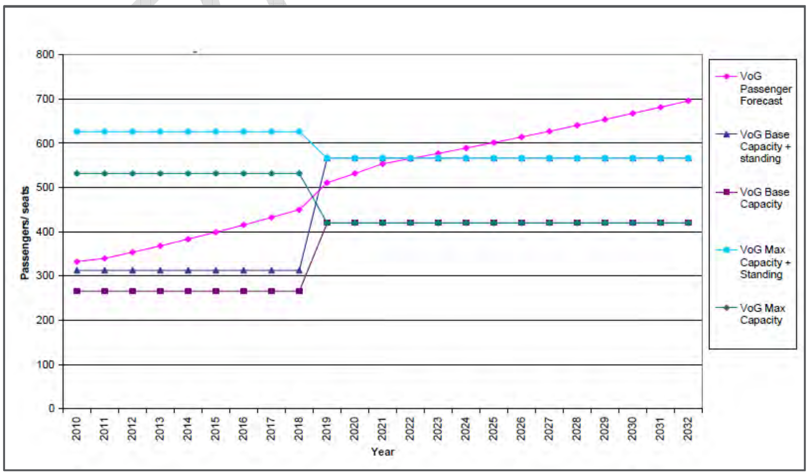
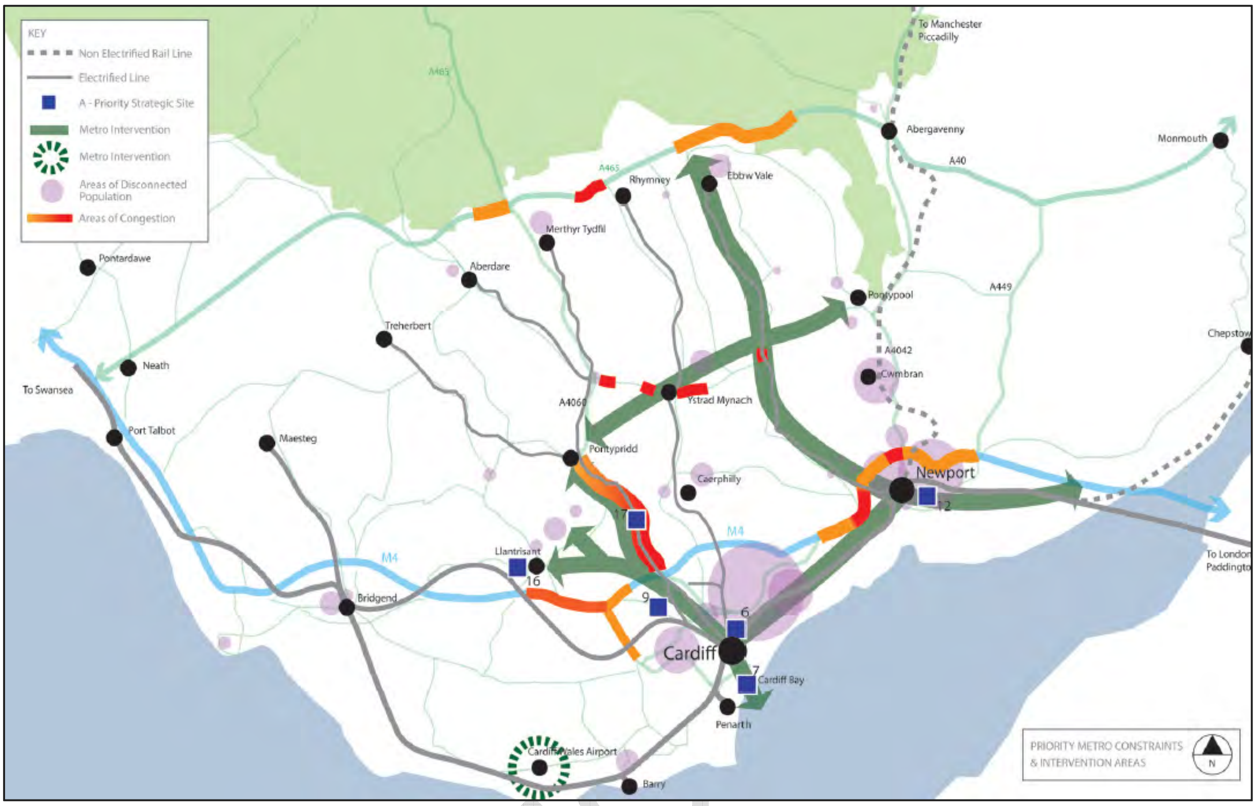


Figure 5 Metro Priorities[5]



Rapid Transport for Cardiff: Scoping, Feasibility, Engineering and Economic Study (2013)

A study to carry out a scoping and feasibility investigation and associated economic assessment of a possible Rapid Transit network for Cardiff, was undertaken by TRL Limited, comprising Appendix M of the Deposit LDP. The report examines the feasibility of several potential rapid transit corridors including; City Centre to Cardiff Bay and Penarth (within the Vale of Glamorgan), considered for further, more detailed study. Feasible alignments have been sought for the following separate sections of the transport corridor:

- City Centre to Cardiff Bay;
- Cardiff Bay to Cogan Station;
- City Centre direct to Cogan Station;
- Cogan Station to Penarth; and
- Cardiff Bay direct to Penarth.

Wales and Borders Rail Franchise (2018 - 2033)

The new 15-year Wales and Border Rail Franchise will commence in October 2018 with KeolisAmey replacing Arriva Trains Wales as the franchisee. Table 2 subsequently outlines the key rail enhancements proposed under the new franchise agreement retained within the South Wales Metro area (Cardiff Capital Region) encompassing Eastbrook Rail Station upgrade, Dinas Powys Station Upgrade, and Vale of Glamorgan Line Rail Service Enhancements. Consultation with Transport for Wales, Network Rail and KeolisAmey would be required in order to determine the proposed interventions and timescales of the enhancement proposals. In addition, the individual aspects of each of the rail station enhancements projects would require specific consideration to determine their viability in the long run. This would include an evaluation of station improvements, their costing and delivery timescales.

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[5] Cardiff Capital Region Metro Study (2013)

Table 2 KeolisAmey Rail Enhancement Proposals (Wales and Border Rail Franchise)

Proposal	Description
Eastbrook Rail Station Upgrade	Station Travel Plan New enclosed waiting shelters Additional secure cycle storage Additional lighting Improved CCTV Additional of customer help points Improved customer information General improvements to the station environment Explore option to reconfigure the car park reconfiguration (to increase availability of spaces) Explore feasibility of providing step free access to the platforms Explore option of providing additional car parking capacity to the north-west of Eastbrook Station
Dinas Powys Rail Station Upgrade	Station Travel Plan New enclosed waiting shelters Additional secure cycle storage Additional lighting Improved CCTV Additional of customer help points Improved customer information General improvements to the station environment
Vale of Glamorgan Line Service Enhancements	As part their commitment to the South East Wales Metro Programme under their Wales and Borders rail franchise, KeolisAmey have outlined a number of proposals the following of which will affect the rail corridor either directly or indirectly through Dinas Powys[6]: • Two trains per hour between Cardiff and Bridgend via Vale of Glamorgan from December 2023; • Remove Pacer trains by December 2019; • Retain the link from Penarth, Barry and Bridgend to destinations north of Cardiff Central using new tri-mode trains (overhead electric, battery and diesel) from December 2023; • Introduce three new Community Rail Partnerships, recruiting a Community and Stakeholder Manager and nine Community and Customer Ambassadors by 2021; • Provide ticket machines at all South Wales Metro stations by April 2019; and • Introduce pay-as-you-go for users of smartcards by April 2020.

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[6] http://tfw.gov.wales/whats-happening-south-east-wales

Dinas Powys to Cardiff Corridor Bus Priority Measures (May 2015)

In February 2015, Capita was commissioned by the Vale of Glamorgan Council to undertake a study to consider feasible bus priority measures along designated corridors between Dinas Powys and the Cardiff County boundary.

Key findings of the study included that the majority of corridors were too constrained to include bus lanes and that highway networks are unlikely to accommodate the 8% demand increase forecast in the next six years. This level of demand increase will be unachievable due to wider network constraints and 'peak spreading' is a realistic prospect. If traffic growth occurs at the rate forecasted and no network improvements are undertaken, an 8% traffic growth would result in a 96% growth in delay in the study area.

The study concluded that a more consistent level of bus provision, in line with the Vale of Glamorgan 'Gold Standard', is needed to present a better visual presence and reinforce the viability of public transport as a pleasant and convenient means of travel. Improvements at a few critical junctions would also allow for faster and more reliable public transport movements; reducing delays. Improvements will be focused at Merrie Harrier Junction and Cogan Hill junction.

City of Cardiff Council

The following documents have also been noted:

- Cardiff LTP (2015)
- Cardiff Deposit LDP 2006 – 2026 (adopted 2016)

2.6 Committed Development

This section provides an overview of the committed developments within proximity to the study area, all of which are referenced within the Vale of Glamorgan LDP 2013 land allocation for residential use.

Land off Caerleon Road

Outline planning consent was granted in January 2016 for the residential development, comprising 70 residential dwelling on land off Caerleon Road (Planning Ref. 2014/00282/OUT). The development proposals include a new shared access from Caerleon Road fronting the site comprising a standard priority junction.

Land at Cross Common Road

Outline planning was granted in February 2016 for the residential site allocated for 50 dwellings (Planning Ref. 2015/00392/OUT), located adjacent to Cross Common Road on the southern extent of Dinas Powys.

A new highway link was constructed by the Local Authority as part of the application between Cross Common Road and the A4055. The existing road crossing the river was stopped up, only permitting pedestrian and cyclist movements.

Land Adjoining St Cyres School, Murch Road

Planning was approved in February 2018, for the construction of 215 dwellings and 3-hectare Community/ Recreation User Zone (Planning Ref. 2017/01136/HYB), on land at the former St Cyres Lower School site on Murch Road, Dinas Powys. The main access to the development will be via a new mini-roundabout, proposed to replace the existing teardrop island in place onto Murch Road.

The proposed access to the site includes a shared footway/ cycleway on the southern side of the carriageway which links to Watery Lane Cycleway to the south, outside of the site. There is also the provision of a footway on the northern side of the carriageway, which links to the existing footways on Murch Road and provides a link to Ash Path. It is anticipated that both pedestrians and cyclists will use the main vehicular access to the site. A connection will also be made to the bridleway to the west of the site between Sunnycroft Lane and Cross Common Road.

3 Baseline Information

3.1 Introduction

This section presents a summary of the baseline context of the study area encompassing:

- Study Area Overview
- Land-use
- Access to Employment
- Access to Services and Recreation
- Access to Cultural Facilities
- Environment
- Walking & Cycling
- Rail Services and Infrastructure
- Bus Services and Infrastructure
- HIghway Network

3.2 Study Area Overview

The Vale of Glamorgan administrative area lying west of Cardiff between the M4 and the Severn Estuary is characterised by a pattern of small settlements and approximately 85% of which comprises agricultural areas. However, Dinas Powys comprises part of the more populous south eastern part of the Vale, including the communities of Dinas Powys, Penarth, Sully and Barry. The Vale of Glamorgan has an overall population of approximately 126,600 (2011 Census) which increased by circa 5% between 2001 and 2011 with population statistics from the Census presented in Table 3. Its neighbouring local authorities are Bridgend County Borough Council to the west, the City of Cardiff Council to the east and Rhondda Cynon Taff County Borough Council to the north. The border with Cardiff Council lies adjacent to the study area, along the River Ely to the east of the Baron's Court junction.

Table 3 Population and Change 2001-11[7]

Location	2011 Population	Population Change (since 2001)
Dinas Powys	**7,490**	**-2%**
Penarth	27,226	+16%

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[7] https://www.citypopulation.de/php/uk-wales.php?adm2id=W06000014

Location	2011 Population	Population Change (since 2001)
Barry	54,673	+7%
Vale of Glamorgan	127,600	+5%

The LDP (2013) recognises the A4055 through Dinas Powys as connecting to the strategic network via the Cogan Spur to the A4232 link road to the M4 Junction 32 and via the A4055 to the A4231 and A4050 to Culverhouse Cross.

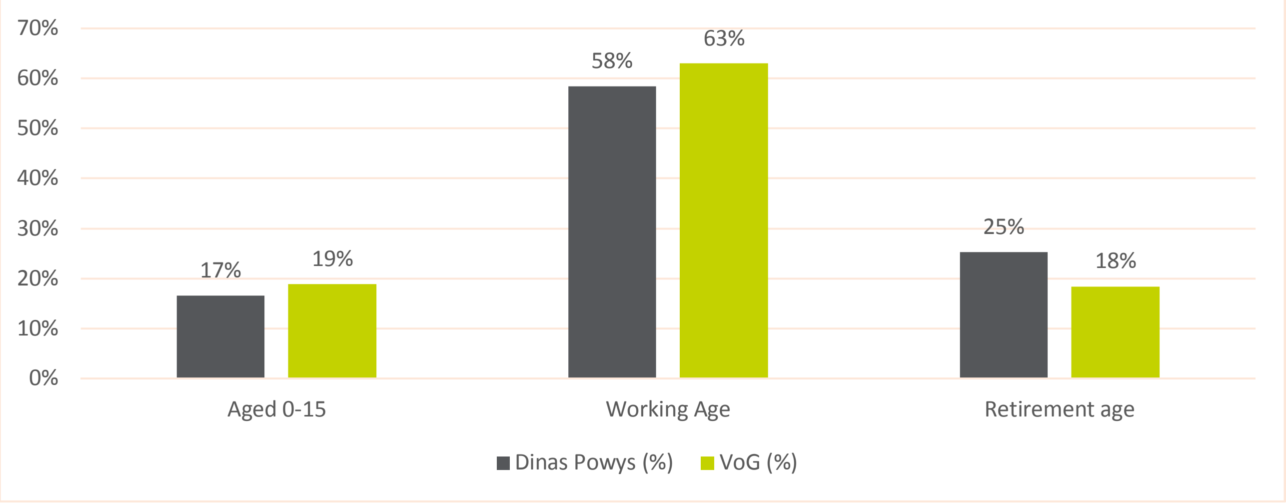
By rail, Dinas Powys is connected to the region via the Vale of Glamorgan Rail Line which connects Bridgend, Barry and Cardiff and locally includes Eastbrook and Dinas Powys rail stations. In addition, Cardiff Airport is located at Rhoose (approximately 12.5km west of Dinas Powys).

Barry has been identified as a key settlement in both the RTP (2010) and LDP (2013). It is recognised as an important hub for social and economic activity and a focus for new development and regeneration, including new housing, employment and retail development. Barry's population grew by 7% over the decade from 2001, to a population of approximately 54,673.

The LDP (2013) identifies Penarth as a Service Centre Settlement as a result of having a significant resident population, good public transport provision, local employment opportunities, established town centre and a wide range of cultural, educational and community services and facilities. Penarth has a population of 27,226 which grew 16% from 2001 to 2011.

Dinas Powys has been identified within the LDP (2013) as a primary settlement, providing a choice of housing and facilities to meet local needs. Dinas Powys has a population of 7,490 which decreased by 2% from 2001 to 2011. The age profile of the population find that Dinas Powys has a population aged 0-15 of 17%, working age 58% and 25% of retirement age which is considerably lower for children and working age adults and higher for retired people than that for the Vale of Glamorgan overall (Figure 6).

Figure 6 Age Profiles 2011 Census



The Vale of Glamorgan exhibits considerable socio-economic diversity containing some of the most affluent and the most deprived communities in Wales in respect of employment, income, education, health and community safety. The Welsh Index of Multiple Deprivation (WIMD) 2014[8], shows that of the 79 lower super output areas (LSOA) in the Vale of Glamorgan, 5% of which are contained with the most deprived 10%

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[8] http://gov.wales/docs/statistics/2015/150812-wimd-2014-summary-revised-en.pdf

LSOA in Wales. Although Dinas Powys has some of the least deprived LSOAs in the county, the study area is close to, and connects to, Barry which retains some of the most deprived areas.

Table 4 Employment Statistics Census 2011

Economic Activity	Dinas Powys	The Vale of Glamorgan	South East Wales	Wales
Employed	62%	62%	58%	58%
Unemployed	3%	4%	5%	4%
Retired	22%	16%	15%	16%
Student	7%	7%	10%	9%
Other	7%	7%	13%	12%

A summary of employment statistics for Dinas Powys has been included as Table 4 against regional and national statistics. Census data (2011) shows that there was a higher percentage of those employed within Dinas Powys and also the Vale of Glamorgan as a whole (figures at 62%) compared with 58% for SE Wales and Wales as a whole. There is a significantly higher population of retired people within Dinas Powys compared to the Vale of Glamorgan, South East Wales and Wales as a whole.

3.3 Land-use

The predominant land-use within the study area are Dinas Powys and the area of Penarth, east of Sully Road, urban areas. The remaining land-use is predominantly rural and agricultural. Open fields are located between Dinas Powys and Lower Penarth (Green Wedge). To the south of the study area lies Cog Moors Wastewater Treatment Works (WwTW), the land-use surrounding Cog Moors WwTW is predominantly rural and agricultural.

To the north west of the study area (north west of Dinas Powys), the land-use is predominantly rural and dominated by a mixture of woodland and ancient woodland (Coed Clwyd-gwyn, Coed Twyncyn and Case Hill Wood).

Throughout the remaining study area, land use is limited to individual residential properties and agricultural land and rural businesses such as golf facilities. The Glamorganshire Golf Course is located approximately 600m east of Sully Road. To the west of the appraisal area lies Dinas Powys Golf Course, located approximately 520m north west of Cardiff Road (A4055) and St. Andrews Major Golf Course is located approximately 920m north west of Cardiff Road (A4055). Additionally, there is the railway line that enters from the south west of the appraisal area and continues north east through the appraisal area to Cogan.

3.4 Access to Employment

Dinas Powys retains several modes of sustainable transport providing viable opportunities for access to employment within the study area, however travel by car is the dominant mode. The following subsequently provides a summary of key characteristics for access to employment affecting the study area.

- 65% of workers travel less than 10km to work from Dinas Powys compared to 52% within the Vale of Glamorgan as a whole; most people from Dinas Powys commute to places of work within the local area (2011 Census Distance Travelled to Work) (Figure 7). This reflects the proximity of the major employment centres of Barry and Cardiff.
- The car (or van) is the dominant mode of travel to work across Dinas Powys, as with the Vale of Glamorgan and South East Wales as a whole. 79% of those from Dinas Powys drive to work (including passengers) compared with 76% of South East Wales as a whole.
- Over three times the percentage of workers in Dinas Powys (10%) travel by train to work compared with the average for South East Wales as a whole (3%) (2011 Census Method of Journey to Work).

- Only 6% of workers in Dinas Powys travel to work on foot, nearly half the percentage of the Vale of Glamorgan (11%) (2011 Census Method of Journey to Work).
- 38% of residents within the Vale of Glamorgan also work there. This is lower than the other adjacent authorities (2011 Census Journey to Work Commuter Flows by Local Authority).
- Reflecting the above, more people commute out of Vale of Glamorgan compared to those commuting into Vale of Glamorgan. 26,715 people out-commute from the Vale of Glamorgan compared to 13,305 people who in-commute establishing a net flow of -13,410 Glamorgan (2011 Census Journey to Work Commuter flows by Local Authority).
- 44% of workers from Barry work in Cardiff and 31% of workers in Barry live in Cardiff.

Figure 7 Distance Travelled to Work (%) (2011 Census)

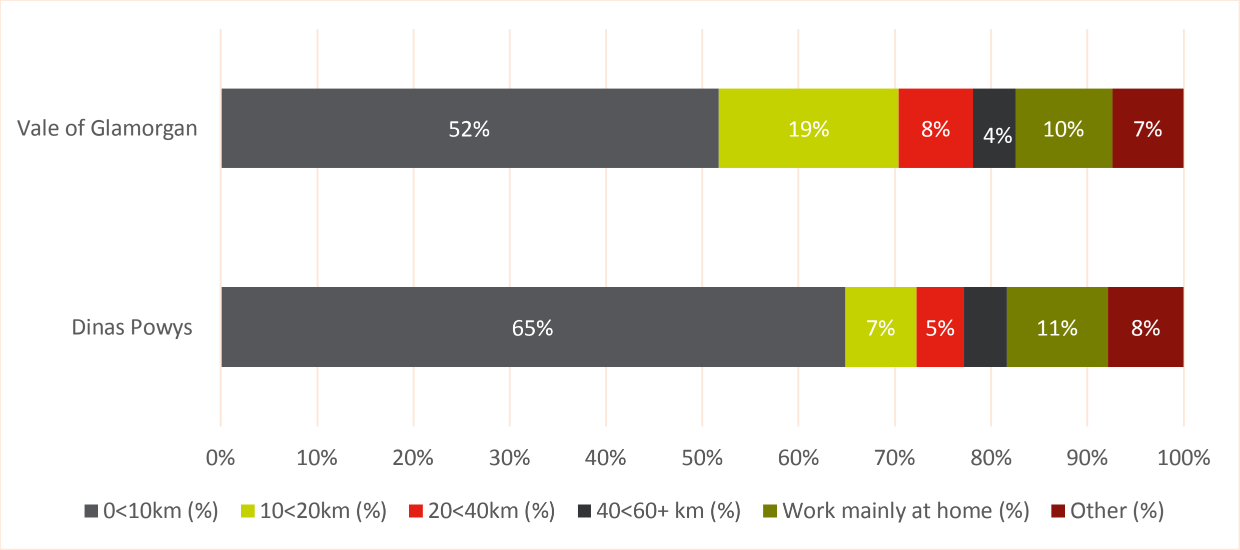

Table 5 Method of Journey to Work (2011 Census)

Mode	Dinas Powys	The Vale of Glamorgan	South East Wales
Car or Van Driver	73%	72%	69%
Car or Van Passenger	6%	6%	7%
Taxi	0%	0%	1%
Motorcycle, Scooter or Moped	1%	1%	1%
Bus, Minibus or Coach	2%	3%	6%
Train	10%	6%	3%
Bicycle	2%	2%	2%
On Foot	6%	9%	11%
Other	1%	1%	1%

Table 6 Comparison Journey to Work Commuter Flows by Local Authority (2011 Census)

Authority	Out Commuting	In Commuting	Net Flow	% Working in Own Area
Bridgend	18,040	17,256	-784	56%
Cardiff	32,845	73,126	40,281	65%
Rhondda Cynon Taff	36,609	19,365	-17,244	48%
Vale of Glamorgan	**26, 715**	**13,305**	**-13,410**	**38%**

Table 7 Location of Usual Residence and Place of Work (2011 Census)

Currenly Residing	Place of Work	Number of People
Vale of Glamorgan	Cardiff	**17,773 (Total)**
Dinas Powys		1,466 (8%)
Barry		7,886 (44%)
Cardiff	**Vale of Glamorgan**	**5,576 (Total)**
	Dinas Powys	197 (4%)
	Barry	1,718 (31%)

Note: The places have been represented by SOA – Mid Layers

3.5 Access to Services and Recreation

There is a mixture of both facilities and services within 2km of Dinas Powys rail station (central point), including: education, healthcare, employment, retail, public transport and recreation.

- There are a significant number of facilities and services in close proximity of Dinas Powys, with potential for access by sustainable modes.
- Llandough University Hospital is located west off Penlan Road/ B4267 opposite Dochdwy Road, approximately 2km north of the centre of Dinas Powys. The hospital benefits from a number of bus stops close by and is also within 1km of Cogan Rail Station.
- There are several schools within the vicinity of the study area encompassing:
    - Dinas Powys Primary School is situated along Cardiff Road/ A4055. The school is located to the northeast of the Cardiff Road/ Millbrook Road/ Murch Road junction where signalised pedestrian crossings comprising tactile paving are present. The crossing serves also as an access route for pedestrians to the nearby bus stop, within approximately 50m of the school site.
    - St Andrew's Major Church in Wales Primary School is situated along St Andrew's Road, opposite Westra. A zebra crossing comprising tactile paving is located next to the school.

  - St Richard Gwyn Catholic High School is located on Argae Lane, northeast of Barry Docks Link Road/ Coldbrook Road East junction. A footway is provided along one side of the carriageway in a southerly direction towards Barry Docks Link Road, where the footway ends.
  - Stanwell High School is located on Salisbury Avenue, southwest Penarth. Footways are provided both sides of the adjacent carriageway as well as traffic calming measures comprising speed humps along the carriageway.
  - St. Cyres, Ysgol y Deri and Saint Joseph's RC Nursery and Primary schools are also all situated to the west of Penarth.
- There are limited evening and weekend bus services leading to potential difficulties in accessing essential services and leisure opportunities thus encouraging greater reliance on the private car.

3.6 Access to Cultural Facilities

A cultural facility has been defined in this study as a place for activity associated with the arts; sport and other attractions. Cultural facilities entail a broad spectrum of facilities comprising, although not exclusive to, the following: arts and craft centres; beaches and marinas; country parks; golf courses and ranges; heritage attractions and museums; leisure centres and stadia; outdoor activities; trekking and riding centres; visitor attractions.

The Well-being of Future Generations (Wales) Act 2015 has a well-being goal of: *'A Wales of vibrant culture and thriving Welsh language'*. It is noted that this well-being goal will be achieved through *'a society that promotes and protects culture, heritage and the Welsh language, and which encourages people to participate in the arts, and sports and recreation.'*

Cultural facilities have largely been identified as presented in the Vale of Glamorgan Tourism Strategy. The cultural facilities include the following in the vicinity of the study area:

- Cosmeston Lakes Country Park;
- Dinas Powys Golf Club;
- St Andrew's Major Golf Club, Barry,
- Cosmeston Medieval Village;
- Dinas Powys Castle;
- Argae House Stables, St Andrews Major; and
- Downside Riding Centre, Penarth.

In addition, there are a range of attractions in Barry including The Knap, Whitmore Bay and Jackson's Bay as well as Penarth Seafront and Marina to the east.

3.7 Environment

3.7.1 Background

An appraisal of all relevant data has been undertaken to identify and understand the current environmental baseline within the study area and the area immediately surrounding the outside of the study area. For this assessment, the study area encompasses the existing transport corridors from Biglis Roundabout, Barry through Dinas Powys, to Cardiff via Leckwith, Cogan and Penarth. There is a wide range of environmental resources within the study area. A desk top study has been undertaken to identify environmental features and constraints using mapping linked with the LDP (2017). Appendix A provides detailed maps of environmental constraints and designations in the area. The desk study has been informed by web-based searches using the following on-line sources:

- Multi-Agency Geographic Information for the Countryside website (MAGIC)
- Historic Wales – Portal for historic environment information in Wales
- Lle Geo-Portal

- Cadw – Historic Landscapes
- Natural Resources Wales' Flood Risk Map Viewer
- AQMA Interactive Map
- The Glamorgan-Gwent Archaeological Trust – Archwilio
- The Wildlife Trust of South & West Wales
- Public Right of Way Maps
- Vale of Glamorgan, Interactive Mapping - Tree Preservation Orders
- Vale of Glamorgan, Interactive Proposals Map
- Noise Priority Areas – Wales

The desk study has also included a review of the following technical reports and strategy documents:

- 2008 Designation of Special Landscape Areas (Vale of Glamorgan County Borough Council ((2008))
- 2013 Agricultural Land Classification of England and Wales 1985 (ALC009)
- 2013 Air Quality Progress Report for Vale of Glamorgan (Vale of Glamorgan, 2013)
- 2016 Air Quality Progress Report for Vale of Glamorgan (Vale of Glamorgan, 2016)
- 2017 Interactive Proposals Map – Sites of Important Nature Conservation (Vale of Glamorgan, 2017)

The following sections describe the environmental constraints identified during the desk study of the study area.

3.7.2 Cultural Heritage

Cultural heritage is defined as follows:

- Buildings (single or in groups) of architectural or historic importance;
- Areas, such as parks, gardens, other designed landscapes or public spaces, remnant historic landscapes, archaeological complexes and heritage coasts;
- Sites (e.g. ancient monuments, places with cultural or historical associations such as battlefields, preserved evidence of human effects on the landscape, for example);
- Individual artefacts that form part of the overall archaeological resource; and
- The sense of identity and place which the combination of these features provides.

This desk study has included a search for known heritage assets within the appraisal area. The known heritage assets listed below have been identified using Lle Wales/ MAGIC and an archaeological desk-based assessment has been undertaken using the Archwilio and Historic Wales Historical Environmental Records (HER) data portals.

Scheduled Monuments

There are six Scheduled Monuments located within the study area as shown in Table 8.

Table 8 Scheduled Monuments within the Study Area (Lle Geo-Portal)

Scheduled Monument	National Grid Reference	Location Description
Romano-British Farmstead, Dinas Powys Common	ST 15103 70939	Romano-British Farmstead, Dinas Powys Common is located between Mount Road and Cardiff Road (A4055), to the south west of Dinas Powys. The monument consists of the remains of a Romano-British settlement dating to the 2nd and 3rd centuries AD. The monument is of national importance for its potential to enhance

Scheduled Monument	National Grid Reference	Location Description
		the knowledge of Roman settlement and agricultural practices. The monument retains significant archaeological potential, with a strong probability of the presence of associated archaeological features and deposits.
Dinas Powys Castle	ST 15275 71637	Dinas Powys Castle is located along Lettons Way, approximately 130m west of Pen-y-Turnpike Road, within the north west of Dinas Powys. The monument comprises the remains of a medieval castle, dating to around 1200AD. It retains significant archaeological potential, with a strong probability of the presence of both structural evidence and intact associated deposits.
Tyn y Coed Earthwork	ST 14896 72016	Tyn y Coed Earthwork is located within Newland Wood, approximately 380m north west of Dinas Powys. The monument comprises the remains of an earthwork dating to the early medieval period and the scheduled area may be expected to contain a wide range of archaeological information.
Cwm George Camp	ST 14804 72232	Cwm George Camp is located within Newland Wood, approximately 600m north west of Dinas Powys. The monument comprises the remains of a defended settlement site dating from the 5th to 7th centuries AD. The monument forms an important element within the wider early medieval context and the scheduled area may be expected to contain a wide range of archaeological information.
Middleton Moated Site	ST 15041 68622	Middleton Moated Site is located approximately 360m north east of Sully Moors Road and approximately 680m south of Cardiff Road (A4055). The monument comprises the remains of a medieval moated homestead. The monument is of national importance for its potential to enhance our knowledge of medieval settlement. It retains significant archaeological potential, with a strong probability of the presence of intact archaeological deposits and structural evidence.
Cogan Deserted Medieval Village	ST 16981 70455	Cogan Deserted Medieval Village is located approximately 150m east of Sully Road and east of Dinas Powys. The monument comprises the remains of earthworks, platforms and building footings, representing a deserted village, of probable medieval date. The monument forms an important element within the wider medieval context and the scheduled area may be expected to contain a wide range of archaeological information, including chronological detail and evidence in regard to construction techniques and agricultural methods.

Listed Buildings

In total, there are 22 Listed Buildings located within the study area, these are presented in Table 9. The Listed Building, Grade, National Grid Reference (NGR) are provided with a description of the location from key features within the appraisal area.

Table 9 Listed Buildings within and immediately surrounding the Study Area (Historic Wales)

Listed Building	Grade	NGR	Location Description
Eight rickstands to north side of Cog Farm	II	ST 16262 68885	Eight rickstands to north side of Cog Farm is located approximately 1.34km southeast from the A4055 (Cardiff Road). Eight rickstands to north side of Cog Farm lies to west of the T-junction in Cog, north of Sully Village.

Listed Building	Grade	NGR	Location Description
Planned group of farmyard buildings at Cog Farm	II	ST 16230 68847	Planned group of farmyard buildings at Cog Farm is located approximately 1.34km southeast from the A4055 (Cardiff Road). Cog Farm lies west of the T-junction in Cog, north east of Sully village
Cog House	II	ST 16272 68798	Cog House is located approximately 1.37km southeast from the A4055 (Cardiff Road). Cog House is located west of the T-junction with Swanbridge Road and Sully Road, northeast of Sully village
Downs Farmhouse	II	ST 16544 69662	Downs Farmhouse is located approximately 110m west from Sully Road and south east of Dinas Powys.
St Peter's Church	II*	ST 16875 70568	St Peter's Church is located along an unnamed road, approximately 120m east from Sully Road and east of Old Cogan Hall Farm.
1-6, Little Orchard	II	ST 16318 71007	1-6 Little Orchard are located along Little Orchard Road, to the south east of Murch, east of Dinas Powys.
Barn at Biglis Farm	II	ST 14247 69827	Barn at Biglis Farm is located south west of Dinas Powys, approximately 800m north west of A4055 (Cardiff Road) and 120 north west of the railway line.
Biglis Farmhouse	II	ST 14217 69855	Biglis Farmhouse is located south west of Dinas Powys, approximately 860m north west of A4055 (Cardiff Road) and 170 north west of the railway line.
The Mount	II	ST 15118 71103	The Mount is located along Mount Road within the south west of Dinas Powys.
Old Court	II	ST 15301 71240	Old Court is located along Station Road, approximately 250m north of the A4055 (Cardiff Road). Old Court falls within the western area Dinas Powys.
War Memorial	II	ST 15318 71293	War Memorial is located at the centre junction of Station Road, Mill Road, Highwalls Road, Elm Grove Road and Britway Road within the centre of Dinas Powys.
Dinas Powys Parish Hall	II	ST 15234 71297	Dinas Powys Parish Hall is located along Britway Road within the centre of Dinas Powys, approximately 280 north of A4055 (Cardiff Road).
Lon Twyn	II	ST 14833 71389	Lon Twyn is located along Beauville Lane within the western area of Dinas Powys.
Remains of Dinas Powys Castle	II	ST 15299 71601	Remains of Dinas Powys Castle is located within the north west Dinas Powys, along Lettons Way.
Church of St Peter	II	ST 15355 71484	Church of St Peter, The Old Rectory, The Bier House in St Andrew's Churchyard and Churchyard cross in St Andrew's Churchyard are located along Ty-gwyn, adjacent to St. Andrews Road, directly west of Dinas Powys. The Listed Buildings, at their closest point, are located approximately 1.5km north west of the A4055 (Cardiff Road).
The Old Rectory	II*	ST 13859 71419	
The Bier House in St Andrew's Churchyard	II	ST 13842 71441	

Listed Building	Grade	NGR	Location Description
Churchyard cross in St Andrew's Churchyard	II	ST 13867 71454	

Conservation Areas

There are two Conservation Areas located within the study area[9]:

- Dinas Powys Conservation Area falls within the centre of Dinas Powys, North west of Cardiff Road (A4055); and
- Michaelston-le-Pit Conservation Area covers the Michaelston-le-Pit village, approximately 400m north west of Pen-y-Turnpike Road.

Historic Parks and Gardens

- There is one Historic Park and Garden located within the study area[10]. Cwrty-yr-ala Historic Park and Garden is located approximately 840m north west of Pen-y-Turnpike Road and approximately 250m south of Michaelston-le-Pit village.

Registered Landscapes of Outstanding Historic Interest

There are no Registered Landscapes of Outstanding Historic Interest located within the appraisal area.

Archaeology

There are 181 non-designated heritage assets located within the appraisal area. Most of the non-designated heritage assets date to the Post Medieval period, there are 79 Post Medieval assets in total. The majority of these relate to settlement activity, however there are also several heritage constraints that relate to industrial activity. These assets comprise lime kilns and charcoal producing sites which are primarily located to the north and north-west of Dinas Powys. The next most frequently represented time-period is the Medieval period. There are 58 heritage assets of this date.

Many of the Medieval assets relate to settlement activity. However, there are five castles, two of which are Scheduled Monuments. Dinas Powys Castle (GM021) and Dinas Powys Ringwork are both located to the north of Dinas Powys. Dinas Powys Castle is both a Scheduled Monument and Listed Building. There are also a number of deserted Medieval villages within the appraisal area, one of which is the Scheduled Monument of Cogan Deserted Medieval village (GM535) which is located to the south-west of Sully Road. The bulk of the Medieval activity is located to the north-north west of Dinas Powys, there is also a dense concentration of activity to the south-east of Sully Road just to the south of Morristown.

There are 22 prehistoric heritage assets which are primarily represented by findspots which are densely concentrated to the north-west of Dinas Powys. There is however an Iron Age settlement to the north-west of Dinas Powys at Cwm George. Two round barrows are recorded to the south-west of Dinas Powys. There are 21 assets of Roman date which are mainly represented by findspots.

There is however a Scheduled Monument of a Romano-British farmstead at Dinas Powys Common (GM431). A villa is recorded to the south-east of Dinas Powys, further settlement activity is recorded to the north-west of Dinas Powys. There are two heritage assets of Early Medieval date which are both Scheduled Monuments and located to the north of Dinas Powys at Cwm George. These designated heritage assets are Cwm George Camp (GM023) which is a defended settlement and Tyn y Coed Earthwork (GM024). There are also three heritage assets which date to the Modern period.

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[9] Archwilio

[10] Archwilio - https://www.archwilio.org.uk/her/chi1/arch.html?county=Vale of Glamorgan&lang=eng

Based upon the known archaeological and built heritage record, the area with the highest archaeological potential within the appraisal area is to the north and north-west of Dinas Powys at Cwm George. There is also the potential for previously unrecorded Medieval archaeological remains to be discovered between the A4055 and B4267 due to the density of known Medieval archaeology within the area and the Scheduled Monuments of Middleton Moated Site at Sully (GM378) and Cogan Deserted Medieval Settlement (GM535).

There is the potential to impact the settings of the Listed Buildings and Scheduled Monuments on the outskirts of Sully and just off Sully Road due to the relatively open nature of the landscape surrounding them. Whilst there is limited potential to impact the settings of the Listed Buildings and Conservation Area within Dinas Powys there is the potential to impact the settings of the Scheduled Monuments that are located on the outskirts of it.

Landscape

The Vale of Glamorgan – LDP (2013), the Lle Geo-Portal and Google Maps have been used to detail the Landscape and Land Use within the appraisal area. Within the study area there are two Sites of Special Scientific Interest (SSSI), a Local Nature Reserve (LNR) and 12 Sites of Importance for Nature Conservation (SINC), see section Nature Conservation. The residential area of Dinas Powys is adjoined by a green wedge, which is an LDP policy designation, to the east which is situated between Dinas Powys and Lower Penarth.

Landscape Designations

There are no National Parks, Areas of Outstanding National Beauty (AONBs) or Heritage Coasts located within 5km of the study area (Magic Application, 2017).

Special Landscape Area

A Special Landscape Area (SLA) is a non-statutory conservation designation used by local government to categorise sensitive landscapes which are, either legally or as a matter of policy, protected from development or other man-made influences. Within the study area, the SLA designation only falls under an area to the north west of Dinas Powys[11].

Common Land

There are 12 pockets of Common Land located within the study area[12]:

- 11.03ha of Common Land is located to the south west of Dinas Powys.
- 0.07ha of Common Land is located adjacent to Pen-y-Turnpike Road, east of Dinas Powys Castle.
- 3.36ha of Common Land is located to the south east of Dinas Powys adjacent to Cross Common Road.

Agricultural Land Classification

An analysis of the Agricultural Land Classification of England and Wales 1985 (ALC009)[13] details that within the study area, the Agricultural Land Classifications (ALC) that form the majority of the area are Grade 3 and to a lesser extent Grade 2. Grade 2 land is located in the south of the study area.

- Grade 2 - very good quality agricultural land: (Land with minor limitations which affect crop yield, cultivations or harvesting. A wide range of agricultural and horticultural crops can usually be grown but on some land in the grade there may be reduced flexibility due to difficulties with the production of the more demanding crops such as winter harvested vegetables and arable root crops. The level of yield is generally high but may be lower or more variable than Grade 1).

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[11] Vale of Glamorgan Council Designation of Special Landscape Areas (2008)

[12] Lle Geo-Portal

[13] Natural England – Agricultural Land Classification of England and Wales 1985 (ALC009) (2013)

- Grade 3 - good to moderate quality agricultural land: (Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield. Where more demanding crops are grown yields are generally lower or more variable than on land in Grades 1 and 2).

In terms of impacts, the main concern would be the loss of any Best and Most Versatile (BMV) agricultural land which includes Grades 1, 2 and 3a. The extent of BVM land affected by a scheme would need to be quantified using more recent draft mapping from Welsh Government at a more detailed stage. It should be noted that the maps referred to do not distinguish between Grade 3a and 3b land.

3.7.3 Water Resources and Flooding

Watercourses

Table 10 Watercourses within the Study Area

Watercourse	Description
Cadoxton	The water course Cadoxton is classified as a 'main river' and flows in a generally south-westerly direction through Dinas Powys, along the route of Cardiff Road (A4055), towards the town of Barry. Available data from the 2016 second cycle regarding water quality, indicates that the River Cadoxton waterbody is currently achieving an overall status of 'Moderate'. The waterbody currently achieves an overall ecological status of 'Moderate' and chemical status of 'Good'. Data for the other watercourses is not available.
East Brook	East Brook is a smaller tributary of the Cadoxton River. The East Brook River joins the Cadoxton south of the A4055 at Dinas Powys. East Brook is classified as a 'main river' and flows through the area of Dinas Powys known as Murch and through Eastbrook.
Coldbrook	Coldbrook starts at St Andrews Major and is classified as a 'main river', Coldbrook and it its tributaries, the largest of which is the Nant yr Argae, flows in a general south-easterly direction across the fields of the locality known as Biglis where it joins the Cadoxton, east of Palmerstown.
Cogan Hall Watercourse	Cogan Hall Watercourse is classified as a 'main river' and flows southwards, west of Penarth. Cogan Hall Watercourse flows south of Old Cogan Hall Farm, adjacent to the Cogan Deserted Medieval Village Scheduled Monument, the river joins the Sully Brook before flowing westwards across the Sully Moors.
Sully Brook	The Sully Brook watercourse is classified as a 'main river' and flows in a southwardly direction through the Cosmeston Lakes Country Park (south east of Lower Penarth). The Sully Brook then flows westwards south of Cog Moors and north of Sully Moors, where it meets the Cog Moors Drains ('main river'), the Sully Brook continues westward before joining the Cadoxton near Barry docks[14].

Flood Risk

The study area and its' surrounding area falls within three separate flood risk zones. The majority falls within Planning Policy Wales TAN 15 Flood Risk Zone A (i.e. area considered to be at little or no risk of fluvial or coastal/tidal flooding). Flood Risk Zone A extends across the majority of the centre of the study area and areas to the east, west and north of the study area surrounding the Cadoxton River[15].

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[14] Natural Resources Wales' Flood Risk Map Viewer – Long term flood risk (2017) - https://www.naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/?lang=en

[15] Natural Resources Wales' Flood Risk Map Viewer – Long term flood risk (2017) - https://www.naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/?lang=en

Planning Policy Wales TAN 15 Flood Risk Zone B (i.e. areas known to have flooded in the past) is located in pockets surrounding the area of Flood Risk Zone C2 and are located along the Sully Brook to the east and along the Nant Argae in the west of the study area.

Planning Policy Wales TAN 15 Flood Risk Zone C1 (i.e. areas without significant flood defence infrastructure) is located within the centre of Dinas Powys, covering an area surrounding the River Cadoxton and railway line.

Within the study area there are areas that fall within Planning Policy Wales TAN 15 Flood Risk Zone C2 (i.e. areas without significant flood defence infrastructure). Flood Risk Zone C2 extents north west of Dinas Powys along Cadoxton River and areas to the south west of the study area along the Cadoxton River, Sully Brook, Cog Moors Drains, East Brook and Coldbrook River.

3.7.4 Nature Conservation

Statutory Designated Sites

The MAGIC website has been used to identify all statutory designated SINCs within and immediately outside of the study area. The search was extended to 10km for identification of statutory sites designated for their bat interest. There are no Special Areas of Conservation (SAC), Special Protection Areas (SPA) or Ramsar sites (a wetland of international importance) within the study area[16]. However, within the surrounding area outside of the appraisal area there are three International designated sites for nature conservation.

International Designated Sites

The Severn Estuary SAC, SPA and Ramsar site, a wetland of international importance, are located approximately 2km east of Sully Road. These sites are all of high (international) importance as described in Table 11.

Table 11 Nature Conservation – International Designated Sites

Designated Site	Description
Severn Estuary SAC	Designated for its Annex I habitats (including estuaries, Atlantic salt meadows and mudflats and sandflats not covered by seawater at low tide) and Annex II species (including sea lamprey, river lamprey and twaite shad) which form primary reasons for the selection of this site;
Severn Estuary SPA	Designated for its internationally important bird populations (including the Annex I species Bewick's swan over winter as well as ringed plover, dunlin, pintail, redshank and curlew) and for regularly supporting at least 20,000 waterfowl; and,
Severn Estuary Ramsar Site	Designated for its Annex I habitats (including estuaries, Atlantic salt meadows and mudflats and sandflats not covered by seawater at low tide), its migratory fish populations (including salmon, sea trout and sea lamprey) and for its internationally important assemblage of waterfowl (including gadwall, dunlin and redshank).

National

There are two SSSIs located within the study area. These are of high (national) importance:

- Cog Moors SSSI, at its closest point, is located approximately 370m east of Cardiff Road (A4055) and approximately 350m west of Sully Road. Cog Moors SSSI is designated for its 'large continuous damp mesotrophic (neutral) semi-natural grassland' which is associated with several stands of tall sedges, and for populations of uncommon plant species.

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[16] Magic Application (2017) - http://www.magic.gov.uk/MagicMap.aspx

- Cosmeston Lakes SSSI, at its closest point is located approximately 430m east of Sully Road and approximately 110m west of Lavernock Road (B4267). Cosmeston Lakes SSSI includes two lakes, created from flooded limestone quarries, which are connected by a narrow channel. These are eutrophic water bodies up to 10m deep, which support a range of submerged plants. One of the lakes is of special interest as the only known site in Wales for the presence of starry stonewort (*Nitellopsis obtusa*).

There are no SACs designated for their bat interest within 10km of the study area. There are no National Nature Reserves (NNR) within the study area and no NNR within 2km of the study area. There are no Marine Conservation Zones (MCZ) and no Marine Nature Reserves (MNR) within the study area and no MCZ/MNR within 2km of the study area[17].

Non-statutory Designated Sites

The MAGIC website and the Vale of Glamorgan LDP (2011-2026) has been used to identify all non-statutory designated SINCs within the study area.

Local Nature Reserve

Local Nature Reserve (LNR) is a designation for nature reserves in Great Britain.

- Cosmeston Lakes Country Park LNR is located approximately 200m east of Sully Road.

Sites of Nature Conservation Importance

- There are approximately 12 Sites of Nature Conservation Importance (SINC) located within the study area. Five are located to the south east of Cardiff Road, whilst the remaining seven are located to the north west of Dinas Powys[18].
- Cog Moors SINC is located immediately adjacent to the eastern boundary of the existing Cog Moors WwTW.
- There is a SINC located fragmentated between Barry Road, Cross Common Road and the area of woodland between Cross Common Road and Sunnycroft Lane.
- To the north west of Dinas Powys, there are approximately four varied sized and fragmented SINCs which cover areas of Coed Clwyd-gwyn and Case Hill Wood. To the south east of Dinas Powys, there are three varied sized SINCs located between the railway line and Cardiff Road.
- To the east of the study area, there is a SINC covering the area of Cosmeston Lakes Country Park, which extends to the south of Lower Penarth.

Ancient Woodland

There are seven varied sized pockets of Ancient Woodland located between Lower Penarth and Dinas Powys, four of these pockets are located north east of Cross Common Road, whilst the remaining three fall south west of Cross Common Road and north of Cog Moors. To the north west of Dinas Powys, there are larger extents of Ancient Woodland covering areas of Coed Twyncyn and Coed Clwyd-gwyn, both of these are adjacent to the Dinas Powys settlement.

Tree Preservation Orders

Within the study area there are numerous pockets and rows of trees with Tree Preservation Orders (TPO):

- Within Dinas Powys, areas with a particularly large concentration of TPOs are centred along Britway Road, to the south of Dinas Powys along the Cardiff Road (A4055), the area of Dinas Powys known as Murch and along Pen-y-turnpike Road to the north west of Dinas Powys.

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[17] Lle Geo-Portal (2017) - http://lle.gov.wales/home

[18] Vale of Glamorgan LDP Proposals Map 2013 - http://www.valeofglamorgan.gov.uk/Documents/Living/Planning/Policy/LDP-2013/02-LDP-Proposals-Map-2013.pdf

- There are multiple connected rows of TPOs adjacent to Cog Moors Wastewater Treatment Works, approximately 950m south east of Dinas Powys.
- To the west of Lower Penarth there are multiple rows and pockets of TPOs located within close proximity to Cogan Hall Watercourse[19].

3.7.5 Noise and Vibration

Noise annoyance is defined by the as 'a feeling of displeasure evoked by noise'. Noise nuisance from transport sources can adversely affect the quality of living of local communities. Vibration is a similar effect, but instead of being transmitted by air, it is transmitted by the earth. Noise is normally considered as an approximate indicator for both noise and vibration, since its effects are normally felt more strongly.

Additionally, WelTAG states that the introduction of transport proposals may generate additional noise, both during construction and system operation. This guidance focuses on the operational noise impacts, since any construction impacts will be temporary and will be unlikely to matter in the overall decision-making process.

Noise maps and associated plans are managed by the Welsh Government and local authorities to find where noise levels are high and help create noise action plans to address the issue[20]. There are no Noise Action Priority Areas (NAPPAs) for roads located within the study area. Within the wider study area there is one NAPPA located along the Junction of Coldbrook Road East and the A4231 (approximate NGR - ST 13442 69888). There are no Noise Action Planning Priority Areas for the railway located within the study area.

The areas of Dinas Powys and Lower Penarth are potential receptors within the study area for any changes in noise associated with transport proposals. Further a review of aerial photographs, the following roads have multiple potential individual noise and vibration receptors (combination of both residential and agricultural receptors) within the study area:

- A4055 Cardiff Road
- Cross Common Road
- Barry Road
- Argae Lane
- Westra
- St. Andrews Road
- Sully Road

3.7.6 Air Quality

As detailed within the 2016 Air Quality Progress Report for Vale of Glamorgan, the overall air quality across the county complies with regulations to protect human health. Data for 2012 did highlight that at some locations road traffic emissions of nitrogen dioxide (NO_2) are at, or close to, the relevant annual average concentration of 40ug/m^3.

These were recorded at Windsor Road, Penarth; Cogan Roundabout; Railway Terrace, Cardiff Road, Dinas Powys; Tynewydd Road, Barry; and Culverhouse Cross. Cogan Roundabout and Railway Terrace lie within the study area, with Windsor Road situated just outside the area (approximately 260m east of Cardiff Road (A4055). There are no Air Quality Management Areas (AQMA) within the study area. There is an AQMA situated along Windsor Road, Cogan, Penarth (Figure 8)[21].

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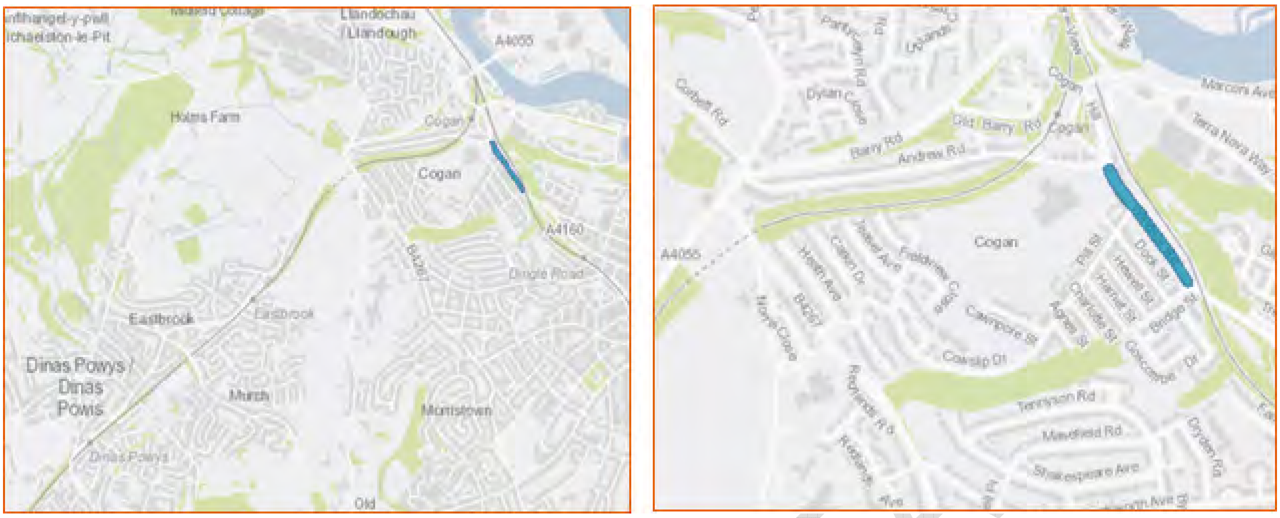
[19] Vale of Glamorgan Council Deposit LDP 2011-2026 (2013)

[20] Noise Priority Areas (2017)

[21] Department for Environment Food & Rural Affairs - https://uk-air.defra.gov.uk/aqma/maps

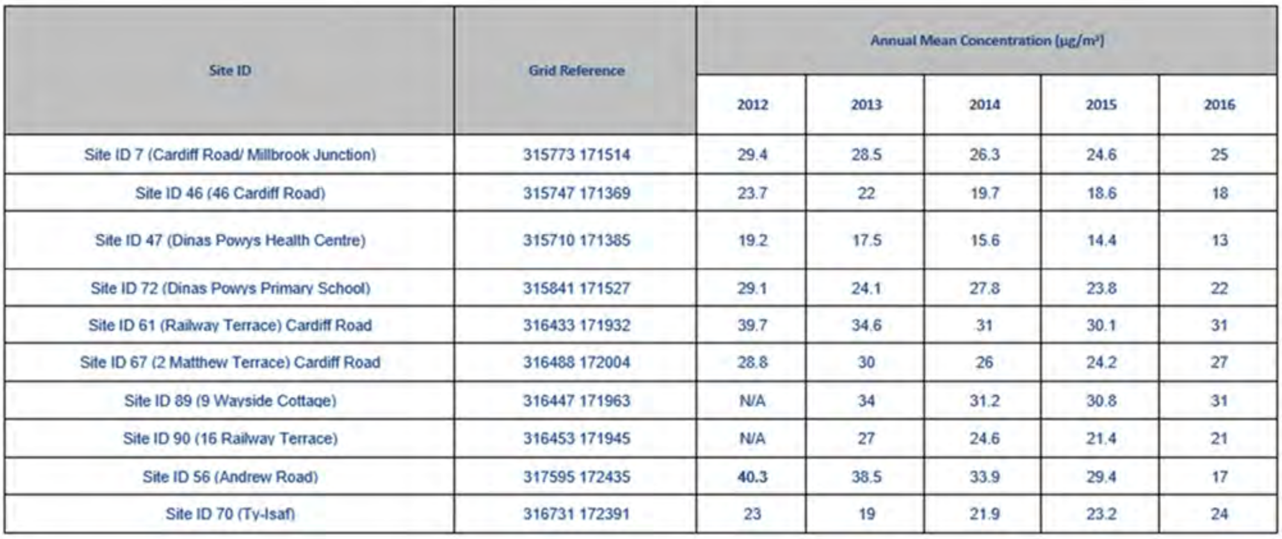
Figure 8 Air Quality Management Area - Windsor Road, Cogan 17



The Vale of Glamorgan Council monitors derived NO2 at four locations within close proximity to the A4055/ Murch Road junction via use of passive diffusion tubes, including monitoring at Dinas Powys Primary School. There are currently a further six NO2 monitoring locations, four located along and in close proximity to Railway Terrace on Cardiff Road (A4055) and two of which are situated in relatively close proximity to the Merrie Harrier signalised junction, situated at the façade of a residential property on Andrew Road and on the A4055 which is directly adjacent to the traffic light system.

The datasets from the last five years levels are generally all below the set national objective limits for NO2. Moreover, levels have been decreasing over the five-year period. NO2 levels have been found below the set national annual and one-hour objectives for NO2 (40µg/m3 & 200 µg/m3 not to be exceeded more than 18 times per year). The overarching results are highlighted in Table 12[22].

Table 12 NO2 Levels in Dinas Powys



Site ID	Grid Reference	Annual Mean Concentration (µg/m³)				
		2012	2013	2014	2015	2016
Site ID 7 (Cardiff Road/ Millbrook Junction)	315773 171514	29.4	28.5	26.3	24.6	25
Site ID 46 (46 Cardiff Road)	315747 171369	23.7	22	19.7	18.6	18
Site ID 47 (Dinas Powys Health Centre)	315710 171385	19.2	17.5	15.6	14.4	13
Site ID 72 (Dinas Powys Primary School)	315841 171527	29.1	24.1	27.8	23.8	22
Site ID 61 (Railway Terrace) Cardiff Road	316433 171932	39.7	34.6	31	30.1	31
Site ID 67 (2 Matthew Terrace) Cardiff Road	316488 172004	28.8	30	26	24.2	27
Site ID 89 (9 Wayside Cottage)	316447 171963	N/A	34	31.2	30.8	31
Site ID 90 (16 Railway Terrace)	316453 171945	N/A	27	24.6	21.4	21
Site ID 56 (Andrew Road)	317595 172435	**40.3**	38.5	33.9	29.4	17
Site ID 70 (Ty-Isaf)	316731 172391	23	19	21.9	23.2	24

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[22] Vale of Glamorgan Council 2016 Air Quality Progress Report - http://www.srs.wales/Documents/Pollution/Air-Quality-Reports/16.09.21-Air-Quality-Progress-Report-2016May-2016-Revised-LTP-and-LDP.pdf

3.8 Walking and Cycling

The walking and cycling network in Dinas Powys is limited in extent and potentially unappealing to walkers and cyclists. Nonetheless plans for cycle route extensions are likely to considerably enhance the area and allow for a more appealing cycling environment, and the Vale of Glamorgan Council is working to promote and improve opportunities for active travel within the local authority area in line the Active Travel (Wales) Act (2013) (http://www.valeofglamorgan.gov.uk/en/our_council/consultation/Active-Travel.aspx).

Existing Conditions

Footways are provided on at least one side of the A4055/ Cardiff Road, from the A4055/ A4160 roundabout heading southwest towards Barry. The footways are considered to be in poor condition along much of the study route. As the A4055 leaves Dinas Powys to the south, there are no footways provided. There are eight signalised pedestrian crossings located along the A4055 route:

- Cogan Junction – full refuge
- Merrie Harrier (only on north arm of A4055 – north to Cogan) – no refuge
- South of Redlands Road/ A4055 junction – full refuge
- Opposite Eastbrook rail station – no refuge
- Opposite Dinas Powys Primary School – narrow waiting margin in middle
- North of Elm Road/ A4055 junction – no refuge
- Dinas Powys rail station – narrow waiting margin in middle
- South of Heol Y Frenhines/ A4055 junction – narrow waiting margin in middle

Cycling signs are visible throughout the study area, with priority for cyclists at key junctions: Cogan junction, Merrie Harrier, Redlands Road/ A4055; and A4055/ Murch Road/ Millbrook Road. Moreover, highway on-road cycle markings are provided along the A4055. There is currently poor connectivity by cycling between Dinas Powys and Penarth, Llandough and Barry, with no off-road routes, as shown in Figure 9.

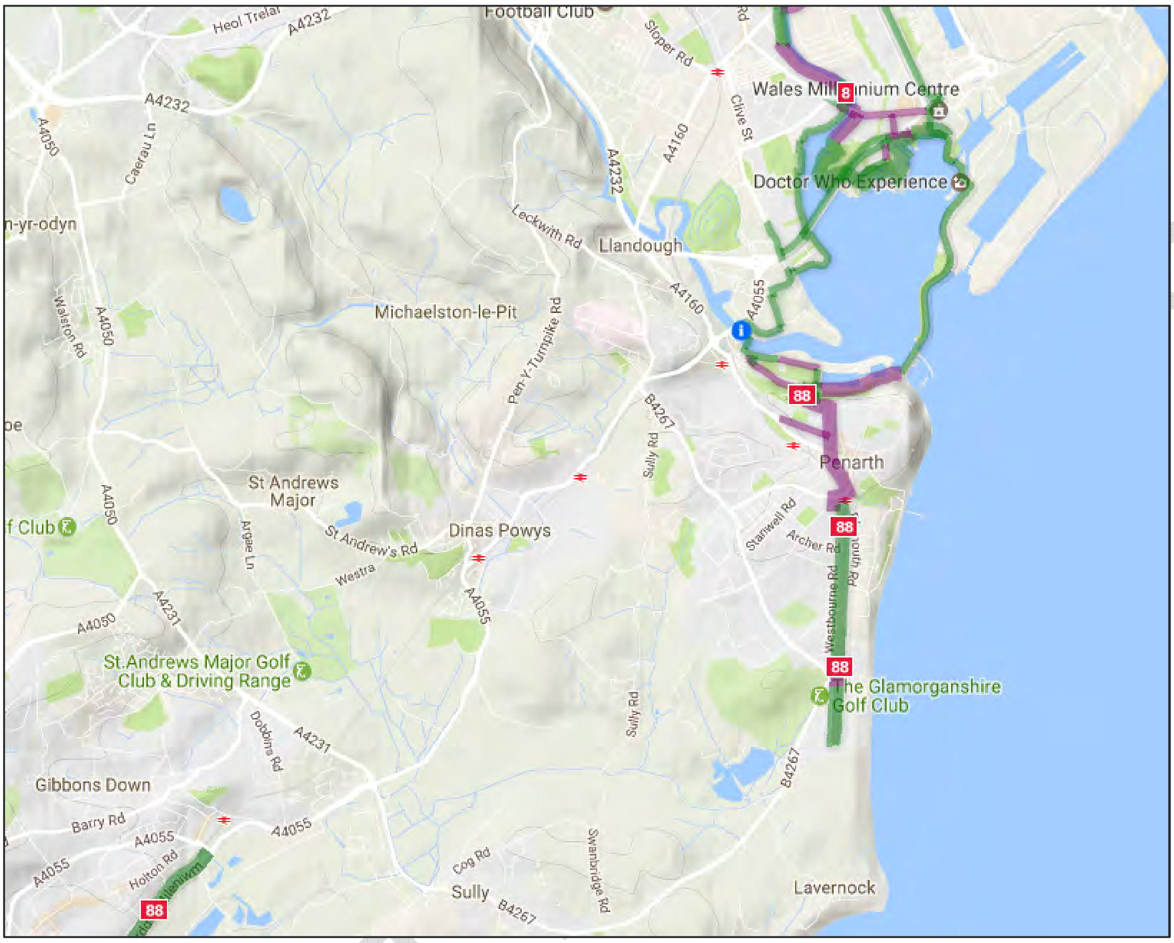
Proposals

As set out in the policy section, there are a number of proposed improvements. The NCN Route 88 has plans to be extended including between Dinas Powys and Penarth. A feasibility study that identifies an indicative but preferred route for NCN 88 has been prepared for the Vale of Glamorgan by Sustrans. Some sections of this have been confirmed and constructed, with the remainder currently at varying stages of development. Some sections including along Cardiff Road between Barry and Dinas Powys have already benefitted from initial feasibility and design studies.

The Vale of Glamorgan LDP has set objectives to promote Penarth as a *'sustainable transport town'* by encouraging new and enhanced walking and cycling links. As such, connections between Dinas Powys and Penarth are important to support this objective.

In the Vale of Glamorgan LDP, Barry Waterfront to Dinas Powys has been identified as a major strategic transport corridor connecting the settlement of Barry to Cardiff. There are currently no walking and cycling facilities linking the Waterfront to Dinas Powys between the Biglis Roundabout on the outskirts of Barry to Dinas Powys. The Council is currently considering the land options to deliver a dedicated off-road shared walking and cycling route to connect these settlements.

Figure 9 Sustrans Map of Cycle Routes in Local Area (http://www.sustrans.org.uk/ncn/map)



3.9 Rail Services and Infrastructure

Rail services in the study area are considered to have good potential. Although rail use for work is already high in comparison to South East Wales as a whole, the facilities and services to and from the stations have the potential to be enhanced for the benefit of existing and future users of the network.

There are two rail stations within the study area namely Dinas Powys and Eastbrook, located on the Vale of Glamorgan Rail Line. Dinas Powys Station[23] does not have a car park or cycle parking provision. Users of the rail station often park on street nearby e.g. on Station Road. Whilst there is step-free access via platform entrances either side of the station, there is no strep-free access between platforms with a subway with steps connecting the two platforms. There is no external lighting to the platform entrances. Although there is no dedicated ticket office, accessible ticket machines are available.

Eastbrook Station[24] does have a free car park with 31 spaces and two accessible spaces available, but no cycle parking provision. Again, there is no dedicated ticket office although an accessible ticket machine is provided. There is no step-free access between platforms with access provided via a stepped footbridge. Step free access is available to each of the platforms. There are limited existing facilities at both stations for interchange for cycling.

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[23] National Rail Enquiries

[24] National Rail Enquiries

The frequency and journey time to a number of key destinations from Dinas Powys and Eastbrook stations is presented in Table 13. A maximum of four train services per hour stop at the stations in both directions linking to a number local and regional destinations throughout South East Wales including Cardiff and Bridgend (Monday to Fridays; reduced service on Sundays).

Rail passenger demand in the last ten years on the valley lines has been growing at circa 6% per annum with some local routes experiencing 80% growth between 2000 and 2009, significantly higher than the average for the UK[25].

At Dinas Powys rail station (2015/16 – 2016/17), rail patronage decreases have been observed from 103,106 to 97,050 passengers in 2016/17 (6.1% decrease), and at Eastbrook rail station (2015/16 – 2016/17), rail patronage decreases have been observed from 176,506 to 174,262 passengers in 2016/17 representing a 1.3% decrease. However, it should be noted that there can be anomalies in the patronage data due to the ticketing zones which may distort the number of users of the two stations.

The Vale of Glamorgan Line was reopened between Barry and Bridgend in 2005 including new stations at Rhoose and Llantwit Major with park and ride facilities[26]. A dedicated shuttle bus also operates between Cardiff Airport and Rhoose Station.

Surveys have illustrated that standing above train capacity may occur on AM peak trains between Cadoxton and Cardiff. Afternoon standing above capacity appears less severe however between Grangetown and Dinas Powys on the Vale of Glamorgan Line, standing is at levels above standard train capacity.[27]

Between 2007 and 2018, Network Rail is installing new signalling technology and improving stations and infrastructure to create more capacity and faster, more frequent rail services. Improvements include:

- A new platform at Barry has been built to accommodate a more frequent service;
- A new southern entrance and a new platform to be able to serve more trains at Cardiff Central;
- Two new platforms to provide extra capacity and a new station entrance at Cardiff Queen Street[28;] and
- The Cardiff Area Signalling Renewal Stage 3 involves Penarth and Barry branches to Cardiff West Junction (completed in June 2014).[29]

  As identified in the policy section, the Metro plans and the new franchise will bring enhanced rolling stock and service frequencies. There were previously plans for the electrification of the Vale of Glamorgan line including through Dinas Powys and Eastbrook, although this line does not form part of the Core Valleys Network currently proposed to be electrified.[30]

  A number of rail stations on the Vale of Glamorgan Line were identified as areas that would require additional park and ride spaces in the short to medium term. Barry Docks Station has been delivered in 2011. A further location at Cogan, Penarth has not been delivered due to issues of deliverability during the Plan period.[31]

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[25] Sewta Rail Strategy 2013 (Jacobs)

[26] Vale of Glamorgan LDP 2011-2026 (2013)

[27] Vale of Glamorgan LDP 2011-2026: Sustainable Transport Assessment

[28] Dates from: http://www.railway-technology.com/projects/cardiff-area-signalling-renewal-casr-project/

[29] Network Rail - http://www.networkrail.co.uk/wp-content/uploads/2016/11/South-Wales-investment-map.pdf

[30] Network Rail - http://www.networkrail.co.uk/wp-content/uploads/2016/11/South-Wales-investment-map.pdf

[31] Jacob's (2010) in Vale of Glamorgan LDP 2011-2026 (2013)

Figure 10 Map of South Wales Rail Stations[32]

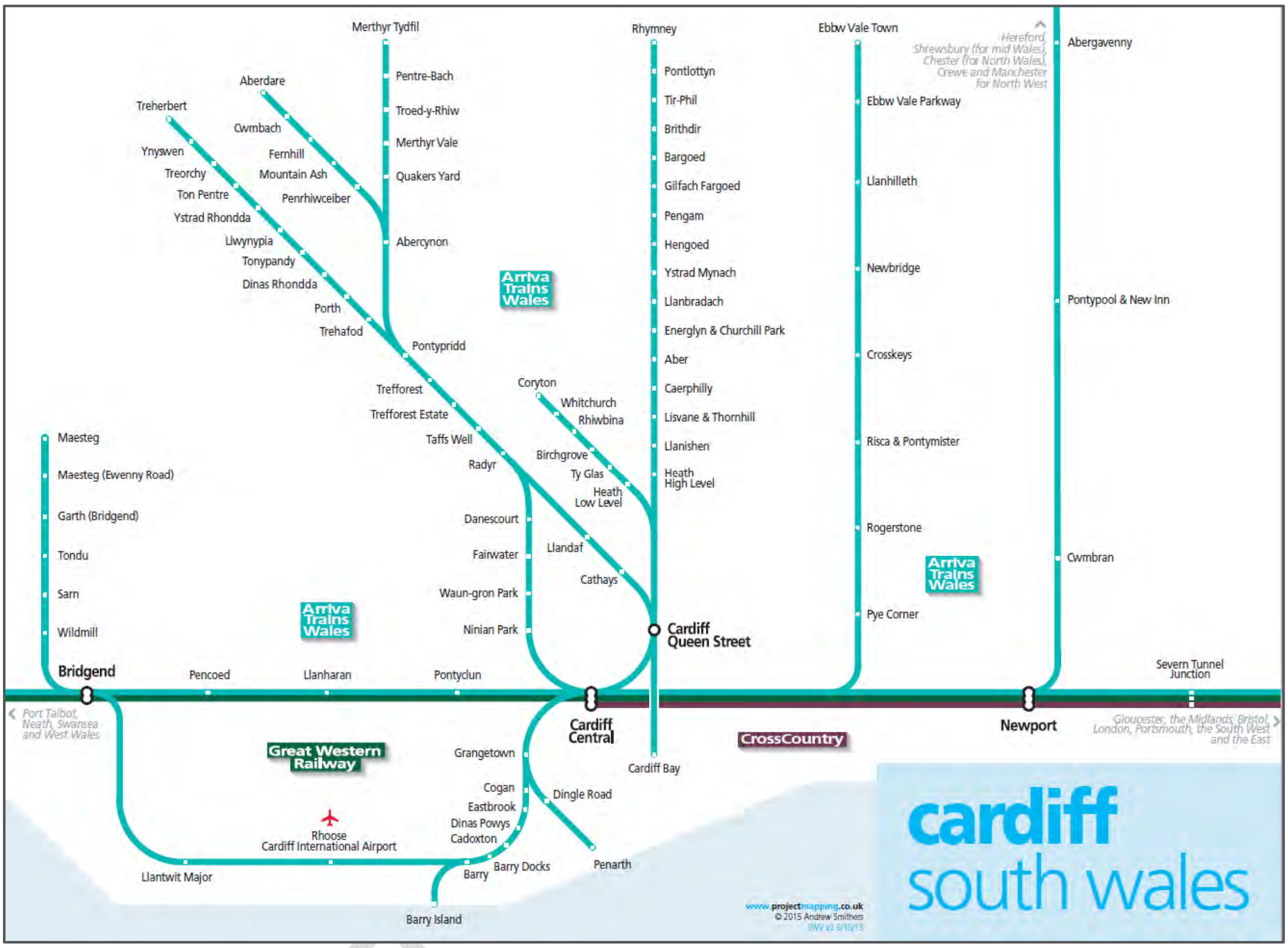

Table 13 Rail Frequency (Monday – Saturday)[33]

Rail Station	To/ Destination	Journey Time	Frequency
Dinas Powys	Cardiff Central	14 minutes	4 per hour
	Barry	11 minutes	4 per hour
	Pontypridd	46 minutes	4 per hour
	Merthyr Tydfil	1 hour 21 minutes	2 per hour
	Aberdare	1 hour 21 minutes	1-2 per hour
	Rhoose (Cardiff International Airport)	18 minutes	1 per hour
	Bridgend	43 minutes	1 per hour

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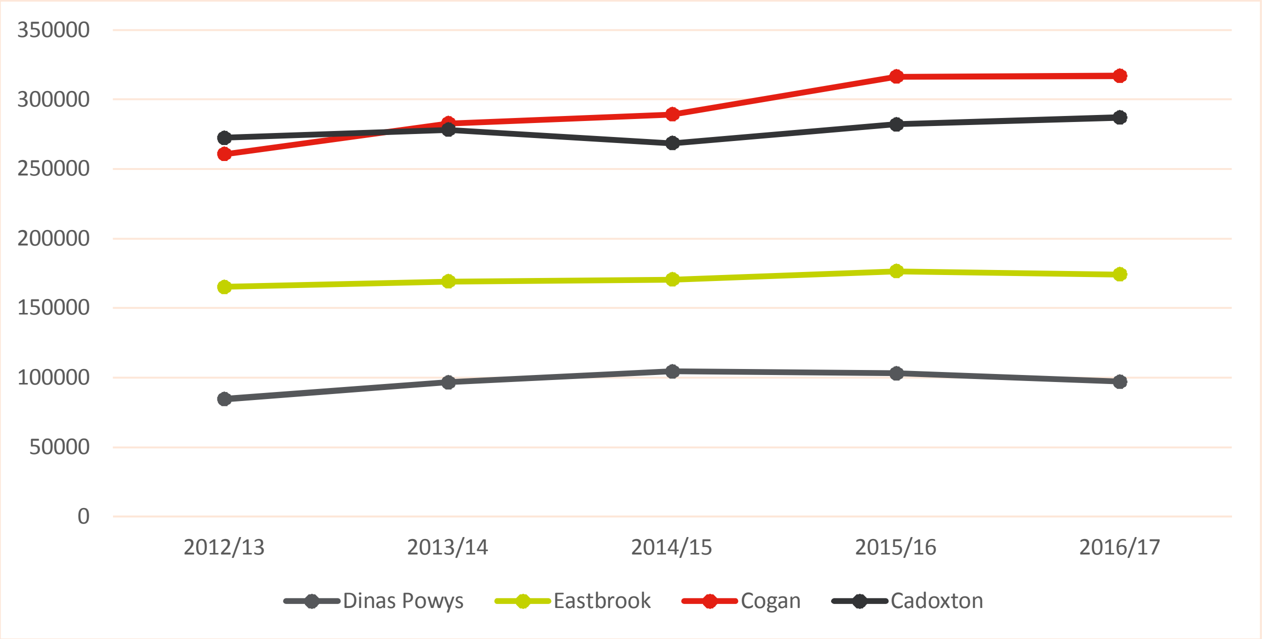
[32] National Rail Enquiries

[33] National Rail

Rail Station	To/ Destination	Journey Time	Frequency
Eastbrook	Cardiff Central	11 minutes	4 per hour
	Barry	13 minutes	4 per hour
	Pontypridd	43 minutes	3 per hour
	Merthyr Tydfil	1 hour 18 minutes	2 per hour
	Aberdare	1 hour 18 minutes	1-2 per hour
	Rhoose (Cardiff International Airport)	19 minutes	1 per hour
	Bridgend	48 minutes	1 per hour

Figure 11 Rail Station Patronage (2012/13 to 2016/17)[34]



3.10 Bus Services and Infrastructure

Bus transport modal share for journeys to work in Dinas Powys is 1% compared to 2% in the Vale of Glamorgan and 3% in South East Wales as a whole.[35] As such, bus travel currently provides for a very low proportion of journeys.

There are a number of bus stops within Dinas Powys, with varying levels of service frequency. Within the study area, there are various bus services serving the area as illustrated in Table 14. The frequency of service varies with Sunday services being very sparse.

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[34] Office of Road and Rail – Station usage 2015-16 data

[35] 2011 Census

There are approximately four buses travelling into Cardiff per hour through Dinas Powys. Two further buses travel into Cardiff per hour from the Cogan junction. These bus routes are described below with regards to the study area.

- Bus service 89 travels from Nat West Bank, The Square Dinas Powys to Cardiff including Cardiff Bay, Grangetown, Butetown and Atlantic Wharf.
- Bus service 92 travels through our study area from the B4267 Redlands Road/ A4055 Cardiff Road junction in a north-easterly direction towards Cogan junction. This route does not travel through Dinas Powys. The bus stop is located approximately 90m north of Cogan junction.
- Bus service 93 travels through Dinas Powys to Cardiff including Grangetown and Riverside.
- Bus service 95 travels through Dinas Powys to Cardiff including Grangetown, Riverside, Cardiff Bus Station o/s Wyndham Arcade and Heath (including Heath Hospital).
- Bus Services 93S, P135 and S77 are school/college services only.
- Bus Service 304 travels through Dinas Powys to Cardiff including Cardiff Bay, Grangetown, Butetown and Atlantic Wharf.

Table 14 Local Bus Services (Traveline Cymru)

Bus No.	Route	Bus Stop	Monday – Friday	Saturday	Sunday
89A	Nat West Bank – Cardiff	Nat West Bank, The Square, Dinas Powys	2 hours	2 hours	-
89B (note does not serve Dinas Powys)	The Institute – Cardiff	Llandough Hospital	2 hours	2 hours	-
92 (note does not serve Dinas Powys)	Castle Avenue – Cardiff	Barons Court, Penarth Road, Cogan Pill	30 mins	-	-
93	Morrisons – Cardiff	School, Cardiff Road, Dinas Powys	Hourly	Hourly	-
94 (note does not serve Dinas Powys)	Morrisons – Cardiff	Barons Court, Penarth Road, Cogan Pill	30 mins	30 mins	1 hour
95	Winston Square – Heath Park Way	School, Cardiff Road, Dinas Powys	30 mins	30 mins	2 hours
95A (note does not serve Dinas Powys)	Cardiff - Cardiff	Merrie Harrier, Penlan Road, Cogan Pill	1 hour	1 hour	-
95B (note does not serve Dinas Powys)	Windsor Arcade – Cardiff	Merrie Harrier, Penlan Road, Cogan Pill	1 hour	1 hour	-
303/304	Cardiff – Barry	Dinas Powys Primary School, Cardiff Road, Eastbrook	Hourly	Hourly	2 Hours

Bus No.	Route	Bus Stop	Monday – Friday	Saturday	Sunday
P135	Barry – St Andrew's Church in Wales Primary School	St Andrew's Church in Wales Primary School	School service	-	-
S77	Llandough – Barry College	Dinas Powys Station	College service	-	-

Figure 12 shows the location of bus stops within and near to the study area. Bus stops are equipped with timetables however there is no real-time passenger information available in Dinas Powys. Along the A4055 from Biglis Roundabout to Cogan junction, there are 16 bus stops; eight of which comprise a pole with timetable, seven of which comprise shelters with seating and one with no facilities.

The quality of the bus stops is inconsistent with many retaining poor quality facilities with limited facilities. This is noted in Capita's Dinas Powys to Cardiff Corridor study (2015) – 'there are a range of different bus stop provisions along the corridors, which for bus passengers presents a disjointed and inconsistent user experience'. This inconsistency and poor maintenance and upkeep of bus stops was confirmed following a site visit in March 2017.

Signalised crossings comprising tactile paving are located near to the bus stops including at Dinas Powys rail station; north and south of Elm Grove/ Cardiff Road junction; Dinas Powys Primary School; south of Cardiff Road / Redlands Road junction and Cogan junction. Footways are generally well lit within the area allowing for good lighting at bus stops with the exception of Bryn-y-Don bus stop north of Cardiff Road/ Cross Common Road junction.

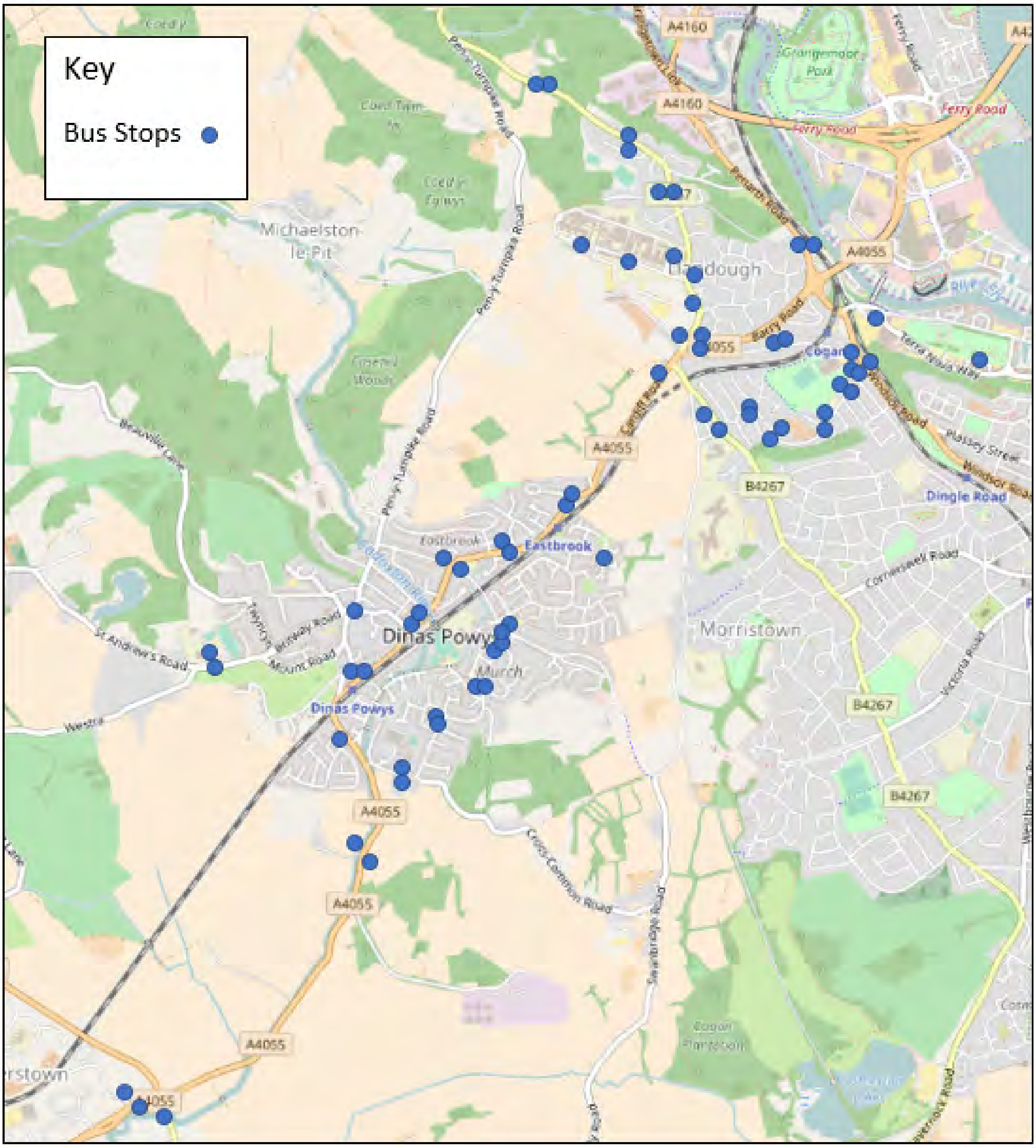
The Vale of Glamorgan LDP 2011-2026 Sustainable Transport Assessment also notes the following:

- It is a regional and local aspiration to standardise bus stops to ensure well maintained infrastructure in order to deliver a fully accessible bus service. The Regional Transport Authority are considering how to increase quality and standardise the provision of bus stops across the region, as part of the Metro project.
- Increased pressure on budgets requires an increase in fare revenue to maintain service stability and network coverage. It was reported in the LDP that around 20% of the total local bus service mileage in the Vale of Glamorgan is supported financially by the Council, the remainder of which being operated on a wholly commercial basis.
- Within the Transport Act 1985, Councils in Wales have powers to secure public transport services by entering into service subsidy agreements. They may only do so where there is, in their opinion, a public transport requirement not being satisfied by the free market and which will not be met unless they take action of offering subsidy for the service.

There are a number of community transport operations within the Vale of Glamorgan including these running in Dinas Powys:

- Greenlinks
- Voluntary Emergency Services Transport (VEST)
- East Vale Community Transport (EVCT)
- Dinas Powys Voluntary Concern (DPVC)
- The Intersensory Club
- Non-Emergency Patient Transport

Figure 12 Local Bus Stops



3.11 Highway Network

3.11.1 Background

The study area encompassing the project scope extension as confirmed by Vale of Glamorgan Council on 3rd May 2018 includes the transport corridors from the junctions of Sully Moors Road/ Hayes Road roundabout and Biglis Roundabout (Barry) through Dinas Powys, to Cardiff via Leckwith, Cogan and Penarth. The highway network provides facilitates movement by the private car, as well as providing the infrastructure for bus transport and walking and cycling links.

The A4055 Cardiff Road is a single carriageway road from the Biglis roundabout through to a point south of the Merrie Harrier junction. At the Murch Road junction there are two lanes on the Cardiff Road south and north, and Millbrook Road, approaches. A bus lane begins north of Eastbrook Station and runs northbound for 400 metres, joining at the B4267 Redlands Road junction. There are two lanes for traffic northbound between the B4267 Redlands Road and Penlan Road junctions, then the A4055 narrows to a single lane for a 200 metres section east of the Merrie Harrier, before widening to two lanes and then three on approach to the Baron's Court junction.

- This Impacts Assessment Report has identified that 79% of those travelling to work use a car with Table 15 and Figure 18 detailing 2-way Annual Average Daily Traffic (AADT) flows through Dinas Powys at specific locations.
- The Highway Impact Assessment (2013) identifies the strategic highway network, key junction and allocated employment and residential development allocations over the local LDP period.

The junctions relevant to this study are:

- The Biglis/ McDonald's roundabout (A4055/ A4231)
- The B4267 Sully Moors Road/ Hayes Road roundabout
- Murch Road/ Cardiff Road, Dinas Powys crossroads
- Merrie Harrier junction, Llandough
- Barons Court junction, Penarth
- Pen-y-Turnpike Road/ Leckwith Road

3.11.2 Manual Classified Turning Counts

The original commission collected Manual Classified Turning Counts at eight junctions throughout the study area from 7am to 7pm on 23rd November 2017, as shown in Appendix B. Two additional Manual Classified Counts were subsequently completed on 15th May 2018, also as shown in Appendix B, to inform assessment of the extended study area and which included further data acquired for the Biglis roundabout to ensure assessment of the network and wider commissioned area remains coherent. The ten junctions in total where the counts were completed encompassed:

- Biglis Roundabout (A4055/ A4231/ B4267)
- A4055/ Station Road
- Milbrook Road/ A4055/ Murch Road
- Merrie Harrier Junction
- Leckwith Rd B4267/ Pen-Y-Turnpike Road
- Barons Court Junction (A4160/ A4055)
- Milbrook Road / Pen-Y-Turnpike Road
- Britway Road/ Mill Road
- Sully Moors Road/ B4267 South Road / Hayes Road
- Ffordd Y Mileniwm/ A4055 Roundabout/ Western arm routes (under the rail line)

3.11.3 Automatic Number Plate Recognition Surveys

A programme of Automatic Number Plate Recognition (ANPR) surveys was completed over the same time periods as for the Manual Classified Counts to establish the point at which trips entered (origin) and left (destination) the study area. The ANPR cameras capture both the registration plate of vehicles passing the cameras and the time at which the registration numbers are recorded.

This means that the journey times of vehicles through the study area can be calculated. The camera locations are shown in Appendix B. Coloured boxes indicate the location of the cameras, with different colours representing the different directions of the traffic recorded.

3.11.4 Observed Data

The study corridor (A4055 between Biglis roundabout and Barons Court Junction) was further divided into six sections for the extraction of traffic flow from the Manual Classified Count data. These sections are shown in Appendix B. The corridor is usually split at the location of junctions, except for the final two sections, Section 12 and Section 13. Here the split happens at the point where the new bypass would connect with the A4055. For each section, the observed traffic flow (vehicles per hour) was extracted from the appropriate Manual Classified Count data. For example, the traffic flow on section 13 is taken from the Manual Classified Count data at the Biglis roundabout arm B. Wherever the flows on a section are available from two counts, one at each end of the section, then the average value is used.

3.11.5 Journey Times

The journey times between Biglis roundabout and Barons Court Junction were extracted from the ANPR data. ANPR records the registration number of each vehicle passing a camera and the time that the vehicle passes the camera. The distributions of journey times for vehicles recorded at Biglis roundabout (camera 017 – 022) and at the Barons Court Junction (camera 005 – 010), are shown in Figure 13 and Figure 14. The length of this corridor is 5,198 m. The analysis shows that on average, vehicles were driving at less than 11 mph during the morning peak period northbound and the evening peak period southbound. The average speed in other time periods was around 20 mph.

3.11.6 Peak Periods

The distribution of traffic flow over the day, by direction, is shown in Figure 15 and Figure 16. Together with above analysis, it was found that the peak periods were:

- AM peak: 07.00 – 10.00hrs
- PM peak: 16.00 – 19.00hrs

The average of vehicles per hour in the AM peak, PM peak and Inter peak (Northbound / Southbound) are in Appendix B.

3.11.7 LDP Transport Assessment

As indicated in Table 1, the Capita Symonds Highway Impact Assessment LDP Background Paper (2013) identified that four junctions are subsequently forecasted to be over capacity in the 2026 future year, namely:

- Cardiff Road/ Murch Road/ Millbrook Road;
- Merrie Harrier; Barons Court;
- Leckwith Road/ Pen-y-Turnpike Road; and
- Cardiff Road/ Murch Road/ Millbrook Road (also over capacity in 2012).

The Sewta RTP identified that an increasing dependence on the car has led to high levels of traffic congestion and an inefficient transport system overall, with traffic congestion costing the local economy £600m a year. Many of the region's roads are said to be close to capacity during the day and exceed capacity during peak hours. Forecast costs of congestion will soon reach £1bn a year in South East Wales alone and continued economic investment will suffer as a result.

Figure 13 Northbound Journey Time (minutes)

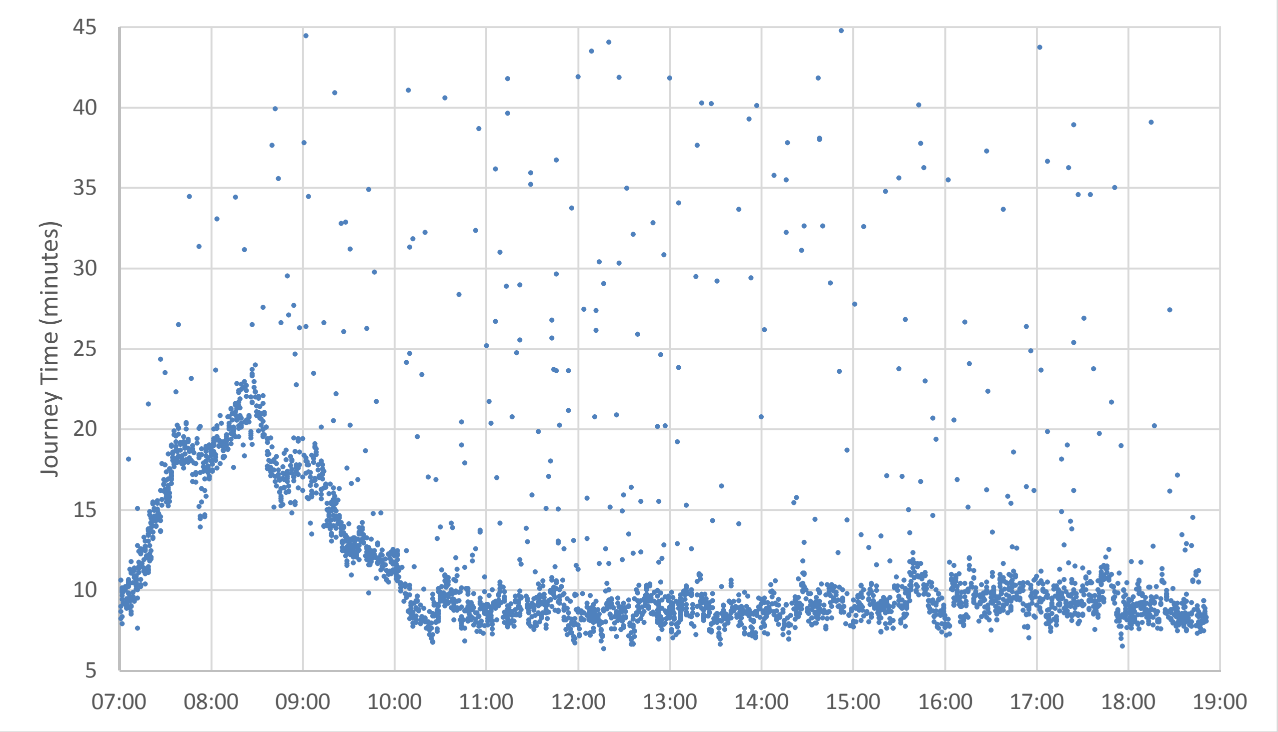


Figure 14 Southbound Journey Time (minutes)

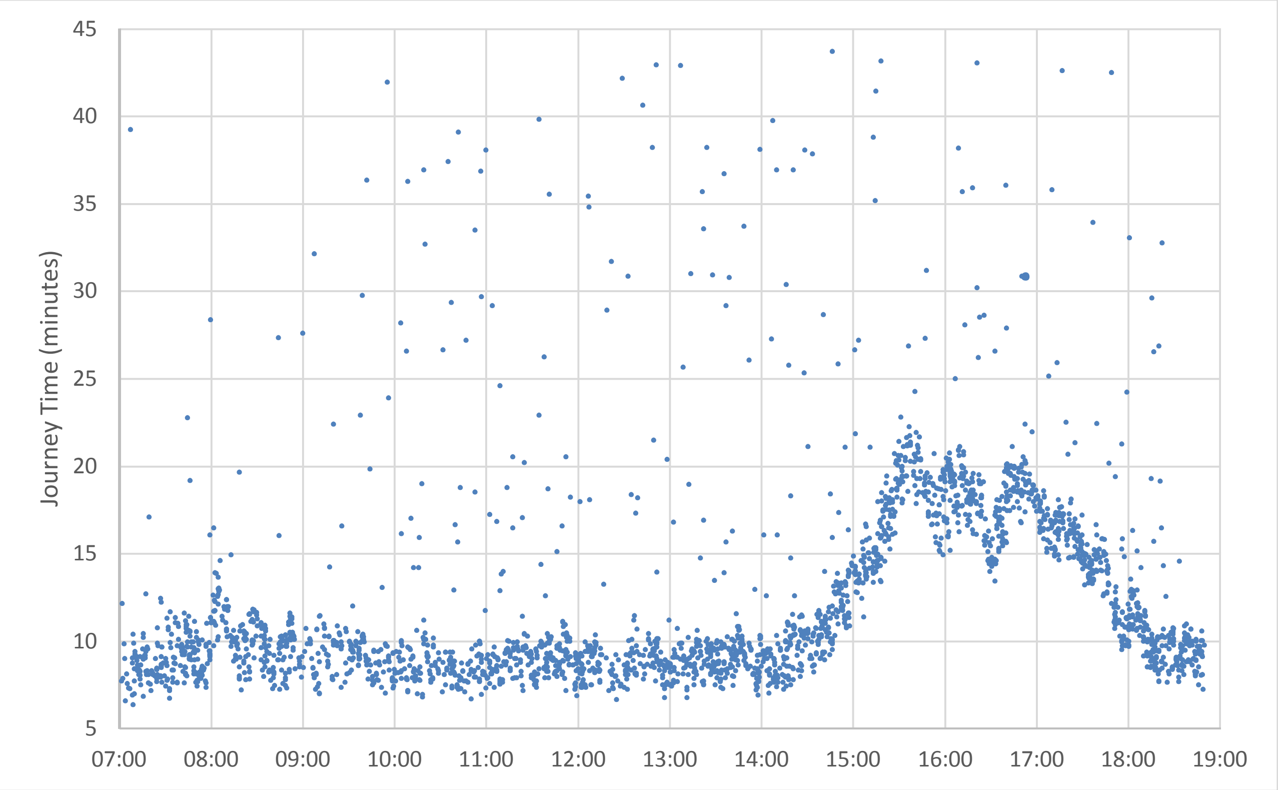


Figure 15 Northbound Vehicles per Hour

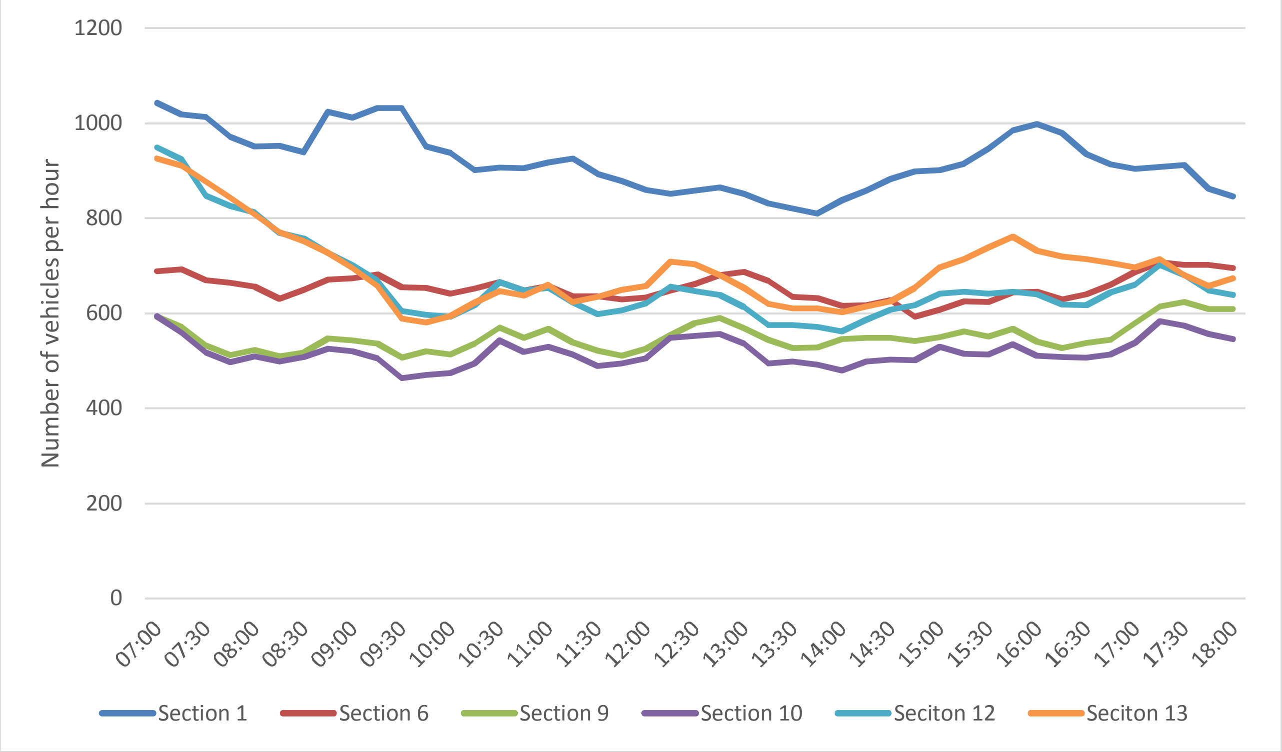


Figure 16 Southbound Vehicles per Hour

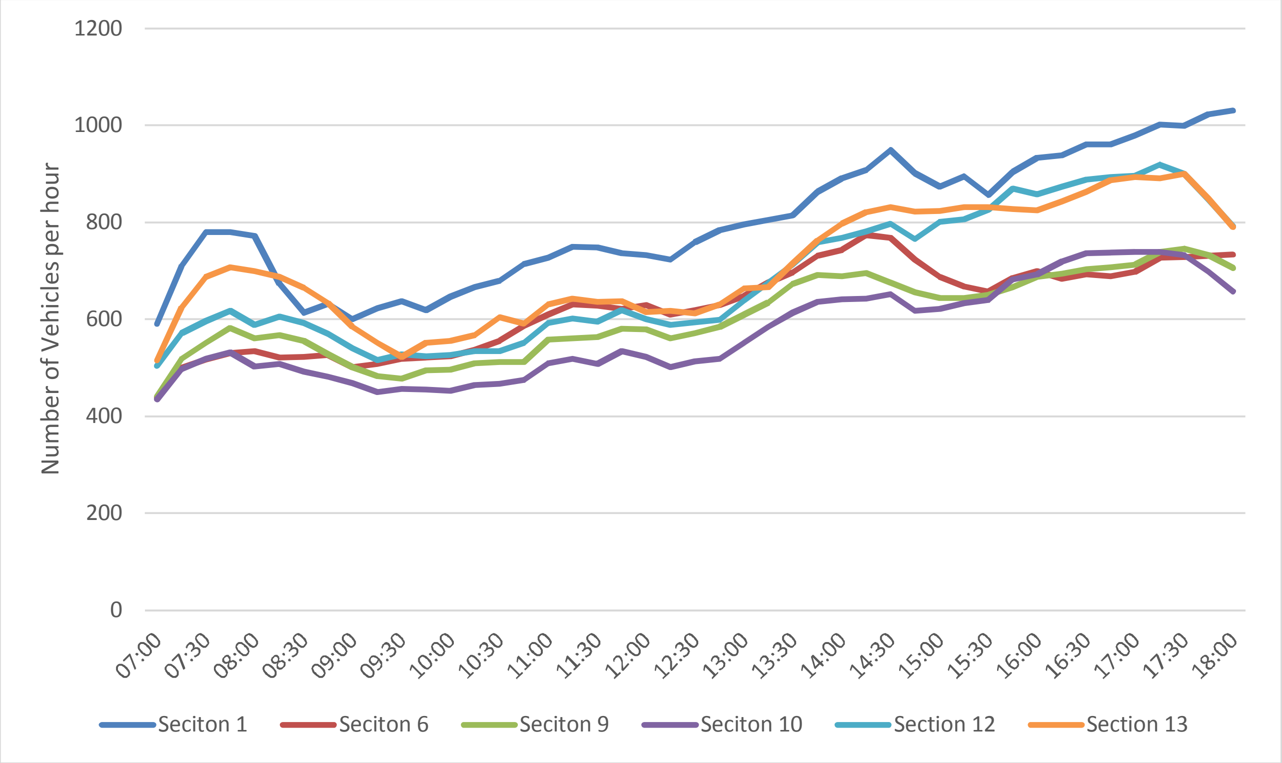


Figure 17 Map Showing Key Junctions and Strategic Route within Study Area

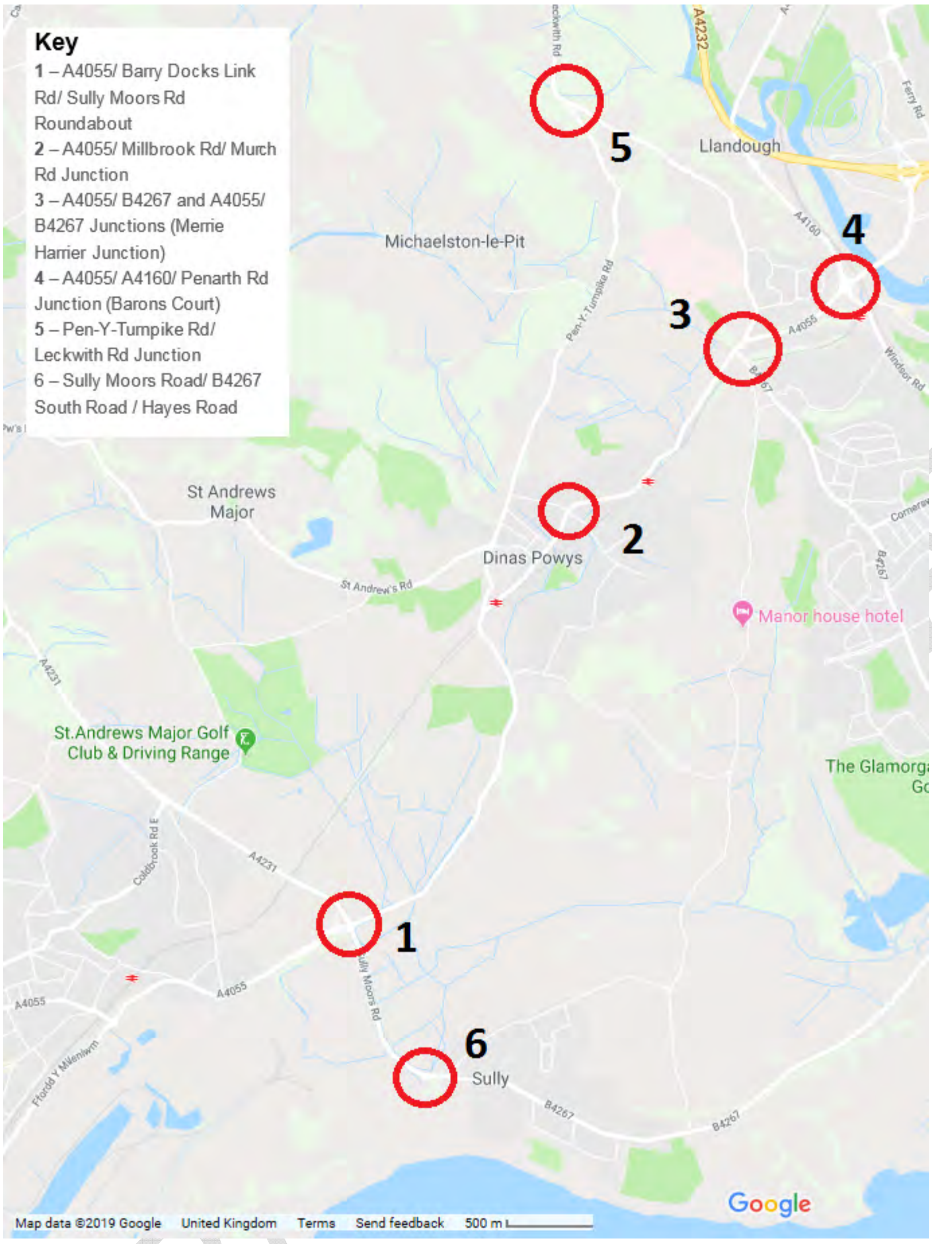
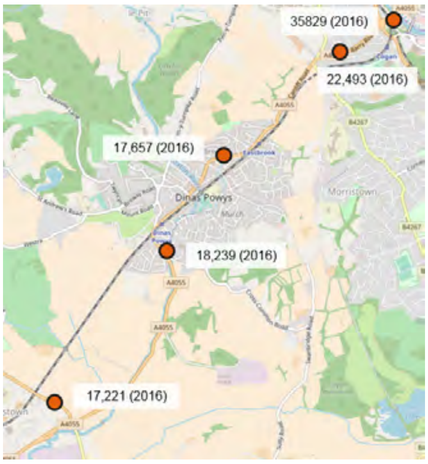


Table 15 AADT flows through Dinas Powys

Road Link	Count Point ID	Total Traffic Flows (2016)	HGVs
A4055	73233	35,829	1.73%
A4055	10630	18,239	2.02%
A4055	78434	17,657	1.52%
A4231	99962	17,221	4.26%
A4955	50578	22,943	1.95%

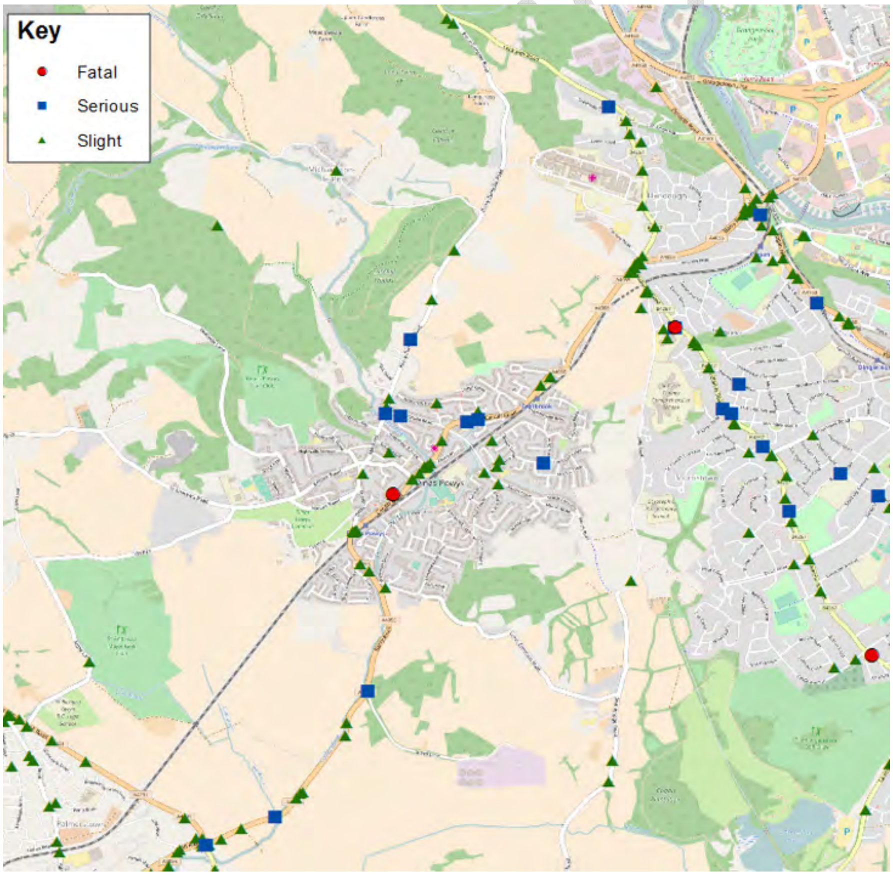
Figure 18 AADT flows through Dinas Powys (2016)



3.11.8 Accidents

Figure 19 shows available accident data by severity within the vicinity of the study area between 2011 and 2015. The map shows a cluster of accidents at the A4055/ Barry Docks Link Rd/ Sully Moors Rd Roundabout with ten accidents nine of which were slight and one of which was serious. Another cluster can be found at Station Road/ Cardiff Road with six accidents which were of slight severity. At the Merrie Harrier junctions with Redlands Road and the B4267, there are a total of 13 accidents, slight in severity. Nine accidents slight in severity have also occurred at the A4055/ A4160/ Penarth Rd Junction (Barons Court) over the survey period. 34 accidents have occurred along Cardiff Road; 31 slight in severity, two of which were series and one fatal.

Figure 19 Accidents by Severity within Study Area (2011-15)



4 Data Sources

4.1 Overview

In accordance with the WelTAG guidance this section summarises the data sources used in and to inform this WelTAG Stage One: Strategic Outline Case.

4.2 Data Sources

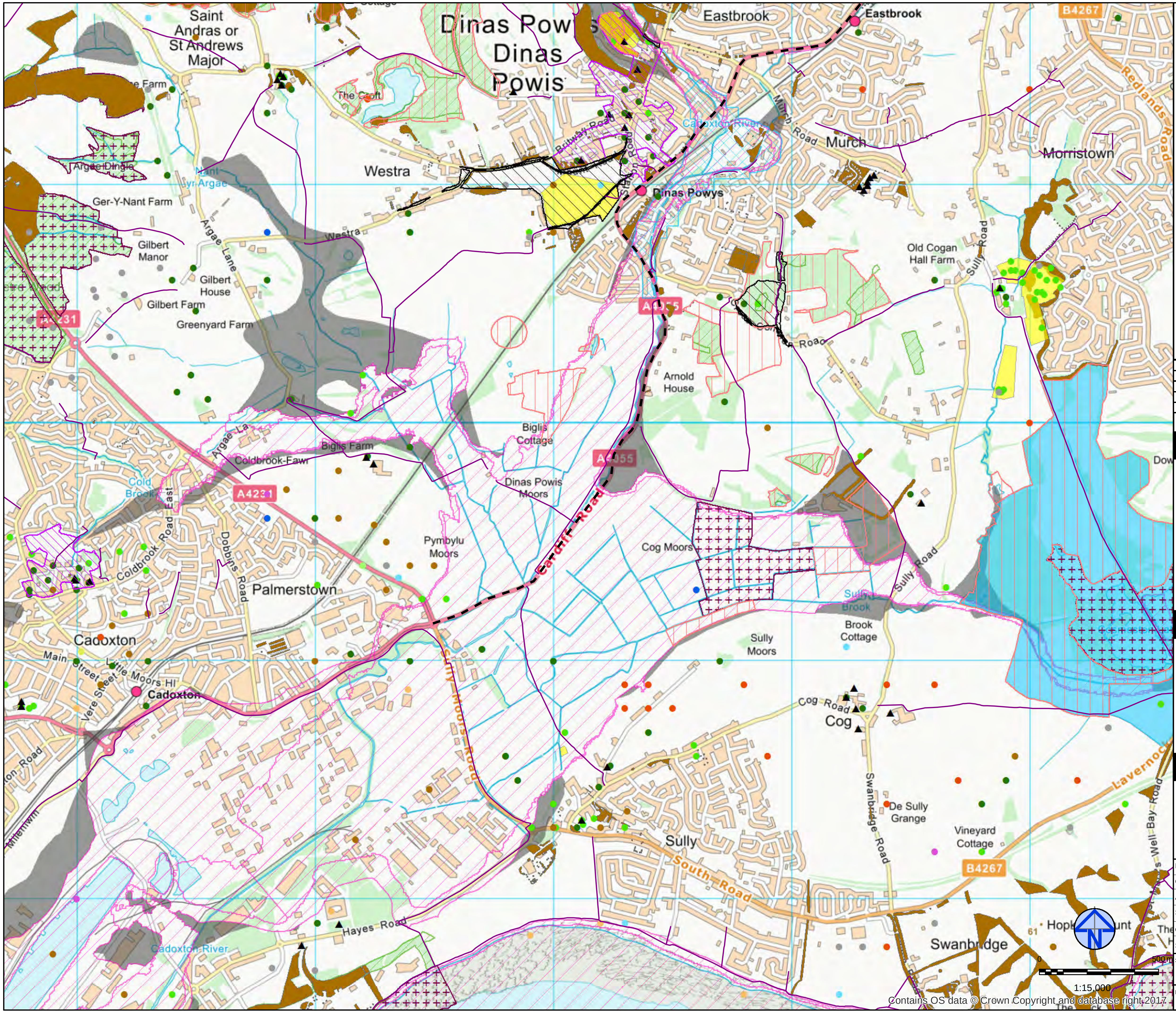
The sources of data used within this Stage One appraisal are as follows:

- AECOM (2014) Mid and North Wales – 2011 Journey to Work Analysis
- Capita Dinas Powys to Cardiff Corridor Bus Priority Measures (2015)
- Cardiff Capital Region Metro Study (2013)
- City Population (2016) – https://www.citypopulation.de/php.uk-wales.php?adm2id=W06000014
- Highways Impact Assessment, Vale of Glamorgan LDP Background Paper (2013)
- National Rail Enquiries - http://www.nationalrail.co.uk/
- National Transport Finance Plan (2015) and Evidence Base
- Network Rail - http://www.networkrail.co.uk/wp-content/uploads/2016/11/South-Wales-investment-map.pdf
- Office for National Statistics (2011) 2011 Census
- Office of Road and Rail (2016) Estimates of Station usage 2015-16
- Rail Engineer – Cardiff Area Signalling Renewal - https://www.railengineer.uk/2016/02/28/cardiff-area-signalling-renewal/
- Railway Technology – Cardiff Area Signalling Renewal (CASR) Project, United Kingdom http://www.railway-technology.com/projects/cardiff-area-signalling-renewal-casr-project/
- Rapid Transport for Cardiff: Scoping, Feasibility, Engineering and Economic Study (2013)
- South East Wales Transport Alliance (Sewta) Rail Strategy (2013) (Jacobs)
- South East Wales Transport Alliance (Sewta) Regional Bus and Community Transport Network Strategy (2014)
- South East Wales Transport Alliance (Sewta) RTP (2010)
- Sustainable Transport Assessment, LDP Background Paper (2013)
- Traveline Cymru - https://www.traveline.cymru/
- Vale of Glamorgan Council (2013) Deposit LDP 2011-2026
- Vale of Glamorgan Council (2013) Adopted LDP 2011-2026
- Vale of Glamorgan Council (2013) LDP 2011-2026: Sustainable Transport Assessment
- Vale of Glamorgan Council LTP 2015-30
- Vale of Glamorgan Council (2013) Vale of Glamorgan Deposit LDP (2011-2026) Proposals Map Deposit Plan - https://www.valeofglamorgan.gov.uk/Documents/Living/Planning/Policy/LDP-2013/02-LDP-Proposals-Map-2013.pdf
- Wales Transport Strategy (2008)
- Well-being of Future Generations (Wales) Act 2015
- Welsh Assembly Government (2016) Welsh Transport Planning and Appraisal Guidance (WelTAG) (draft version, June 2016)

- Welsh Government (2013) Active Travel (Wales) Act 2013
- Welsh Government (2015) Active Travel (Wales) Act 2013 Annual Report 2015
- Welsh Government (2014) Welsh Index of Multiple Deprivation - http://gov.wales/docs/statistics/2015/150812-wimd-2014-summary-revised-en.pdf

APPENDIX A

Environmental Constraints Plans



Contains OS data © Crown Copyright and database right 2017

NOTES:

Legend:

- Public Rights of Way
- A4055
- ▨ Registered Common Land
- ▨ Site of Importance for Nature Conservation (SINC)
- ▨ Conservation Area

Designated Heritage Assets

- ▲ Listed Building

Archaeological Features

- ● Prehistoric
- ● Mesolithic
- ● Neolithic
- ● Bronze Age
- ● Iron Age
- ● Roman
- ● Early Medieval
- ● Medieval
- ● Post-Medieval
- ● Modern
- ● Unknown
- 🟨 Scheduled Monument
- 🟫 Tree Preservation Order

Environmental Designations

- ▨ Site of Special Scientific Interest
- 🟦 Local Nature Reserve
- ▨ Ancient Woodland
- ▨ Zone C1
- ▨ Zone C2

Flood Zones

- ■ Zone B

01	27/06/18	DESCRIPTION	RM	SP	MF
Rev	Date	Description	Drawn	Check	Approv

Client

VALE OF GLAMORGAN COUNCIL

PROJECT:

WELTAG STAGE 2 APPRAISAL

Site

Dinas Powys

ARCADIS Design & Consultancy for natural and built assets

Registered office:
Arcadis House
34 York Way,
London
N1 9AB

Coordinating office:
Arcadis Cymru House
Fortran Road
St Mellons, Cardiff
CF3 0EY

www.arcadis.com

TITLE:

Figure 1:
Dinas Powys (Extended Study Area) - Environmental Constraints

Drawn	R.MILLMAN	Date 27JUN18	Signed
Checked	S.PRICE	Date 27JUN18	Signed
Approved	M.FRY	Date 27JUN18	Signed
Scale:	1:15,000	Datum:	AOD
Original Size:	A3	Grid:	OS
Suitability Code:	S2	Project Number:	10015022

Suitability Description: Issued for information

Drawing Number: 10015022-ARC -XX-XX-DR-YE-0001

Revision: 01

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Print Date: 06-27-18 15:40:45

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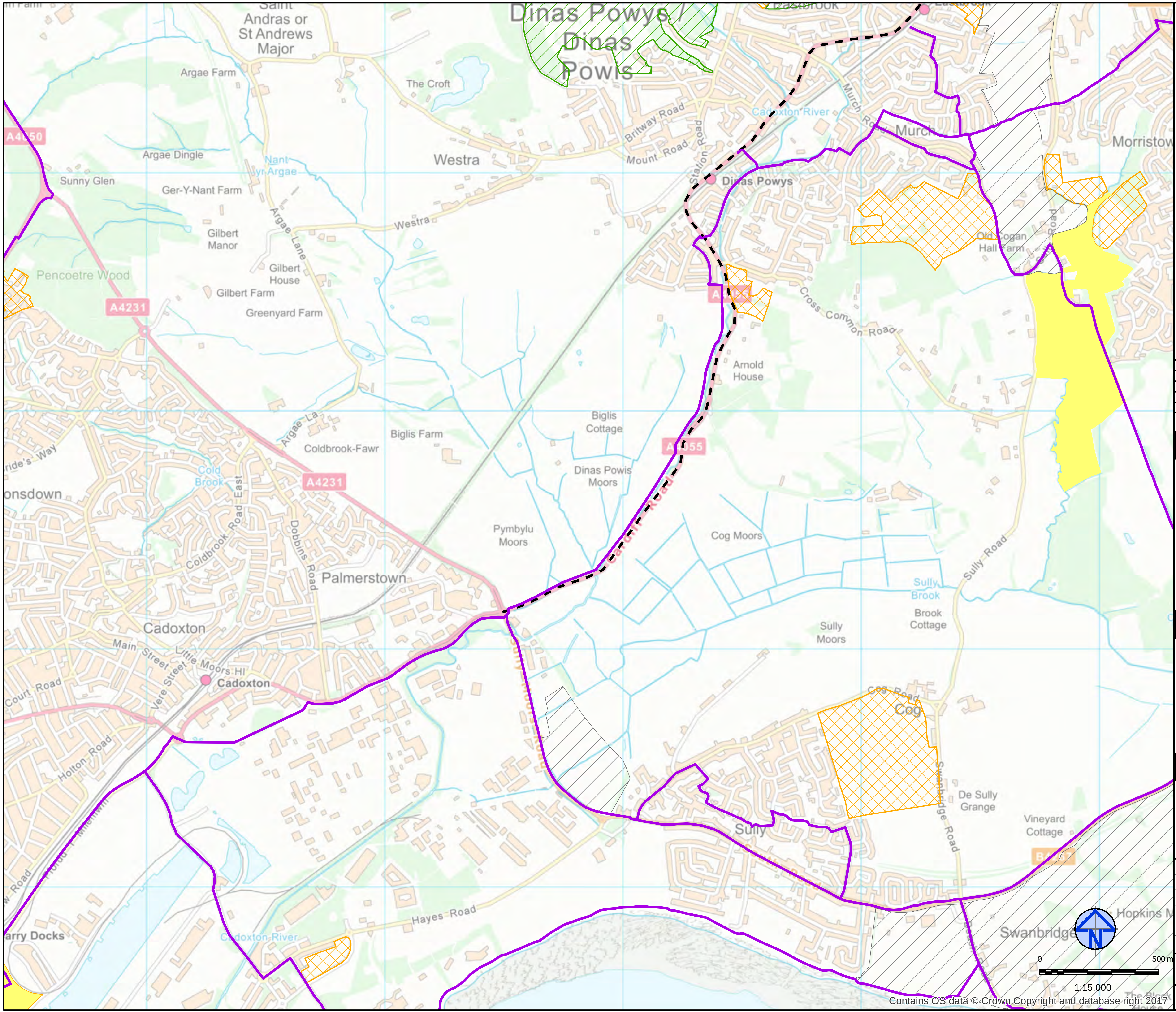

NOTES:

Legend:

- ━ LDP Transport Cycling
- ╍ A4055
- ▨ LDP Green Wedge
- ▨ LDP SLA
- 🟨 LDP Public Open Space
- ▨ LDP Housing

Rev	Date	Description	Drawn	Check	Approv
01	30/05/18	DESCRIPTION	RM	SP	MF

Client

VALE OF GLAMORGAN COUNCIL

PROJECT:

WELTAG
STAGE 2
APPRAISAL

Site

Dinas Powys

Registered office:
Arcadis House
34 York Way,
London
N1 9AB

Coordinating office:
Arcadis Cymru House
Fortran Road
St Mellons, Cardiff
CF3 0EY

www.arcadis.com

TITLE:

Figure 2:
Planning Policies

Drawn	R.MILLMAN	Date 30MAY18	Signed
Checked	S.PRICE	Date 30MAY18	Signed
Approved	M.FRY	Date 30MAY18	Signed
Scale:	1:15,000	Datum:	AOD
Original Size:	A3	Grid:	OS
Suitability Code:	S2	Project Number:	10015022

Suitability Description:
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Revision: 01

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Print Date: 05-30-18 15:25:51

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APPENDIX B

Highway Network Traffic Plans

Figure 3.1 Biglis Roundabout

Project Number: **TSP13598**
Project Name: **Dinas Powys**
Survey Type: **Manual Classified Turning Count**
Site No: **1**
Location: **Biglis Roundabout (A4055/ A4231/ B4267)**

traffic survey partners

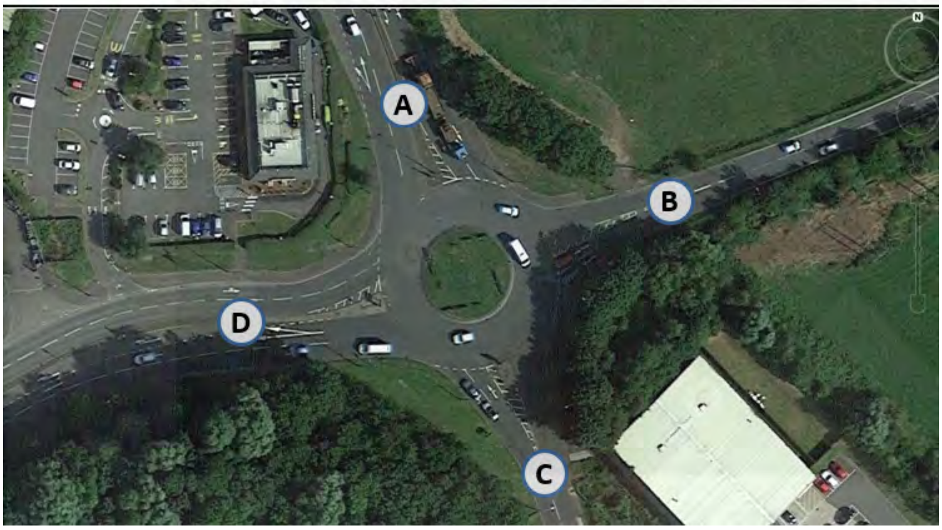


Figure 3.2 A4055/Station Rd

Project Number: **TSP13598**
Project Name: **Dinas Powys**
Survey Type: **Manual Classified Turning Count**
Site No: **2**
Location: **A4055 / Station Road**

traffic survey partners

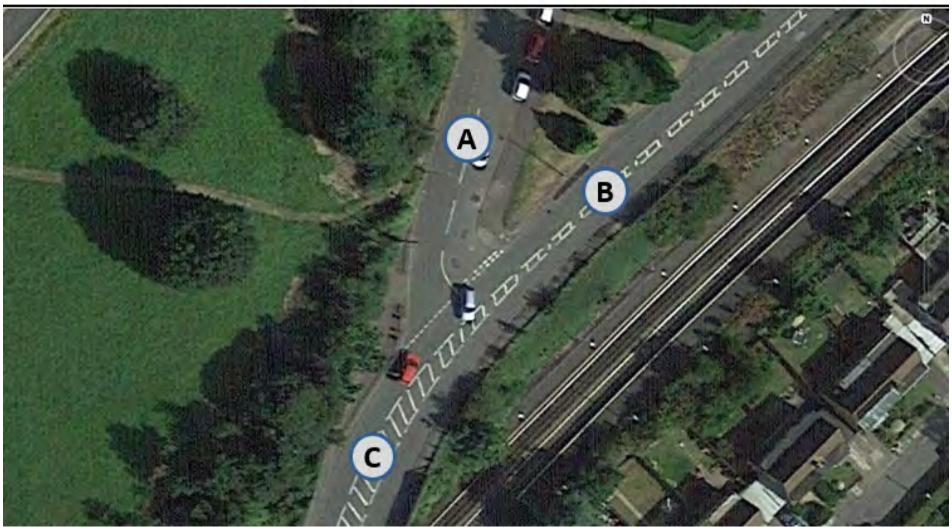


Figure 3.3 Milbrook Rd / A4055 / Murch Rd

Project Number: **TSP13598**
Project Name: **Dinas Powys**
Survey Type: **Manual Classified Turning Count**
Site No: **3**
Location: **Milbrook Road / A4055 / Murch Road**

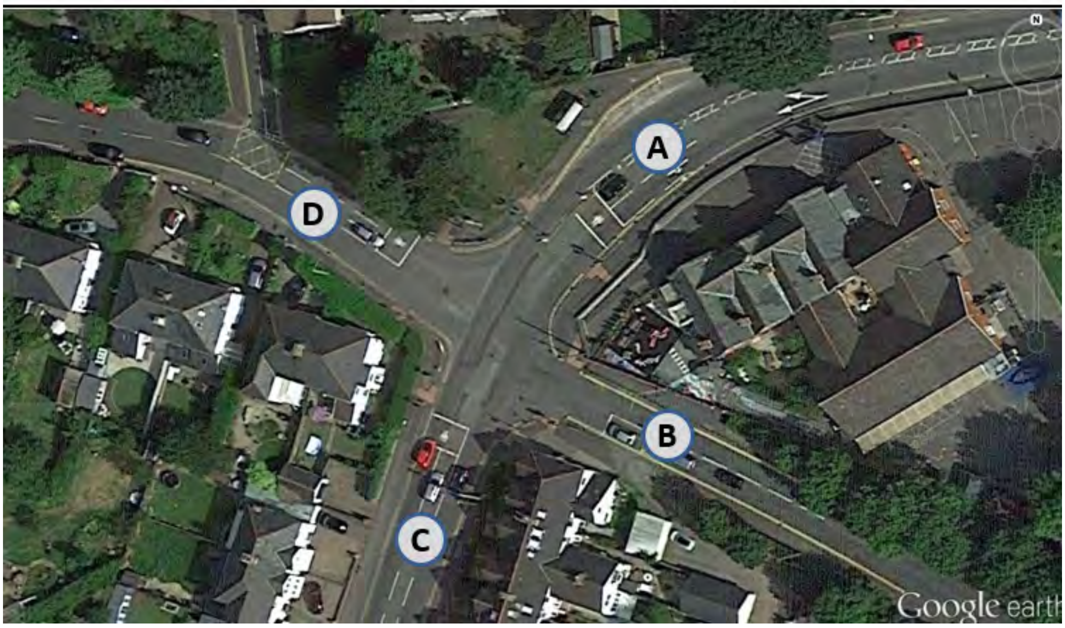


Figure 3.4 Merrie Harrier Junction

Project Number: **TSP13598**
Project Name: **Dinas Powys**
Survey Type: **Manual Classified Turning Count**
Site No: **4**
Location: **Merrie Harrier Junction (A4055/ B4267/ Andrew Road)**

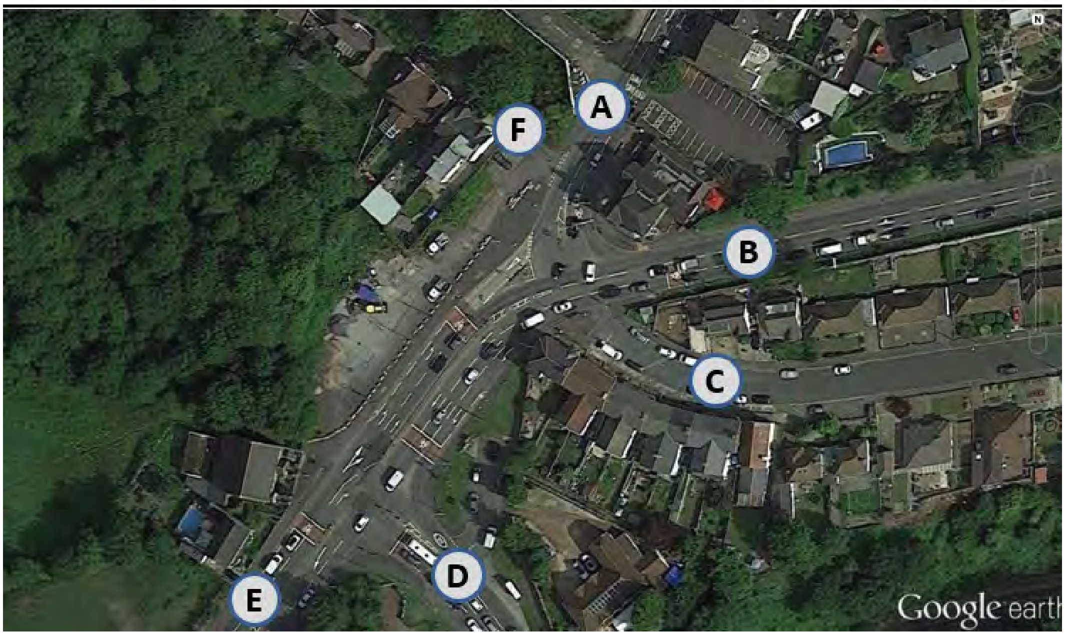
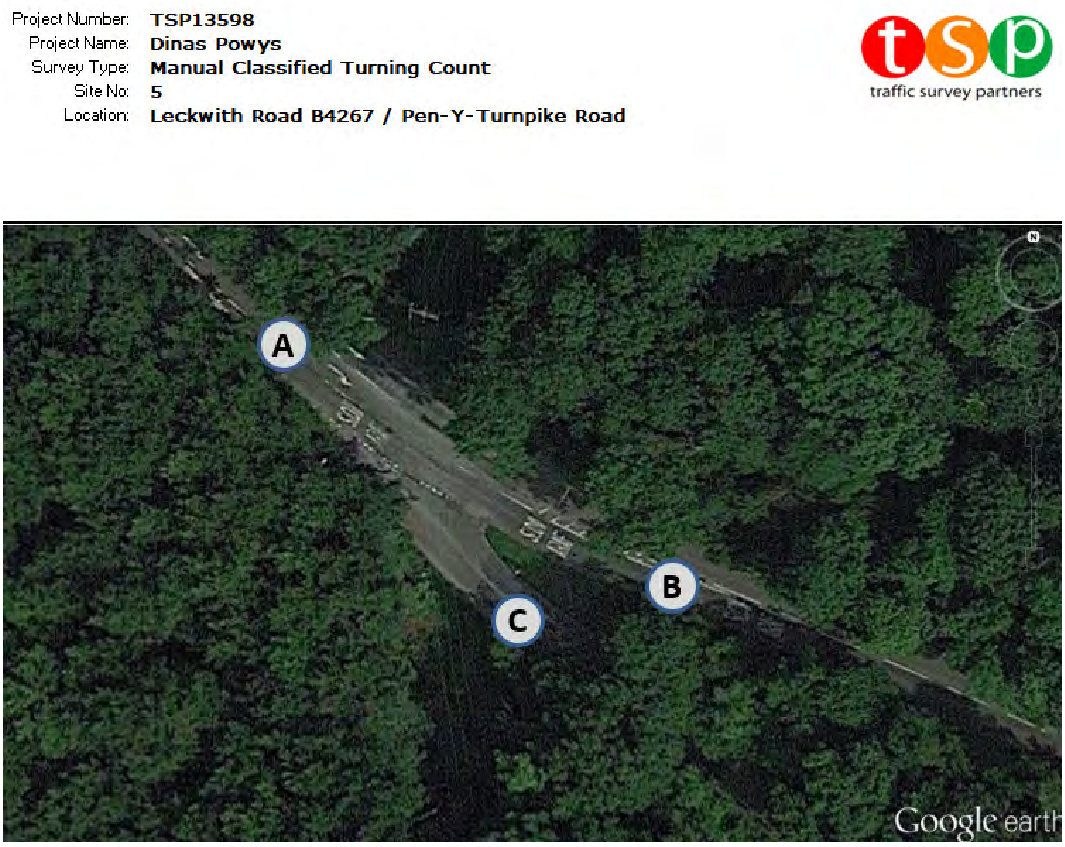


Figure 3.5 Leckwith Rd B4267 / Pen-Y-Turnpike Rd



Project Number: **TSP13598**
Project Name: **Dinas Powys**
Survey Type: **Manual Classified Turning Count**
Site No: **5**
Location: **Leckwith Road B4267 / Pen-Y-Turnpike Road**

Figure 3.6 Barons Court Junction

Project Number: **TSP13598**
Project Name: **Dinas Powys**
Survey Type: **Manual Classified Turning Count**
Site No: **6**
Location: **Barons Court Junction (A4160 / A4055)**

Figure 3.7 Milbrook Rd / Pen-Y-Turnpike Rd

Project Number: **TSP13598**
Project Name: **Dinas Powys**
Survey Type: **Manual Classified Turning Count**
Site No: **7**
Location: **Millbrook Road / Pen-Y-Turnpike Road**

Figure 3.8 Britway Rd / Mill Rd

Project Number: **TSP13598**
Project Name: **Dinas Powys**
Survey Type: **Manual Classified Turning Count**
Site No: **8**
Location: **Britway Road / Mill Road**

Figure 3.9 Location of ANPR cameras - Barons Court Junction , Merrie Harrier junction, B4267/Llandough Hill Junction, Leckwith Road B4267 / Pen-Y-Turnpike Road Junction

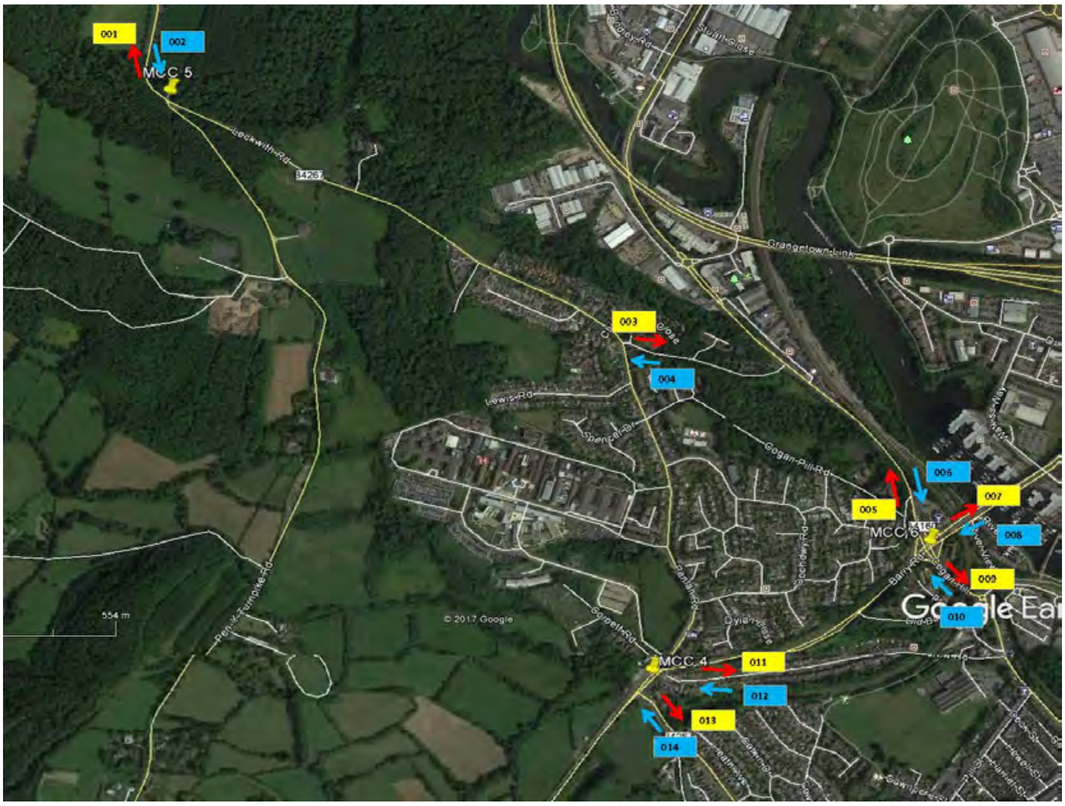


Figure 3.10 Location of ANPR cameras - Britway Road / Mill Road Junction, Milbrook Road/A4055/Murch Road Junction, Millbrook Road / Pen-Y-Turnpike Road Junction and Biglis roundabout

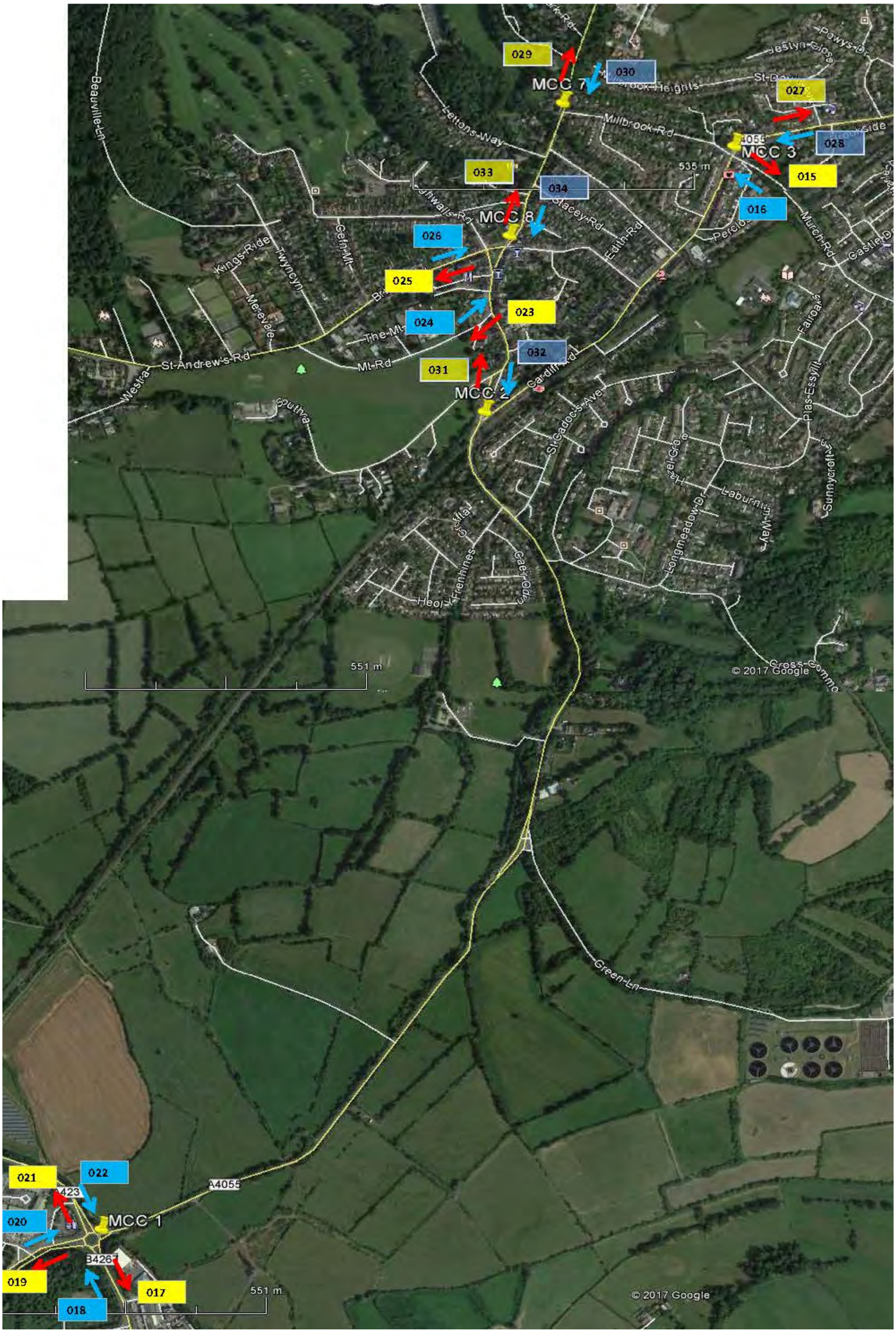


Figure 3.11 Road Segments

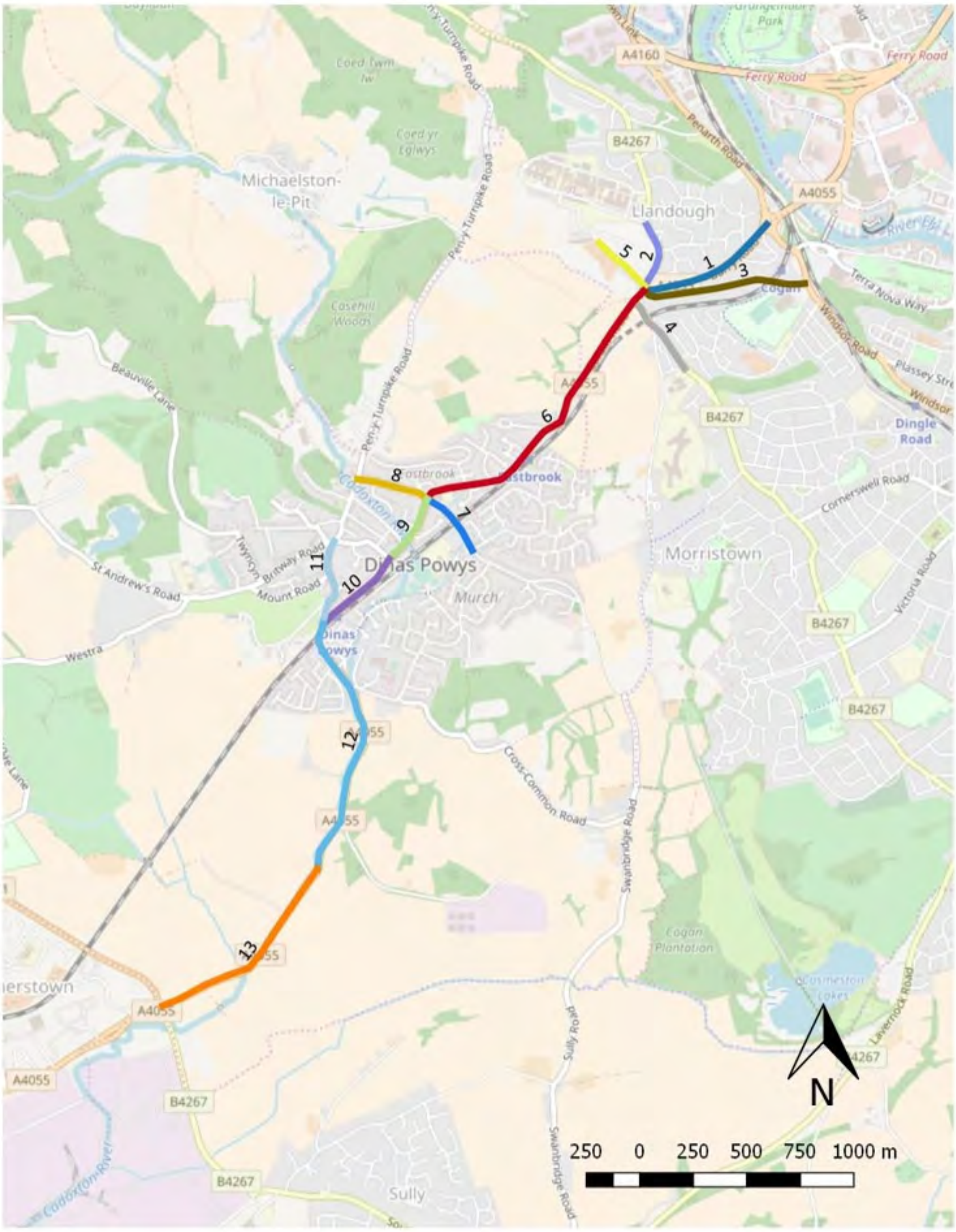


Figure 3.12 Average of Vehicles per hour in the AM peak (Northbound / Southbound)

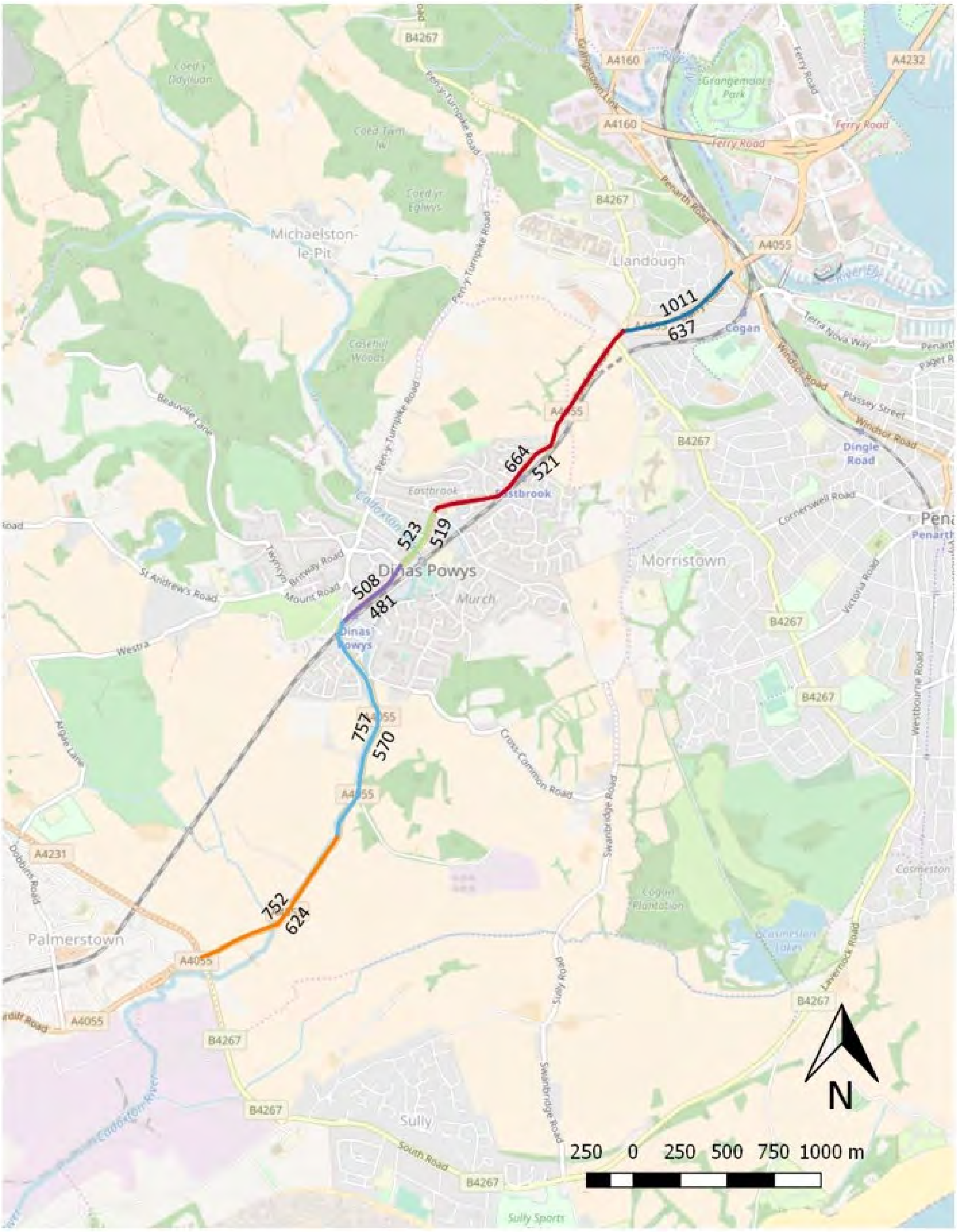


Figure 3.13 Average of Vehicles per hour in the Inter Peak (Northbound / Southbound)

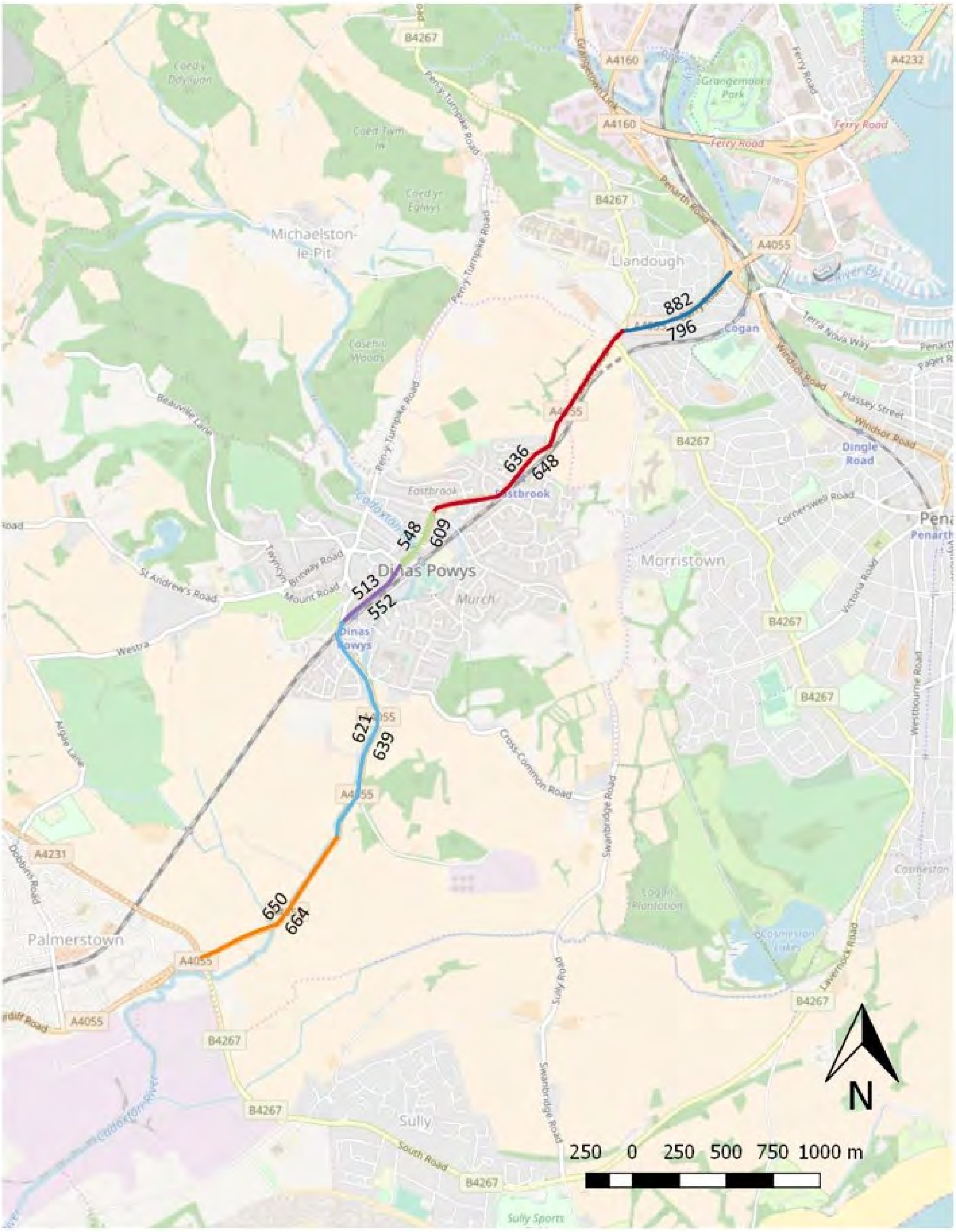
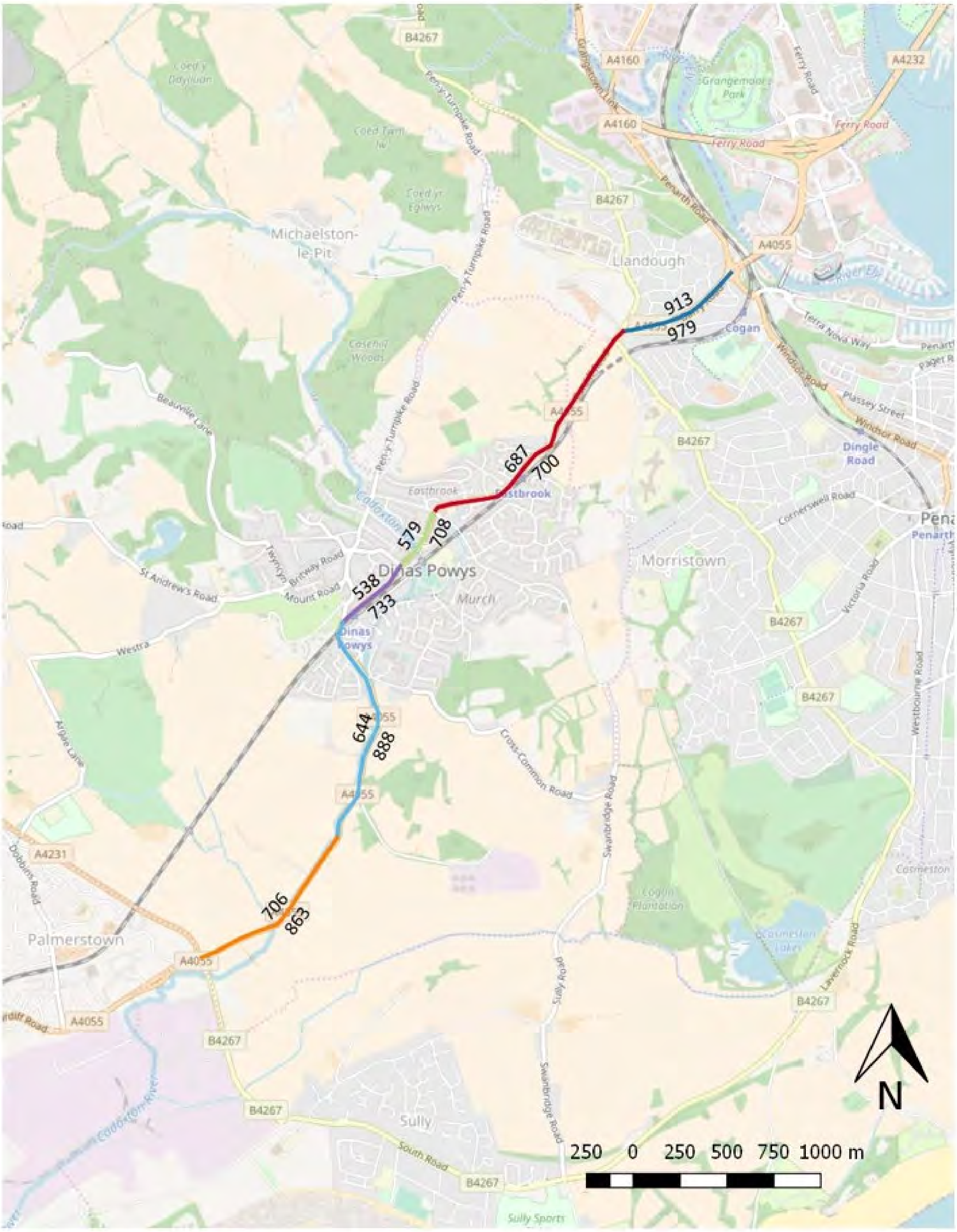


Figure 3.14 Average of Vehicles per hour in the PM peak (Northbound / Southbound)



traffic survey partners

Client:	Arcadis Consulting (UK) Limited
Project Number:	TSP13819
Project Name:	Dinas Powys - May 2018
Survey Type:	ANPR
Survey Date:	15 May 2018, Tuesday
Survey Time:	07:00 - 19:00

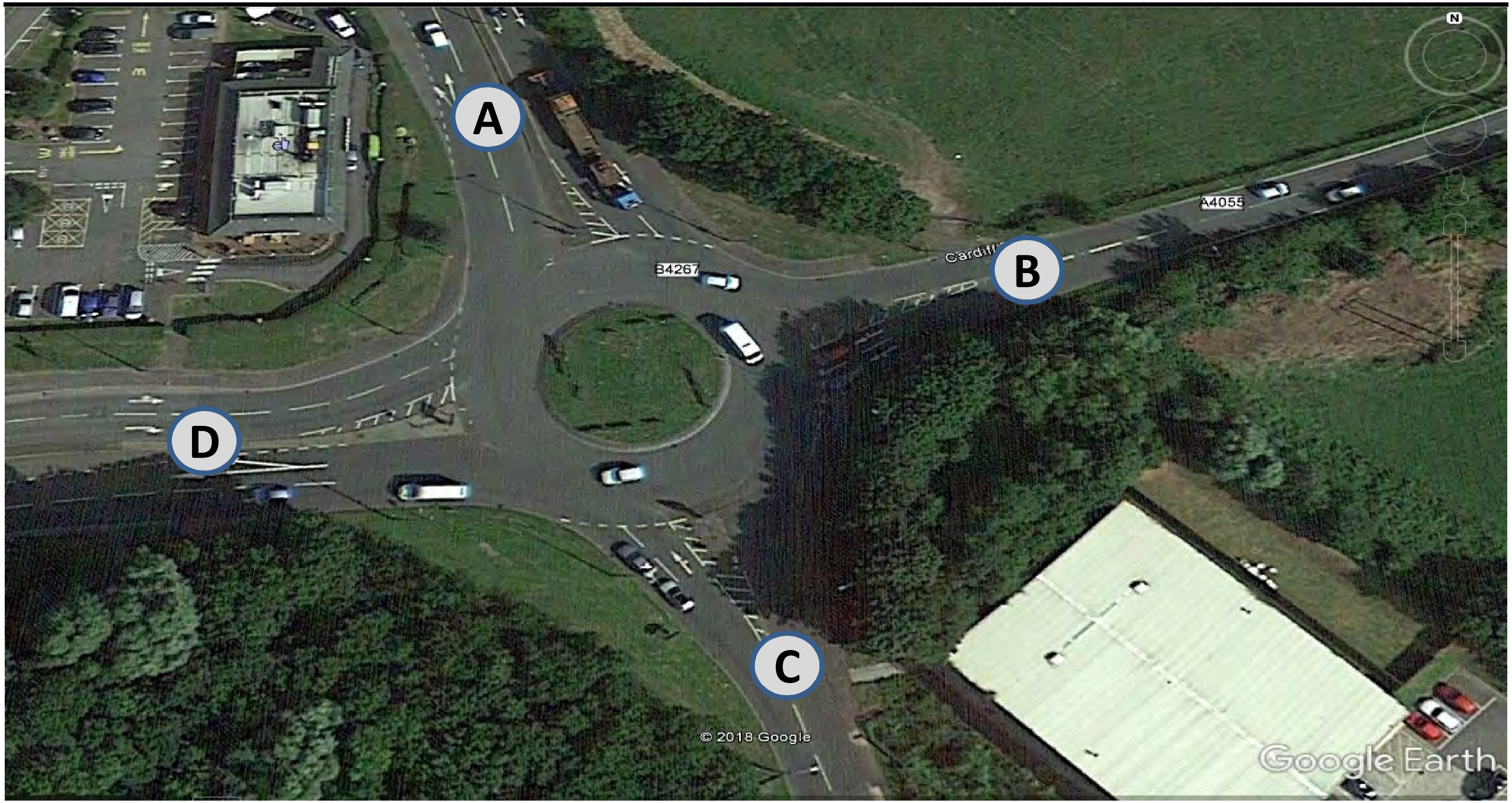
TSP13819-Dinas Powys - May 2018 ANPR Data
Overall Plan

Location	Direction	Recs	Match	Unmatch	%	Control Counts	Sample Rate
1	O -1	8083	5305	2778	65.6%	8914	91%
2	I -2	7117	5490	1627	77.1%	7452	96%
3	O -3	7603	4666	2937	61.4%	8471	90%
4	I -4	7678	6024	1654	78.5%	8094	95%
5	O -5	6636	5331	1305	80.3%	6949	95%
6	I -6	6603	4803	1800	72.7%	7097	93%
7	O -7	2812	1877	935	66.7%	3087	91%
8	I -8	2981	2377	604	79.7%	3155	94%
9	O -9	7038	5958	1080	84.7%	7264	97%
10	I -10	7892	5428	2464	68.8%	8296	95%
11	O -11	5873	4983	890	84.8%	6261	94%
12	I -12	5338	3998	1340	74.9%	5461	98%

traffic survey partners

Client:	Arcadis
Project Number:	TSP13819
Project Name:	Dinas Powys - May 2018
Survey Type:	Manual Classified Turning Count
Survey Date:	15 May 2018, Tuesday
Survey Time:	07:00 - 19:00
Weather:	Dry
Comments:	

Project Number: TSP13819
Project Name: Dinas Powys - May 2018
Survey Type: Manual Classified Turning Count
Site No: 1
Location: A4231 Barry Docks Link Road / A4055 Cardiff Road / B4267 Sully Moors Road



Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **1**
Location: **A4231 Barry Docks Link Road / A4055 Cardiff Road / B4267 Sully Moors Road**
Date: **15 May 2018, Tuesday**

	1	1	1.5	2.3	2	2	0.4	0.2												
Time	**A - A**										**A - B**									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00									0	0	54	6	1				1	1	63	62.1
07:15	5	2							7	7	49	2				1			52	53
07:30	4	2							6	6	47	5	1						53	53.5
07:45	3								3	3	40	11					1		52	51.4
H/Total	12	4	0	0	0	0	0	0	16	16	190	24	2	0	0	1	2	1	220	220
08:00	8	3							11	11	38	3	1				1		43	42.9
08:15	5	2							7	7	35	3	2			1			41	43
08:30	4	1							5	5	34	3		1		1			39	41.3
08:45	7	2							9	9	28	5						1	34	33.2
H/Total	24	8	0	0	0	0	0	0	32	32	135	14	3	1	0	2	1	1	157	160.4
09:00	5	1							6	6	30	6							36	36
09:15	5	1							6	6	42	8	1						51	51.5
09:30	5								5	5	26	5	1	1					33	34.8
09:45	7								7	7	34	3		2					39	41.6
H/Total	22	2	0	0	0	0	0	0	24	24	132	22	2	3	0	0	0	0	159	163.9
10:00	4	2							6	6	39	4	4						47	49
10:15	6	1							7	7	28	9					1		38	37.4
10:30	3	1							4	4	31	5							36	36
10:45	2	2							4	4	23	3	1						27	27.5
H/Total	15	6	0	0	0	0	0	0	21	21	121	21	5	0	0	0	1	0	148	149.9
11:00	2								2	2	28	4	4						36	38
11:15	4	1							5	5	23	2	4	2					31	35.6
11:30	5	1							6	6	28	1	1	2					32	35.1
11:45	4	1							5	5	26	4							30	30
H/Total	15	3	0	0	0	0	0	0	18	18	105	11	9	4	0	0	0	0	129	138.7
12:00	2								2	2	29	1	1			1	1		33	33.9
12:15	5								5	5	30	3	2						35	36
12:30	2								2	2	45	6					1		52	51.4
12:45	5								5	5	35	4				2	1		42	43.4
H/Total	14	0	0	0	0	0	0	0	14	14	139	14	3	0	0	3	3	0	162	164.7
13:00	9	1							10	10	40	7							47	47
13:15	8								8	8	40	2					1		43	42.4
13:30	5	1							6	6	22	1	2						25	26
13:45	2	1							3	3	32	1	3			2			38	41.5
H/Total	24	3	0	0	0	0	0	0	27	27	134	11	5	0	0	2	1	0	153	156.9
14:00	10								10	10	34	2		1		2			39	42.3
14:15	5	1							6	6	31	6				1			38	39
14:30	5								5	5	45	4				1	1		51	51.4
14:45	6	1				1			8	9	34	5	1	1		1	1		43	45.2
H/Total	26	2	0	0	0	1	0	0	29	30	144	17	1	2	0	5	2	0	171	177.9
15:00	9								9	9	42	2	1			1	1		47	47.9
15:15	11	1							12	12	29	3	1			1			34	35.5
15:30	7								7	7	34	4	1			1			40	41.5
15:45	7	1							8	8	40								40	40
H/Total	34	2	0	0	0	0	0	0	36	36	145	9	3	0	0	3	1	0	161	164.9
16:00	10	2							12	12	38	6	1						45	45.5
16:15	6						2		8	6.8	47	1							48	48
16:30	5								5	5	48	1					1		50	49.4
16:45	10	1							11	11	54	1				1			56	57
H/Total	31	3	0	0	0	0	2	0	36	34.8	187	9	1	0	0	1	1	0	199	199.9
17:00	5								5	5	45	3	1		1		1		51	51.9
17:15	8								8	8	51	3	1						55	55.5
17:30	5								5	5	39	5					1		45	44.4
17:45	4	1							5	5	39	1							40	40
H/Total	22	1	0	0	0	0	0	0	23	23	174	12	2	0	1	0	2	0	191	191.8
18:00	5								5	5	40	2							42	42
18:15	5								5	5	30	2		1			1		34	34.7
18:30	7								7	7	41								41	41
18:45	7								7	7	42	3						1	46	45.2
H/Total	24	0	0	0	0	0	0	0	24	24	153	7	0	1	0	0	1	1	163	162.9
Total	263	34	0	0	0	1	2	0	300	299.8	1759	171	36	11	1	17	15	3	2013	2051.9

Project Number:	**TSP13819**
Project Name:	**Dinas Powys - May 2018**
Survey Type:	**Manual Classified Turning Count**
Site No:	**1**
Location:	**A4231 Barry Docks Link Road / A4055 Cardiff Road / B4267 Sully Moors Road**
Date:	**15 May 2018, Tuesday**

Time	**A - C**										**A - D**									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00	23	8	2	1		1	1		36	38.7	40	11	1						52	52.5
07:15	45	13		1					59	60.3	28	12		1					41	42.3
07:30	67	11		2		1	1		82	85	23	7	3	5		1			39	48
07:45	103	8		2		1	1		115	118	34	16	1	3					54	58.4
H/Total	238	40	2	6	0	3	3	0	292	302	125	46	5	9	0	1	0	0	186	201.2
08:00	90	17	1	2		2	1		113	117.5	37	11	3	2					53	57.1
08:15	76	11	2	2		1			92	96.6	36	6	1	2			1		46	48.5
08:30	92	8	1	3		1			105	110.4	43	10	2	1					56	58.3
08:45	91	11	5	1		4			112	119.8	56	10		3					69	72.9
H/Total	349	47	9	8	0	8	1	0	422	444.3	172	37	6	8	0	0	1	0	224	236.8
09:00	48	8		1	1	2			60	64.3	36	9		2	1				48	51.6
09:15	47	10	3	2					62	66.1	37	8	1	10	1		2		59	72.3
09:30	55	6	2	1					64	66.3	51	10	3	1		2			67	71.8
09:45	50	5	5	2					62	67.1	38	12	3	3					56	61.4
H/Total	200	29	10	6	1	2	0	0	248	263.8	162	39	7	16	2	2	2	0	230	257.1
10:00	32	8	2	1		1			44	47.3	36	7	2	4		2			51	59.2
10:15	46	10	6	2					64	69.6	27	13	3	4					47	53.7
10:30	32	2	2						36	37	38	6	3	2					49	53.1
10:45	34	8	1	1				1	45	46	26	8	3						37	38.5
H/Total	144	28	11	4	0	1	0	1	189	199.9	127	34	11	10	0	2	0	0	184	204.5
11:00	49	7	2						58	59	38	7	2	1					48	50.3
11:15	48	8		1					57	58.3	22	9	1	4					36	41.7
11:30	38	3	2	3					46	50.9	36	8	5	4		2			55	64.7
11:45	48	3	1	2					54	57.1	25	9	1	6					41	49.3
H/Total	183	21	5	6	0	0	0	0	215	225.3	121	33	9	15	0	2	0	0	180	206
12:00	39	5	1	1					46	47.8	36	12		4		1	1		54	59.6
12:15	45	6	2	2					55	58.6	38	9	2	1					50	52.3
12:30	48	7	2						57	58	31	4	3	6			1		45	53.7
12:45	45	8	1						54	54.5	36	11	2	3					52	56.9
H/Total	177	26	6	3	0	0	0	0	212	218.9	141	36	7	14	0	1	2	0	201	222.5
13:00	46	8	5	2					61	66.1	38	5	4	2		1	2		52	56.4
13:15	51	7		4			1		63	67.6	38	6	6	2		1			53	59.6
13:30	44	4	5	2		1	1		57	62.5	30	7							37	37
13:45	45	3		3					51	54.9	35	2	2						39	40
H/Total	186	22	10	11	0	1	2	0	232	251.1	141	20	12	4	0	2	2	0	181	193
14:00	34	5		1			1		41	41.7	28	6	1	3			1		39	42.8
14:15	46	4		1					51	52.3	34	8	1	6			1		50	57.7
14:30	45	11	2	2		1			61	65.6	32	6		4					42	47.2
14:45	57	11	1	3					72	76.4	27	8	4	4					43	50.2
H/Total	182	31	3	7	0	1	1	0	225	236	121	28	6	17	0	0	2	0	174	197.9
15:00	59	5	2	1					67	69.3	28	10							38	38
15:15	62	11	2	4		2			81	89.2	37	4	2	3		1			47	52.9
15:30	26	6	1	1		1	1		36	38.2	32	10					2		44	42.8
15:45	63	5	1	2		1			72	76.1	43	8	1						52	52.5
H/Total	210	27	6	8	0	4	1	0	256	272.8	140	32	3	3	0	1	2	0	181	186.2
16:00	57	4	2	2			2		67	69.4	29	9		2			1		41	43
16:15	47	7		1				1	56	56.5	35	10	1	2			1		49	51.5
16:30	41	5		1		1			48	50.3	42	12	1			1	1		57	57.9
16:45	49	4		2		1			56	59.6	29	5	1	1					36	37.8
H/Total	194	20	2	6	0	2	2	1	227	235.8	135	36	3	5	0	1	3	0	183	190.2
17:00	47	5	2					1	55	55.2	38	4	1	1					44	45.8
17:15	49	5	1	3					58	62.4	35	3	1	2					41	44.1
17:30	39	3	1				2		45	44.3	33	2		2			1		38	40
17:45	47	6	1			1	3		58	57.7	40	4		1					45	46.3
H/Total	182	19	5	3	0	1	5	1	216	219.6	146	13	2	6	0	0	1	0	168	176.2
18:00	42	5	3	1				1	52	54	37	3	1	2					43	46.1
18:15	48	4	1	3					56	60.4	30	3	1	2					36	39.1
18:30	40	3							43	43	25	3		1			2		31	31.1
18:45	48	5	1				1		55	54.9	26	5							31	31
H/Total	178	17	5	4	0	0	1	1	206	212.3	118	14	2	5	0	0	2	0	141	147.3
Total	2423	327	74	72	1	23	16	4	2940	3081.8	1649	368	73	112	2	12	17	0	2233	2418.9

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **1**
Location: **A4231 Barry Docks Link Road / A4055 Cardiff Road / B4267 Sully Moors Road**
Date: **15 May 2018, Tuesday**

Time	B - A										B - B									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00	10	2							12	12									0	0
07:15	12	3			1		1		17	17.4				1					1	2.3
07:30	31	6							37	37									0	0
07:45	26	6							32	32									0	0
H/Total	79	17	0	0	1	0	1	0	98	98.4	0	0	0	1	0	0	0	0	1	2.3
08:00	15	2				1			18	19									0	0
08:15	37	4							41	41									0	0
08:30	31	2				2			35	37									0	0
08:45	25	4				1			30	31									0	0
H/Total	108	12	0	0	0	4	0	0	124	128	0	0	0	0	0	0	0	0	0	0
09:00	23	3				6	1		33	38.4									0	0
09:15	25	3	1						29	29.5									0	0
09:30	30	5				1	1		37	37.4				2					2	4.6
09:45	25	4	1	1					31	32.8									0	0
H/Total	103	15	2	1	0	7	2	0	130	138.1	0	0	0	2	0	0	0	0	2	4.6
10:00	31	3	3	2					39	43.1									0	0
10:15	33	8					1		42	41.4				1					1	2.3
10:30	21	5		1					27	28.3									0	0
10:45	25	3	1						29	29.5	1								1	1
H/Total	110	19	4	3	0	0	1	0	137	142.3	1	0	0	1	0	0	0	0	2	3.3
11:00	29	4	1	2			1		37	39.5				1					1	2.3
11:15	19	6							25	25									0	0
11:30	24	5	2						31	32	1								1	1
11:45	36	7		1					44	45.3									0	0
H/Total	108	22	3	3	0	0	1	0	137	141.8	1	0	0	1	0	0	0	0	2	3.3
12:00	29	3	2	1					35	37.3									0	0
12:15	27	3	2						32	33				1					1	2.3
12:30	31	6	1	1					39	40.8									0	0
12:45	32	6							38	38									0	0
H/Total	119	18	5	2	0	0	0	0	144	149.1	0	0	0	1	0	0	0	0	1	2.3
13:00	36	4	1						41	41.5									0	0
13:15	26	6							32	32									0	0
13:30	41	3							44	44									0	0
13:45	34	4					1		39	38.4									0	0
H/Total	137	17	1	0	0	0	1	0	156	155.9	0	0	0	0	0	0	0	0	0	0
14:00	30	8							38	38				1					1	2.3
14:15	41	2	1				1		45	44.9	1								1	1
14:30	46	7		1			2		56	56.1									0	0
14:45	34	2	1			1			38	39.5									0	0
H/Total	151	19	2	1	0	1	3	0	177	178.5	1	0	0	1	0	0	0	0	2	3.3
15:00	30	3	1				1		35	34.9		1							1	1
15:15	45	2				2			49	51									0	0
15:30	48	4					1		53	52.4									0	0
15:45	53	3				1	1		58	58.4									0	0
H/Total	176	12	1	0	0	3	3	0	195	196.7	0	1	0	0	0	0	0	0	1	1
16:00	44	8							52	52									0	0
16:15	44	10					1		55	54.4									0	0
16:30	57	7							64	64									0	0
16:45	43	5					1		49	48.4									0	0
H/Total	188	30	0	0	0	0	2	0	220	218.8	0	0	0	0	0	0	0	0	0	0
17:00	55	8					1		64	63.4									0	0
17:15	67	4	1	1			1		74	75.2									0	0
17:30	63	2							65	65	1								1	1
17:45	32	2					1		35	34.4									0	0
H/Total	217	16	1	1	0	0	3	0	238	238	1	0	0	0	0	0	0	0	1	1
18:00	61	7							68	68									0	0
18:15	47	5					1	1	54	52.6									0	0
18:30	48	2							50	50									0	0
18:45	32	2					2		36	34.8		1							1	1
H/Total	188	16	0	0	0	0	3	1	208	205.4	0	1	0	0	0	0	0	0	1	1
Total	1684	213	19	11	1	15	20	1	1964	1991	4	2	0	7	0	0	0	0	13	22.1

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **1**
Location: **A4231 Barry Docks Link Road / A4055 Cardiff Road / B4267 Sully Moors Road**
Date: **15 May 2018, Tuesday**

traffic survey partners

Time	B - C										B - D									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	TOTAL	TOTAL (PCU)	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	TOTAL	TOTAL (PCU)
07:00	4	3		1					8	9.3	28	10	1	1	3				43	47.8
07:15	12	3							15	15	36	8	2		1				47	49
07:30	14	5	1				1		21	20.9	57	12	1	2	3	2			77	85.1
07:45	17	6							23	23	80	9	2	1	2	2			96	102.3
H/Total	47	17	1	1	0	0	1	0	67	68.2	201	39	6	4	9	4	0	0	263	284.2
08:00	20	4							24	24	50	13	4		1	1	1		70	73.4
08:15	22	6							28	28	97	17	1		1	2			118	121.5
08:30	20	4				2			26	28	76	8	3	1	1		1		90	93.2
08:45	20	7	2			1			30	32	68	19	3	1					91	93.8
H/Total	82	21	2	0	0	3	0	0	108	112	291	57	11	2	3	3	2	0	369	381.9
09:00	19	4	1	1			1		26	27.2	76	11	2	1	3	6			99	110.3
09:15	17	2		1					20	21.3	79	16	3						98	99.5
09:30	13	5	1	1					20	21.8	56	11	6		1	1			75	80
09:45	18	7	1	1		1			28	30.8	62	14	5		1				82	85.5
H/Total	67	18	3	4	0	1	1	0	94	101.1	273	52	16	1	5	7	0	0	354	375.3
10:00	17	1							18	18	64	13	4	1	2	2	1		87	93.7
10:15	18	3	1						22	22.5	70	15	1			2	2		90	91.3
10:30	8	6	2	2					18	21.6	76	13					1		90	89.4
10:45	18								18	18	74	18	2	1	2				97	101.3
H/Total	61	10	3	2	0	0	0	0	76	80.1	284	59	7	2	4	4	4	0	364	375.7
11:00	13	5	2						20	21	90	14	4		2	1	2		113	116.8
11:15	10	2	2			1			15	17	74	13	5		1		1	1	95	97.1
11:30	16	4	2	1		1			24	27.3	78	13	2	1	1	2		1	98	102.5
11:45	14	6				1			21	22	87	12	3	2	1		1		106	110.5
H/Total	53	17	6	1	0	3	0	0	80	87.3	329	52	14	3	5	3	4	2	412	426.9
12:00	9	4	1				1		15	14.9	79	11			1			1	92	92.2
12:15	19	3	1						23	23.5	76	15	1		1			1	94	94.7
12:30	19	4	2					1	26	26.2	78	15	2	1	1	1	1	1	100	102.9
12:45	23	3							26	26	86	8	2	1	2	1			100	105.3
H/Total	70	14	4	0	0	0	1	1	90	90.6	319	49	5	2	5	2	1	3	386	395.1
13:00	18	3	1	1					23	24.8	95	9	2	2					108	111.6
13:15	15	4							19	19	88	11			2	1	1		103	105.4
13:30	11	3		1					15	16.3	80	12	1	1	1	1	1		97	100.2
13:45	20	4							24	24	75	10	2	2	1		1		91	95
H/Total	64	14	1	2	0	0	0	0	81	84.1	338	42	5	5	4	2	3	0	399	412.2
14:00	15	4							19	19	96	15		1	1				113	115.3
14:15	13	3	1			1			18	19.5	99	11	3	1	1	1			116	120.8
14:30	19	3				1			23	24	101	9	2		1	1			114	117
14:45	17	4	1						22	22.5	101	8		1	2		3		115	116.5
H/Total	64	14	2	0	0	2	0	0	82	85	397	43	5	3	5	2	3	0	458	469.6
15:00	18	2	3			1	1	1	26	27.1	78	8	2			2	1		91	93.4
15:15	15	3	2					1	21	21.2	109	10	2	1	1	4	1		128	134.7
15:30	18	4	1	1				1	25	26	103	15	2		1	2	3		126	128.2
15:45	21	1							22	22	95	13	5			4	1		118	123.9
H/Total	72	10	6	1	0	1	1	3	94	96.3	385	46	11	1	2	12	6	0	463	480.2
16:00	16	1							17	17	129	22	4	2	2		1	1	161	166.2
16:15	12	1		2		1			16	19.6	121	21	1		1		2		146	146.3
16:30	16	2		1					19	20.3	115	20	4			3			142	147
16:45	10	1		1					12	13.3	142	14				1			157	158
H/Total	54	5	0	4	0	1	0	0	64	70.2	507	77	9	2	3	4	3	1	606	617.5
17:00	17	4							21	21	135	15	1		3			1	155	157.7
17:15	16	1							17	17	150	15					3	1	169	166.4
17:30	29								29	29	154	8	1		1	1	3	3	171	169.3
17:45	27	2	1	1					31	32.8	133	13					1	2	149	146.8
H/Total	89	7	1	1	0	0	0	0	98	99.8	572	51	2	0	4	1	7	7	644	640.2
18:00	15	2		1			1		19	19.7	124	15			1		1		141	141.4
18:15	21	1							22	22	131	13			1		3	1	149	147.4
18:30	12						1		13	12.4	91	8	1		2		1		103	104.9
18:45	8	2							10	10	74	8	2		1	1	1		87	89.4
H/Total	56	5	0	1	0	0	2	0	64	64.1	420	44	3	0	5	1	6	1	480	483.1
Total	779	152	29	17	0	11	6	4	998	1038.8	4316	611	94	25	54	45	39	14	5198	5341.9

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **1**
Location: **A4231 Barry Docks Link Road / A4055 Cardiff Road / B4267 Sully Moors Road**
Date: **15 May 2018, Tuesday**

traffic survey partners

Time	C - A										C - B									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	TOTAL	TOTAL (PCU)	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	TOTAL	TOTAL (PCU)
07:00	24	15	5	4		1			49	57.7	8	1							9	9
07:15	31	8		5				2	46	50.9	15					1			16	17
07:30	42	13	1				1		57	56.9	9	2	1	1		2			15	18.8
07:45	52	4	1				1		58	57.9	11	3		1					15	16.3
H/Total	149	40	7	9	0	1	2	2	210	223.4	43	6	1	2	0	3	0	0	55	61.1
08:00	58	9	2	1					70	72.3	17	1							18	18
08:15	66	6	3	1					76	78.8	20	2				1			23	24
08:30	80	5	2	3		2			92	98.9	21	2							23	23
08:45	49	5	4	1					59	62.3	20		1	1					22	23.8
H/Total	253	25	11	6	0	2	0	0	297	312.3	78	5	1	1	0	1	0	0	86	88.8
09:00	68	5	4	3		1			81	87.9	20	1	1						22	22.5
09:15	41	5	2	3					51	55.9	12	2	1						15	15.5
09:30	40	5		3				1	49	52.1	21	3							24	24
09:45	34	8	2	2					46	49.6	12	3		1					16	17.3
H/Total	183	23	8	11	0	1	0	1	227	245.5	65	9	2	1	0	0	0	0	77	79.3
10:00	38	8	3	4					53	59.7	18	1	1	1				1	22	23
10:15	43	7	1	3					54	58.4	21	2							23	23
10:30	52	10		1					63	64.3	16	1	2				1		20	20.4
10:45	41	8	2	1					52	54.3	15	1	1	1					18	19.8
H/Total	174	33	6	9	0	0	0	0	222	236.7	70	5	4	2	0	0	1	1	83	86.2
11:00	45	9	3	3					60	65.4	11	1		1		1			14	16.3
11:15	40	6		2					48	50.6	12	5	1						18	18.5
11:30	36	5	3	1					45	47.8	13	3							16	16
11:45	38	11	3	2					54	58.1	18	6	1				1		26	25.9
H/Total	159	31	9	8	0	0	0	0	207	221.9	54	15	2	1	0	1	1	0	74	76.7
12:00	76	8		2		1			87	90.6	13	2		1				2	18	17.7
12:15	43	5						1	49	48.2	11	3	1						15	15.5
12:30	48	6		3			1		58	61.3	9	3							12	12
12:45	53	12	3						68	69.5	14	3		1					18	19.3
H/Total	220	31	3	5	0	1	1	1	262	269.6	47	11	1	2	0	0	0	2	63	64.5
13:00	68	3	2	3			1		77	81.3	13	6	2						21	22
13:15	51	2	3	2					58	62.1	12	4	1				1		18	17.9
13:30	40	7	1	2		1			51	55.1	14	1		1					16	17.3
13:45	47	9	3	1					60	62.8	13	1							14	14
H/Total	206	21	9	8	0	1	1	0	246	261.3	52	12	3	1	0	0	1	0	69	71.2
14:00	59	8	2			2			71	74	16	4	1	1					22	23.8
14:15	49	12	1	3			1		66	69.8	12	4	1	1					18	19.8
14:30	57	8	2	2					69	72.6	18	2				1			21	22
14:45	59	5		2		1	1		68	71	16	5				1			22	23
H/Total	224	33	5	7	0	3	2	0	274	287.4	62	15	2	2	0	2	0	0	83	88.6
15:00	78	11	1	1			1		92	93.2	19	1							20	20
15:15	59	9	1	2		3	1		75	80.5	16	2							18	18
15:30	92	16	1	1		2			112	115.8	18	3	1	1			2		25	25.6
15:45	70	11	2	3					86	90.9	25	5	1				1		32	31.9
H/Total	299	47	5	7	0	5	2	0	365	380.4	78	11	2	1	0	0	3	0	95	95.5
16:00	76	15	2	1		1			95	98.3	17	1							18	18
16:15	81	10	1	1				1	94	95	26	1	1				1	1	30	29.1
16:30	64	12	1	1			2	1	81	80.8	19	7							26	26
16:45	77	5	1			2			85	87.5	24	3				2			29	31
H/Total	298	42	5	3	0	3	2	2	355	361.6	86	12	1	0	0	2	1	1	103	104.1
17:00	79	10	1						90	90.5	31			1					32	33.3
17:15	61	7		2					70	72.6	22	1							23	23
17:30	74	7	1				2		84	83.3	23		1	1				1	26	27
17:45	76	8	1	1			5	1	92	90	21	2					1		24	23.4
H/Total	290	32	3	3	0	0	7	1	336	336.4	97	3	1	2	0	0	1	1	105	106.7
18:00	61	6					3		70	68.2	23	1						1	25	24.2
18:15	66	2					1		69	68.4	13	2							15	15
18:30	38	3							41	41	17							2	19	17.4
18:45	45	2						1	48	47.2	21							1	22	21.2
H/Total	210	13	0	0	0	0	4	1	228	224.8	74	3	0	0	0	0	0	4	81	77.8
Total	2665	371	71	76	0	17	21	8	3229	3361.3	806	107	20	15	0	9	8	9	974	1000.5

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **1**
Location: **A4231 Barry Docks Link Road / A4055 Cardiff Road / B4267 Sully Moors Road**
Date: **15 May 2018, Tuesday**

Time	C - C										C - D									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00									0	0	13	4	1						18	18.5
07:15									0	0	17	5	1	1					24	25.8
07:30									0	0	26	13	1	1	2			2	45	47.2
07:45									0	0	40	6	1					3	50	48.1
H/Total	0	0	0	0	0	0	0	0	0	0	96	28	4	2	2	0	0	5	137	139.6
08:00	1								1	1	60	3	2			2	3		70	71.2
08:15									0	0	65	6			1	2		2	76	77.4
08:30	1								1	1	70	5			2	1			78	81
08:45	1								1	1	56	4	1						61	61.5
H/Total	3	0	0	0	0	0	0	0	3	3	251	18	3	0	3	5	3	2	285	291.1
09:00									0	0	62	8				1	2		73	72.8
09:15									0	0	51	10	2		1		1		65	66.4
09:30									0	0	53	5	3		2		1		64	66.9
09:45									0	0	45	6	1						52	52.5
H/Total	0	0	0	0	0	0	0	0	0	0	211	29	6	0	3	1	4	0	254	258.6
10:00									0	0	46	15					1		62	61.4
10:15									0	0	44	4	1		1	1			51	53.5
10:30									0	0	35	5		1	2				43	46.3
10:45	1								1	1	55	8	1	1			1	1	67	67.4
H/Total	1	0	0	0	0	0	0	0	1	1	180	32	2	2	3	1	2	1	223	228.6
11:00									0	0	50	10	1			1			62	63.5
11:15									0	0	57	9			1		1		68	68.4
11:30		1							1	1	57	12	2		2		2		75	76.8
11:45									0	0	64	8	2						74	75
H/Total	0	1	0	0	0	0	0	0	1	1	228	39	5	0	3	1	3	0	279	283.7
12:00									0	0	75	5	2			1	1		84	85.4
12:15									0	0	64	6	1		1	1			73	75.5
12:30									0	0	56	9	2		2				69	72
12:45									0	0	45	11	1	1					58	59.8
H/Total	0	0	0	0	0	0	0	0	0	0	240	31	6	1	3	2	1	0	284	292.7
13:00									0	0	53	7					1		61	60.4
13:15									0	0	71	9	2		1				83	85
13:30									0	0	53	11	1		2				67	69.5
13:45									0	0	53	9	1						63	63.5
H/Total	0	0	0	0	0	0	0	0	0	0	230	36	4	0	3	0	1	0	274	278.4
14:00	2								2	2	33	4	2			1	2		42	42.8
14:15		1							1	1	69	7	1		1		2		80	80.3
14:30									0	0	51	11			2		1	2	67	66.8
14:45									0	0	47	7	1	2		1	1		59	62.5
H/Total	2	1	0	0	0	0	0	0	3	3	200	29	4	2	3	2	6	2	248	252.4
15:00									0	0	77	5				1			83	84
15:15									0	0	58	18	3	1	2	1	1		84	89.2
15:30									0	0	63	6		1	2	2	1		75	79.7
15:45									0	0	71	10	1						82	82.5
H/Total	0	0	0	0	0	0	0	0	0	0	269	39	4	2	4	4	2	0	324	335.4
16:00									0	0	51	12	1		1				65	66.5
16:15									0	0	64	12			1	1	1		79	80.4
16:30									0	0	62	6		1	2			2	73	74.7
16:45									0	0	55	10	1				2	1	69	67.5
H/Total	0	0	0	0	0	0	0	0	0	0	232	40	2	1	4	1	3	3	286	289.1
17:00									0	0	50	3	1			1			55	56.5
17:15									0	0	60	1		1	1				63	65.3
17:30									0	0	57	5			1	1		2	66	66.4
17:45									0	0	54	3			1		2	1	61	60
H/Total	0	0	0	0	0	0	0	0	0	0	221	12	1	1	3	2	2	3	245	248.2
18:00									0	0	54	3						1	58	57.2
18:15									0	0	57	2			1	1	1		62	63.4
18:30									0	0	58	3			2			1	64	65.2
18:45									0	0	53	1							54	54
H/Total	0	0	0	0	0	0	0	0	0	0	222	9	0	0	3	1	1	2	238	239.8
Total	6	2	0	0	0	0	0	0	8	8	2580	342	41	11	37	20	28	18	3077	3137.6

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
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Site No: **1**
Location: **A4231 Barry Docks Link Road / A4055 Cardiff Road / B4267 Sully Moors Road**
Date: **15 May 2018, Tuesday**

Time	D - A										D - B									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00	32	14				1			47	48	146	19	2	1	1	1	5		175	176.3
07:15	25	11	2	1			1		40	41.7	157	29		2		1			189	192.6
07:30	34	6	2	3					45	49.9	145	23	2			1	1		172	173.4
07:45	28	15	3	1					47	49.8	123	15	2	1	2		3		146	148.5
H/Total	119	46	7	5	0	1	1	0	179	189.4	571	86	6	4	3	3	9	0	682	690.8
08:00	18	10	4	3					35	40.9	120	11	5		1	1	2	1	141	143.5
08:15	27	8		5					40	46.5	133	18	1	2	2	3	2	1	162	168.1
08:30	43	20	4	5					72	80.5	108	18	3	2			1		132	135.5
08:45	46	9	3	3		1			62	68.4	97	22	2		2	1	2		126	128.8
H/Total	134	47	11	16	0	1	0	0	209	236.3	458	69	11	4	5	5	7	2	561	575.9
09:00	36	15	3	6					60	69.3	90	18	3				2		113	113.3
09:15	53	10	1	1					65	66.8	77	12	1		2	1	1		94	96.9
09:30	58	14		3		1			76	80.9	81	13	4			2			100	104
09:45	60	7	5	2			1		75	79.5	86	12	3		3	1	1		106	110.9
H/Total	207	46	9	12	0	1	1	0	276	296.5	334	55	11	0	5	4	4	0	413	425.1
10:00	58	11	1	3					73	77.4	70	11	1			3		1	86	88.7
10:15	50	18	4				1		73	74.4	83	11	3	1	1				99	102.8
10:30	51	15	1	5		3			75	85	86	17	5		2	2			112	118.5
10:45	40	8	3	5					56	64	87	13	2	3	1		1		107	112.3
H/Total	199	52	9	13	0	3	1	0	277	300.8	326	52	11	4	4	5	1	1	404	422.3
11:00	48	17	3	4		1	1		74	81.1	80	22	2						104	105
11:15	54	10		4			1		69	73.6	88	14	3		2				107	110.5
11:30	55	18	1	2			1	1	78	79.7	83	9	1		1		2		96	96.3
11:45	58	14	2	3		1			78	83.9	81	12	5				1		99	100.9
H/Total	215	59	6	13	0	2	3	1	299	318.3	332	57	11	0	3	0	3	0	406	412.7
12:00	58	9	5			1	1		74	76.9	88	19	5		1		1	1	115	117.1
12:15	70	12	2						84	85	113	15	2	3	1		1		135	140.3
12:30	62	8	1	3					74	78.4	94	10	5	2	2				113	120.1
12:45	54	18	3	2			1		78	81.5	92	11	3						106	107.5
H/Total	244	47	11	5	0	1	2	0	310	321.8	387	55	15	5	4	0	2	1	469	485
13:00	54	9	1	3		1	1		69	73.8	91	15	1		1		1		109	109.9
13:15	53	18	1	3					75	79.4	86	13		1	2	1	1		104	107.7
13:30	63	7	4	5		1			80	89.5	107	12	1		1		2		123	123.3
13:45	61	14	5	2		1			83	89.1	82	10					1	1	94	92.6
H/Total	231	48	11	13	0	3	1	0	307	331.8	366	50	2	1	4	1	5	1	430	433.5
14:00	50	7	2	3		1	1		64	69.3	76	16	3	2	1	2	1		101	107.5
14:15	77	9	3	1		2			92	96.8	59	9	2	4	2	3			79	90.2
14:30	63	14		4			4		85	87.8	82	16	3	1	2	1	1		106	111.2
14:45	61	8	1	3			1		74	77.8	85	12	3		2	1	3		106	108.7
H/Total	251	38	6	11	0	3	6	0	315	331.7	302	53	11	7	7	7	5	0	392	417.6
15:00	86	9	1	2		2	2		102	105.9	90	13	4		1	1	1	1	111	113.6
15:15	69	8	1	7		1			86	96.6	97	16	4			1			118	121
15:30	65	14		2	1				82	85.6	97	7			2	1	3		110	111.2
15:45	73	9	3	3			1		89	93.8	101	13	1		2	1			118	121.5
H/Total	293	40	5	14	1	3	3	0	359	381.9	385	49	9	0	5	4	4	1	457	467.3
16:00	62	19					1		82	81.4	100	7	4			3	2	1	117	120
16:15	75	11		2			1		89	91	104	15	2				1		122	122.4
16:30	85	16		2			1		104	106	100	9	2		1				112	114
16:45	64	12	1	2			3	1	83	83.5	92	10	1		1			1	105	105.7
H/Total	286	58	1	6	0	0	6	1	358	361.9	396	41	9	0	2	3	3	2	456	462.1
17:00	78	7							85	85	117	13	2					1	133	133.2
17:15	70	8	1	1					80	81.8	119	7	2		2	1			131	135
17:30	89	12	1				1		103	102.9	114	12			1				127	128
17:45	70	2		2			1		75	77	101	4			2	1	1	3	112	112
H/Total	307	29	2	3	0	0	2	0	343	346.7	451	36	4	0	5	2	1	4	503	508.2
18:00	70	5							75	75	94	9	1		2				106	108.5
18:15	62	5	1	1			2		71	71.6	96	10	1		1			1	109	109.7
18:30	57	5		1					63	64.3	92	2	1		2	1			98	101.5
18:45	56	3		3					62	65.9	72	4			1			2	79	78.4
H/Total	245	18	1	5	0	0	2	0	271	276.8	354	25	3	0	6	1	0	3	392	398.1
Total	2731	528	79	116	1	18	28	2	3503	3693.9	4662	628	103	25	53	35	44	15	5565	5698.6

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **1**
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Date: **15 May 2018, Tuesday**

Time	D - C										D - D									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00	35	8				1			44	45	2	6							8	8
07:15	33	7			1			1	42	42.2	3								3	3
07:30	56	12	2	1		1	1		73	75.7	5	2							7	7
07:45	62	13			1			1	77	77.2	5	6							11	11
H/Total	186	40	2	1	2	2	1	2	236	240.1	15	14	0	0	0	0	0	0	29	29
08:00	53	14	1		2	2	1		73	76.9	7	7							14	14
08:15	40	8	1			2			51	53.5	5	7							12	12
08:30	60	4				2	1		67	68.4	14	4							18	18
08:45	44	10	1						55	55.5	12	8	2						22	23
H/Total	197	36	3	0	2	6	2	0	246	254.3	38	26	2	0	0	0	0	0	66	67
09:00	63	9			2		1		75	76.4	11	8							19	19
09:15	48	14	2	1	1				66	69.3	15	7							22	22
09:30	44	9						1	54	53.2	9	1	1						11	11.5
09:45	49	5	3	1			2		60	61.6	13		2						15	16
H/Total	204	37	5	2	3	0	3	1	255	260.5	48	16	3	0	0	0	0	0	67	68.5
10:00	50	12	1		2	1			66	69.5	15	3							18	18
10:15	46	9	2		1			1	59	60.2	15	5	1						21	21.5
10:30	48	9	1				2		60	59.3	8	2							10	10
10:45	51	7							58	58	9	2							11	11
H/Total	195	37	4	0	3	1	2	1	243	247	47	12	1	0	0	0	0	0	60	60.5
11:00	42	5			2				49	51	8	5	1						14	14.5
11:15	48	10			1		1		60	60.4	7	3							10	10
11:30	55	7							62	62	5	1							6	6
11:45	60	15						1	76	75.2	7	6							13	13
H/Total	205	37	0	0	3	0	1	1	247	248.6	27	15	1	0	0	0	0	0	43	43.5
12:00	55	12	4		2		1		74	77.4	23	6	2						31	32
12:15	48	5	1	1	1				56	58.8	19	2							21	21
12:30	62	7							69	69	20	4							24	24
12:45	67	5					2		74	72.8	12	4							16	16
H/Total	232	29	5	1	3	0	3	0	273	278	74	16	2	0	0	0	0	0	92	93
13:00	56	15			2	1	1		75	77.4	23	2					1		26	25.4
13:15	66	10		1	1	1	1	1	81	82.9	21	1							22	22
13:30	56	4	1						61	61.5	18	6					1		25	24.4
13:45	67	11					1		79	78.4	12	4							16	16
H/Total	245	40	1	1	3	2	3	1	296	300.2	74	13	0	0	0	0	2	0	89	87.8
14:00	42	7			2	1			52	55	19	3	1						23	23.5
14:15	40	5	2		1	1	1		50	52.4	15	3							18	18
14:30	44	8				1			53	54	15	2							17	17
14:45	57	11							68	68	18	3	1				1		23	22.9
H/Total	183	31	2	0	3	3	1	0	223	229.4	67	11	2	0	0	0	1	0	81	81.4
15:00	67	4	2		2		1	1	77	78.6	17	4							21	21
15:15	54	5	1		1	1		1	63	64.7	15	5	1						21	21.5
15:30	71	8							79	79	17	5							22	22
15:45	71	6					1		78	77.4	17	4				1			22	23
H/Total	263	23	3	0	3	1	2	2	297	299.7	66	18	1	0	0	1	0	0	86	87.5
16:00	50	5	1		2				58	60.5	13	4							17	17
16:15	61	5		1	1		1		69	70.7	15	5							20	20
16:30	54	9	1	1					65	66.8	27	3	1						31	31.5
16:45	71	5	1				6		83	79.9	21						1		22	21.4
H/Total	236	24	3	2	3	0	7	0	275	277.9	76	12	1	0	0	0	1	0	90	89.9
17:00	63	5	1		2			2	73	73.9	32	3					1		36	35.4
17:15	80	5	1			1		2	89	88.9	26	1							27	27
17:30	68	8					2		78	76.8	22	2							24	24
17:45	52	3							55	55	17						1		18	17.4
H/Total	263	21	2	0	2	1	2	4	295	294.6	97	6	0	0	0	0	2	0	105	103.8
18:00	55	6	1		1	1		1	65	66.7	14								14	14
18:15	48	1							49	49	13	2					1		16	15.4
18:30	56	1			1	1			59	61	7	1							8	8
18:45	53	5							58	58	14								14	14
H/Total	212	13	1	0	2	2	0	1	231	234.7	48	3	0	0	0	0	1	0	52	51.4
Total	2621	368	31	7	32	18	27	13	3117	3165	677	162	13	0	0	1	7	0	860	863.3

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **1**
Location: **A4231 Barry Docks Link Road / A4055 Cardiff Road / B4267 Sully Moors Road**
Date: **15 May 2018, Tuesday**

Time	From A										To A									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00	117	25	4	1	0	1	2	1	151	153.3	66	31	5	4	0	2	0	0	108	117.7
07:15	127	29	0	2	0	1	0	0	159	162.6	73	24	2	6	1	0	2	2	110	117
07:30	141	25	4	7	0	2	1	0	180	192.5	111	27	3	3	0	0	1	0	145	149.8
07:45	180	35	1	5	0	1	2	0	224	230.8	109	25	4	1	0	0	1	0	140	142.7
H/Total	565	114	9	15	0	5	5	1	714	739.2	359	107	14	14	1	2	4	2	503	527.2
08:00	173	34	5	4	0	2	2	0	220	228.5	99	24	6	4	0	1	0	0	134	143.2
08:15	152	22	5	4	0	2	1	0	186	195.1	135	20	3	6	0	0	0	0	164	173.3
08:30	173	22	3	5	0	2	0	0	205	215	158	28	6	8	0	4	0	0	204	221.4
08:45	182	28	5	4	0	4	0	1	224	234.9	127	20	7	4	0	2	0	0	160	170.7
H/Total	680	106	18	17	0	10	3	1	835	873.5	519	92	22	22	0	7	0	0	662	708.6
09:00	119	24	0	3	2	2	0	0	150	157.9	132	24	7	9	0	7	1	0	180	201.6
09:15	131	27	5	12	1	0	2	0	178	195.9	124	19	4	4	0	0	0	0	151	158.2
09:30	137	21	6	3	0	2	0	0	169	177.9	133	24	0	6	0	2	1	1	167	175.4
09:45	129	20	8	7	0	0	0	0	164	177.1	126	19	8	5	0	0	1	0	159	168.9
H/Total	516	92	19	25	3	4	2	0	661	708.8	515	86	19	24	0	9	3	1	657	704.1
10:00	111	21	8	5	0	3	0	0	148	161.5	131	24	7	9	0	0	0	0	171	186.2
10:15	107	33	9	6	0	0	1	0	156	167.7	132	34	5	3	0	0	2	0	176	181.2
10:30	104	14	5	2	0	0	0	0	125	130.1	127	31	1	7	0	3	0	0	169	181.6
10:45	85	21	5	1	0	0	0	1	113	116	108	21	6	6	0	0	0	0	141	151.8
H/Total	407	89	27	14	0	3	1	1	542	575.3	498	110	19	25	0	3	2	0	657	700.8
11:00	117	18	8	1	0	0	0	0	144	149.3	124	30	7	9	0	1	2	0	173	188
11:15	97	20	5	7	0	0	0	0	129	140.6	117	23	0	6	0	0	1	0	147	154.2
11:30	107	13	8	9	0	2	0	0	139	156.7	120	29	6	3	0	0	1	1	160	165.5
11:45	103	17	2	8	0	0	0	0	130	141.4	136	33	5	6	0	1	0	0	181	192.3
H/Total	424	68	23	25	0	2	0	0	542	588	497	115	18	24	0	2	4	1	661	700
12:00	106	18	2	5	0	2	2	0	135	143.3	165	20	7	3	0	2	1	0	198	206.8
12:15	118	18	6	3	0	0	0	0	145	151.9	145	20	4	0	0	0	0	1	170	171.2
12:30	126	17	5	6	0	0	2	0	156	165.1	143	20	2	7	0	0	1	0	173	182.5
12:45	121	23	3	3	0	2	1	0	153	159.8	144	36	6	2	0	0	1	0	189	194
H/Total	471	76	16	17	0	4	5	0	589	620.1	597	96	19	12	0	2	3	1	730	754.5
13:00	133	21	9	4	0	1	2	0	170	179.5	167	17	4	6	0	1	2	0	197	206.6
13:15	137	15	6	6	0	1	2	0	167	177.6	138	26	4	5	0	0	0	0	173	181.5
13:30	101	13	7	2	0	1	1	0	125	131.5	149	18	5	7	0	2	0	0	181	194.6
13:45	114	7	5	3	0	2	0	0	131	139.4	144	28	8	3	0	1	1	0	185	193.3
H/Total	485	56	27	15	0	5	5	0	593	628	598	89	21	21	0	4	3	0	736	776
14:00	106	13	1	5	0	2	2	0	129	136.8	149	23	4	3	0	3	1	0	183	191.3
14:15	116	19	1	7	0	1	1	0	145	155	172	24	5	4	0	2	2	0	209	217.5
14:30	127	21	2	6	0	2	1	0	159	169.2	171	29	2	7	0	0	6	0	215	221.5
14:45	124	25	6	8	0	2	1	0	166	180.8	160	16	2	5	0	3	2	0	188	197.3
H/Total	473	78	10	26	0	7	5	0	599	641.8	652	92	13	19	0	8	11	0	795	827.6
15:00	138	17	3	1	0	1	1	0	161	164.2	203	23	3	3	0	2	4	0	238	243
15:15	139	19	5	7	0	4	0	0	174	189.6	184	20	2	9	0	6	1	0	222	240.1
15:30	99	20	2	1	0	2	3	0	127	129.5	212	34	1	3	1	2	1	0	254	260.8
15:45	153	14	2	2	0	1	0	0	172	176.6	203	24	5	6	0	1	2	0	241	251.1
H/Total	529	70	12	11	0	8	4	0	634	659.9	802	101	11	21	1	11	8	0	955	995
16:00	134	21	3	4	0	0	3	0	165	169.9	192	44	2	1	0	1	1	0	241	243.7
16:15	135	18	1	3	0	0	3	1	161	162.8	206	31	1	3	0	0	4	1	246	247.2
16:30	136	18	1	1	0	2	2	0	160	162.6	211	35	1	3	0	0	3	1	254	255.8
16:45	142	11	1	3	0	2	0	0	159	165.4	194	23	2	2	0	2	4	1	228	230.4
H/Total	547	68	6	11	0	4	8	1	645	660.7	803	133	6	9	0	3	12	3	969	977.1
17:00	135	12	4	1	1	0	1	1	155	157.9	217	25	1	0	0	0	1	0	244	243.9
17:15	143	11	3	5	0	0	0	0	162	170	206	19	2	4	0	0	1	0	232	237.6
17:30	116	10	1	2	0	0	4	0	133	133.7	231	21	2	0	0	0	3	0	257	256.2
17:45	130	12	1	1	0	1	3	0	148	149	182	13	1	3	0	0	7	1	207	206.4
H/Total	524	45	9	9	1	1	8	1	598	610.6	836	78	6	7	0	0	12	1	940	944.1
18:00	124	10	4	3	0	0	0	1	142	147.1	197	18	0	0	0	0	3	0	218	216.2
18:15	113	9	2	6	0	0	1	0	131	139.2	180	12	1	1	0	0	4	1	199	197.6
18:30	113	6	0	1	0	0	2	0	122	122.1	150	10	0	1	0	0	0	0	161	162.3
18:45	123	13	1	0	0	0	1	1	139	138.1	140	7	0	3	0	0	2	1	153	154.9
H/Total	473	38	7	10	0	0	4	2	534	546.5	667	47	1	5	0	0	9	2	731	731
Total	6094	900	183	195	4	53	50	7	7486	7852.4	7343	1146	169	203	2	51	71	11	8996	9346

Project Number:	**TSP13819**
Project Name:	**Dinas Powys - May 2018**
Survey Type:	**Manual Classified Turning Count**
Site No:	**1**
Location:	**A4231 Barry Docks Link Road / A4055 Cardiff Road / B4267 Sully Moors Road**
Date:	**15 May 2018, Tuesday**

Time	**From B**										**To B**									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00	42	15	1	2	3	0	0	0	63	69.1	208	26	3	1	1	1	6	1	247	247.4
07:15	60	14	2	1	2	0	1	0	80	83.7	221	31	0	3	0	3	0	0	258	264.9
07:30	102	23	2	2	3	2	1	0	135	143	201	30	4	1	0	3	1	0	240	245.7
07:45	123	21	2	1	2	2	0	0	151	157.3	174	29	2	2	2	0	4	0	213	216.2
H/Total	327	73	7	6	10	4	2	0	429	453.1	804	116	9	7	3	7	11	1	958	974.2
08:00	85	19	4	0	1	2	1	0	112	116.4	175	15	6	0	1	1	3	1	202	204.4
08:15	156	27	1	0	1	2	0	0	187	190.5	188	23	3	2	2	5	2	1	226	235.1
08:30	127	14	3	1	1	4	1	0	151	158.2	163	23	3	3	0	1	1	0	194	199.8
08:45	113	30	5	1	0	2	0	0	151	156.8	145	27	3	1	2	1	2	1	182	185.8
H/Total	481	90	13	2	3	10	2	0	601	621.9	671	88	15	6	5	8	8	3	804	825.1
09:00	118	18	3	2	3	12	2	0	158	175.9	140	25	4	0	0	0	2	0	171	171.8
09:15	121	21	4	1	0	0	0	0	147	150.3	131	22	3	0	2	1	1	0	160	163.9
09:30	99	21	7	3	1	2	1	0	134	143.8	128	21	5	3	0	2	0	0	159	167.4
09:45	105	25	7	2	1	1	0	0	141	149.1	132	18	3	3	3	1	1	0	161	169.8
H/Total	443	85	21	8	5	15	3	0	580	619.1	531	86	15	6	5	4	4	0	651	672.9
10:00	112	17	7	3	2	2	1	0	144	154.8	127	16	6	1	0	3	0	2	155	160.7
10:15	121	26	2	1	0	2	3	0	155	157.5	132	22	3	2	1	0	1	0	161	165.5
10:30	105	24	2	3	0	0	1	0	135	139.3	133	23	7	0	2	2	1	0	168	174.9
10:45	118	21	3	1	2	0	0	0	145	149.8	126	17	4	4	1	0	1	0	153	160.6
H/Total	456	88	14	8	4	4	5	0	579	601.4	518	78	20	7	4	5	3	2	637	661.7
11:00	132	23	7	3	2	1	3	0	171	179.6	119	27	6	2	0	1	0	0	155	161.6
11:15	103	21	7	0	1	1	1	1	135	139.1	123	21	8	2	2	0	0	0	156	164.6
11:30	119	22	6	2	1	3	0	1	154	162.8	125	13	2	2	1	0	2	0	145	148.4
11:45	137	25	3	3	1	1	1	0	171	177.8	125	22	6	0	0	0	2	0	155	156.8
H/Total	491	91	23	8	5	6	5	2	631	659.3	492	83	22	6	3	1	4	0	611	631.4
12:00	117	18	3	1	1	0	1	1	142	144.4	130	22	6	1	1	1	2	3	166	168.7
12:15	122	21	4	1	1	0	0	1	150	153.5	154	21	5	4	1	0	1	0	186	194.1
12:30	128	25	5	2	1	1	1	2	165	169.9	148	19	5	2	2	0	1	0	177	183.5
12:45	141	17	2	1	2	1	0	0	164	169.3	141	18	3	1	0	2	1	0	166	170.2
H/Total	508	81	14	5	5	2	2	4	621	637.1	573	80	19	8	4	3	5	3	695	716.5
13:00	149	16	4	3	0	0	0	0	172	177.9	144	28	3	0	1	0	1	0	177	178.9
13:15	129	21	0	0	2	1	1	0	154	156.4	138	19	1	1	2	1	3	0	165	168
13:30	132	18	1	2	1	1	1	0	156	160.5	143	14	3	1	1	0	2	0	164	166.6
13:45	129	18	2	2	1	0	2	0	154	157.4	127	12	3	0	0	2	1	1	146	148.1
H/Total	539	73	7	7	4	2	4	0	636	652.2	552	73	10	2	4	3	7	1	652	661.6
14:00	141	27	0	2	1	0	0	0	171	174.6	126	22	4	5	1	4	1	0	163	175.9
14:15	154	16	5	1	1	2	1	0	180	186.2	103	19	3	5	2	4	0	0	136	150
14:30	166	19	2	1	1	2	2	0	193	197.1	145	22	3	1	2	3	2	0	178	184.6
14:45	152	14	2	1	2	1	3	0	175	178.5	135	22	4	1	2	3	4	0	171	176.9
H/Total	613	76	9	5	5	5	6	0	719	736.4	509	85	14	12	7	14	7	0	648	687.4
15:00	126	14	6	0	0	3	3	1	153	156.4	151	17	5	0	1	2	2	1	179	182.5
15:15	169	15	4	1	1	6	1	1	198	206.9	142	21	5	0	0	2	0	0	170	174.5
15:30	169	23	3	1	1	2	4	1	204	206.6	149	14	2	1	2	2	5	0	175	178.3
15:45	169	17	5	0	0	5	2	0	198	204.3	166	18	2	0	2	1	1	0	190	193.4
H/Total	633	69	18	2	2	16	10	3	753	774.2	608	70	14	1	5	7	8	1	714	728.7
16:00	189	31	4	2	2	0	1	1	230	235.2	155	14	5	0	0	3	2	1	180	183.5
16:15	177	32	1	2	1	1	3	0	217	220.3	177	17	3	0	0	0	2	1	200	199.5
16:30	188	29	4	1	0	3	0	0	225	231.3	167	17	2	0	1	0	1	0	188	189.4
16:45	195	20	0	1	0	1	1	0	218	219.7	170	14	1	0	1	3	0	1	190	193.7
H/Total	749	112	9	6	3	5	5	1	890	906.5	669	62	11	0	2	6	5	3	758	766.1
17:00	207	27	1	0	3	0	1	1	240	242.1	193	16	3	1	1	0	1	1	216	218.4
17:15	233	20	1	1	0	0	4	1	260	258.6	192	11	3	0	2	1	0	0	209	213.5
17:30	247	10	1	0	1	1	3	3	266	264.3	177	17	1	1	1	0	1	1	199	200.4
17:45	192	17	1	1	0	0	2	2	215	214	161	7	0	0	2	1	2	3	176	175.4
H/Total	879	74	4	2	4	1	10	7	981	979	723	51	7	2	6	2	4	5	800	807.7
18:00	200	24	0	1	1	0	2	0	228	229.1	157	12	1	0	2	0	0	1	173	174.7
18:15	199	19	0	0	1	0	4	2	225	222	139	14	1	1	1	0	1	1	158	159.4
18:30	151	10	1	0	2	0	2	0	166	167.3	150	2	1	0	2	1	0	2	158	159.9
18:45	114	13	2	0	1	1	3	0	134	135.2	135	8	0	0	1	0	0	4	148	145.8
H/Total	664	66	3	1	5	1	11	2	753	753.6	581	36	3	1	6	1	1	8	637	639.8
Total	6783	978	142	60	55	71	65	19	8173	8393.8	7231	908	159	58	54	61	67	27	8565	8773.1

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **1**
Location: **A4231 Barry Docks Link Road / A4055 Cardiff Road / B4267 Sully Moors Road**
Date: **15 May 2018, Tuesday**

traffic survey partners

Time	From C										To C									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00	45	20	6	4	0	1	0	0	76	85.2	62	19	2	2	0	2	1	0	88	93
07:15	63	13	1	6	0	1	0	2	86	93.7	90	23	0	1	1	0	0	1	116	117.5
07:30	77	28	3	2	2	2	1	2	117	122.9	137	28	3	3	0	2	3	0	176	181.6
07:45	103	13	2	1	0	0	1	3	123	122.3	182	27	0	2	1	1	1	1	215	218.2
H/Total	288	74	12	13	2	4	2	7	402	424.1	471	97	5	8	2	5	5	2	595	610.3
08:00	136	13	4	1	0	2	3	0	159	162.5	164	35	2	2	2	4	2	0	211	219.4
08:15	151	14	3	1	1	3	0	2	175	180.2	138	25	3	2	0	3	0	0	171	178.1
08:30	172	12	2	3	2	3	0	0	194	203.9	173	16	1	3	0	5	1	0	199	207.8
08:45	126	9	6	2	0	0	0	0	143	148.6	156	28	8	1	0	5	0	0	198	208.3
H/Total	585	48	15	7	3	8	3	2	671	695.2	631	104	14	8	2	17	3	0	779	813.6
09:00	150	14	5	3	0	2	2	0	176	183.2	130	21	1	2	3	2	2	0	161	167.9
09:15	104	17	5	3	1	0	1	0	131	137.8	112	26	5	4	1	0	0	0	148	156.7
09:30	114	13	3	3	2	0	1	1	137	143	112	20	3	2	0	0	0	1	138	141.3
09:45	91	17	3	3	0	0	0	0	114	119.4	117	17	9	4	0	1	2	0	150	159.5
H/Total	459	61	16	12	3	2	4	1	558	583.4	471	84	18	12	4	3	4	1	597	625.4
10:00	102	24	4	5	0	0	1	1	137	144.1	99	21	3	1	2	2	0	0	128	134.8
10:15	108	13	2	3	1	1	0	0	128	134.9	110	22	9	2	1	0	0	1	145	152.3
10:30	103	16	2	2	2	0	1	0	126	131	88	17	5	2	0	0	2	0	114	117.9
10:45	112	17	4	3	0	0	1	1	138	142.5	104	15	1	1	0	0	0	1	122	123
H/Total	425	70	12	13	3	1	3	2	529	552.5	401	75	18	6	3	2	2	2	509	528
11:00	106	20	4	4	0	2	0	0	136	145.2	104	17	4	0	2	0	0	0	127	131
11:15	109	20	1	2	1	0	1	0	134	137.5	106	20	2	1	1	1	1	0	132	135.7
11:30	106	21	5	1	2	0	2	0	137	141.6	109	15	4	4	0	1	0	0	133	141.2
11:45	120	25	6	2	0	0	1	0	154	159	122	24	1	2	0	1	0	1	151	154.3
H/Total	441	86	16	9	3	2	4	0	561	583.3	441	76	11	7	3	3	1	1	543	562.2
12:00	164	15	2	3	0	2	1	2	189	193.7	103	21	6	1	2	0	2	0	135	140.1
12:15	118	14	2	0	1	1	0	1	137	139.2	112	14	4	3	1	0	0	0	134	140.9
12:30	113	18	2	3	2	0	1	0	139	145.3	129	18	4	0	0	0	0	1	152	153.2
12:45	112	26	4	2	0	0	0	0	144	148.6	135	16	1	0	0	0	2	0	154	153.3
H/Total	507	73	10	8	3	3	2	3	609	626.8	479	69	15	4	3	0	4	1	575	587.5
13:00	134	16	4	3	0	0	2	0	159	163.7	120	26	6	3	2	1	1	0	159	168.3
13:15	134	15	6	2	1	0	1	0	159	165	132	21	0	5	1	1	2	1	163	169.5
13:30	107	19	2	3	2	1	0	0	134	141.9	111	11	6	3	0	1	1	0	133	140.3
13:45	113	19	4	1	0	0	0	0	137	140.3	132	18	0	3	0	0	1	0	154	157.3
H/Total	488	69	16	9	3	1	3	0	589	610.9	495	76	12	14	3	3	5	1	609	635.4
14:00	110	16	5	1	0	3	2	0	137	142.6	93	16	0	1	2	1	1	0	114	117.7
14:15	130	24	3	4	1	0	3	0	165	170.9	99	13	3	1	1	2	1	0	120	125.2
14:30	126	21	2	2	2	1	1	2	157	161.4	108	22	2	2	0	3	0	0	137	143.6
14:45	122	17	1	4	0	3	2	0	149	156.5	131	26	2	3	0	0	0	0	162	166.9
H/Total	488	78	11	11	3	7	8	2	608	631.4	431	77	7	7	3	6	2	0	533	553.4
15:00	174	17	1	1	0	1	1	0	195	197.2	144	11	7	1	2	1	2	2	170	175
15:15	133	29	4	3	2	4	2	0	177	187.7	131	19	5	4	1	3	0	2	165	175.1
15:30	173	25	2	3	2	4	3	0	212	221.1	115	18	2	2	0	1	1	1	140	143.2
15:45	166	26	4	3	0	0	1	0	200	205.3	155	12	1	2	0	1	1	0	172	175.5
H/Total	646	97	11	10	4	9	7	0	784	811.3	545	60	15	9	3	6	4	5	647	668.8
16:00	144	28	3	1	1	1	0	0	178	182.8	123	10	3	2	2	0	2	0	142	146.9
16:15	171	23	2	1	1	1	2	2	203	204.5	120	13	0	4	1	1	1	1	141	146.8
16:30	145	25	1	2	2	0	2	3	180	181.5	111	16	1	3	0	1	0	0	132	137.4
16:45	156	18	2	0	0	4	2	1	183	186	130	10	1	3	0	1	6	0	151	152.8
H/Total	616	94	8	4	4	6	6	6	744	754.8	484	49	5	12	3	3	9	1	566	583.9
17:00	160	13	2	1	0	1	0	0	177	180.3	127	14	3	0	2	0	0	3	149	150.1
17:15	143	9	0	3	1	0	0	0	156	160.9	145	11	2	3	0	1	0	2	164	168.3
17:30	154	12	2	1	1	1	2	3	176	176.7	136	11	1	0	0	0	4	0	152	150.1
17:45	151	13	1	1	1	0	8	2	177	173.4	126	11	2	1	0	1	3	0	144	145.5
H/Total	608	47	5	6	3	2	10	5	686	691.3	534	47	8	4	2	2	7	5	609	614
18:00	138	10	0	0	0	0	3	2	153	149.6	112	13	4	2	1	1	1	2	136	140.4
18:15	136	6	0	0	1	1	2	0	146	146.8	117	6	1	3	0	0	0	0	127	131.4
18:30	113	6	0	0	2	0	0	3	124	123.6	108	4	0	0	1	1	1	0	115	116.4
18:45	119	3	0	0	0	0	0	2	124	122.4	109	12	1	0	0	0	1	0	123	122.9
H/Total	506	25	0	0	3	1	5	7	547	542.4	446	35	6	5	2	2	3	2	501	511.1
Total	6057	822	132	102	37	46	57	35	7288	7507.4	5829	849	134	96	33	52	49	21	7063	7293.6

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **1**
Location: **A4231 Barry Docks Link Road / A4055 Cardiff Road / B4267 Sully Moors Road**
Date: **15 May 2018, Tuesday**

traffic survey partners

Time	From D										To D									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00	215	47	2	1	1	3	5	0	274	277.3	83	31	3	1	3	0	0	0	121	126.8
07:15	218	47	2	3	1	1	1	1	274	279.5	84	25	3	2	1	0	0	0	115	120.1
07:30	240	43	6	4	0	2	2	0	297	306	111	34	5	8	5	3	0	2	168	187.3
07:45	218	49	5	2	3	0	3	1	281	286.5	159	37	4	4	2	2	0	3	211	219.8
H/Total	891	186	15	10	5	6	11	2	1126	1149.3	437	127	15	15	11	5	0	5	615	654
08:00	198	42	10	3	3	3	3	1	263	275.3	154	34	9	2	1	3	4	0	207	215.7
08:15	205	41	2	7	2	5	2	1	265	280.1	203	36	2	2	2	4	1	2	252	259.4
08:30	225	46	7	7	0	2	2	0	289	302.4	203	27	5	2	3	1	1	0	242	250.5
08:45	199	49	8	3	2	2	2	0	265	275.7	192	41	6	4	0	0	0	0	243	251.2
H/Total	827	178	27	20	7	12	9	2	1082	1133.5	752	138	22	10	6	8	6	2	944	976.8
09:00	200	50	6	6	2	0	3	0	267	278	185	36	2	3	4	7	2	0	239	253.7
09:15	193	43	4	2	3	1	1	0	247	255	182	41	6	10	2	0	3	0	244	260.2
09:30	192	37	5	3	0	3	0	1	241	249.6	169	27	13	1	3	3	1	0	217	230.2
09:45	208	24	13	3	3	1	4	0	256	268	158	32	11	3	1	0	0	0	205	215.4
H/Total	793	154	28	14	8	5	8	1	1011	1050.6	694	136	32	17	10	10	6	0	905	959.5
10:00	193	37	3	3	2	4	0	1	243	253.6	161	38	6	5	2	4	2	0	218	232.3
10:15	194	43	10	1	2	0	1	1	252	258.9	156	37	6	4	1	3	2	0	209	220
10:30	193	43	7	5	2	5	2	0	257	272.8	157	26	3	3	2	0	1	0	192	198.8
10:45	187	30	5	8	1	0	1	0	232	245.3	164	36	6	2	2	0	1	1	212	218.2
H/Total	767	153	25	17	7	9	4	2	984	1030.6	638	137	21	14	7	7	6	1	831	869.3
11:00	178	49	6	4	2	1	1	0	241	251.6	186	36	8	1	2	2	2	0	237	245.1
11:15	197	37	3	4	3	0	2	0	246	254.5	160	34	6	4	2	0	2	1	209	217.2
11:30	198	35	2	2	1	0	3	1	242	244	176	34	9	5	3	4	2	1	234	250
11:45	206	47	7	3	0	1	1	1	266	273	183	35	6	8	1	0	1	0	234	247.8
H/Total	779	168	18	13	6	2	7	2	995	1023.1	705	139	29	18	8	6	7	2	914	960.1
12:00	224	46	16	0	3	1	3	1	294	303.4	213	34	4	4	1	2	2	1	261	269.2
12:15	250	34	5	4	2	0	1	0	296	305.1	197	32	4	1	2	1	0	1	238	243.5
12:30	238	29	6	5	2	0	0	0	280	291.5	185	32	7	7	3	1	2	1	238	252.6
12:45	225	38	6	2	0	0	3	0	274	277.8	179	34	5	5	2	1	0	0	226	238
H/Total	937	147	33	11	7	1	7	1	1144	1177.8	774	132	20	17	8	5	4	3	963	1003.3
13:00	224	41	2	3	3	2	4	0	279	286.5	209	23	6	4	0	1	4	0	247	253.8
13:15	226	42	1	5	3	2	2	1	282	292	218	27	8	2	3	2	1	0	261	272
13:30	244	29	6	5	1	1	3	0	289	298.7	181	36	2	1	3	1	2	0	226	231.1
13:45	222	39	5	2	0	1	2	1	272	276.1	175	25	5	2	1	0	1	0	209	214.5
H/Total	916	151	14	15	7	6	11	2	1122	1153.3	783	111	21	9	7	4	8	0	943	971.4
14:00	187	33	6	5	3	4	2	0	240	255.3	176	28	4	4	1	1	3	0	217	224.4
14:15	191	26	7	5	3	6	1	0	239	257.4	217	29	5	7	2	1	3	0	264	276.8
14:30	204	40	3	5	2	2	5	0	261	270	199	28	2	4	3	1	1	2	240	248
14:45	221	34	5	3	2	1	5	0	271	277.4	193	26	6	7	2	1	5	0	240	252.1
H/Total	803	133	21	18	10	13	13	0	1011	1060.1	785	111	17	22	8	4	12	2	961	1001.3
15:00	260	30	7	2	3	3	4	2	311	319.1	200	27	2	0	0	3	1	0	233	236.4
15:15	235	34	7	7	1	3	0	1	288	303.8	219	37	8	5	3	6	2	0	280	298.3
15:30	250	34	0	2	3	1	3	0	293	297.8	215	36	2	1	3	4	6	0	267	272.7
15:45	262	32	4	3	2	2	2	0	307	315.7	226	35	7	0	0	5	1	0	274	281.9
H/Total	1007	130	18	14	9	9	9	3	1199	1236.4	860	135	19	6	6	18	10	0	1054	1089.3
16:00	225	35	5	0	2	3	3	1	274	278.9	222	47	5	4	3	0	2	1	284	292.7
16:15	255	36	2	3	1	0	3	0	300	304.1	235	48	2	2	2	1	4	0	294	298.2
16:30	266	37	4	3	1	0	1	0	312	318.3	246	41	6	1	2	4	1	2	303	311.1
16:45	248	27	3	2	1	0	10	2	293	290.5	247	29	2	1	0	1	3	1	284	284.7
H/Total	994	135	14	8	5	3	17	3	1179	1191.8	950	165	15	8	7	6	10	4	1165	1186.7
17:00	290	28	3	0	2	0	1	3	327	327.5	255	25	3	1	3	1	1	1	290	295.4
17:15	295	21	4	1	2	2	0	2	327	332.7	271	20	1	3	1	0	3	1	300	302.8
17:30	293	34	1	0	1	0	3	0	332	331.7	266	17	1	2	2	2	4	5	299	299.7
17:45	240	9	0	2	2	1	3	3	260	261.4	244	20	0	1	1	0	4	3	273	270.5
H/Total	1118	92	8	3	7	3	7	8	1246	1253.3	1036	82	5	7	7	3	12	10	1162	1168.4
18:00	233	20	2	0	3	1	0	1	260	264.2	229	21	1	2	1	0	1	1	256	258.7
18:15	219	18	2	1	1	0	3	1	245	245.7	231	20	1	2	2	1	5	1	263	265.3
18:30	212	9	1	1	3	2	0	0	228	234.8	181	15	1	1	4	0	3	1	206	209.2
18:45	195	12	0	3	1	0	0	2	213	216.3	167	14	2	0	1	1	1	0	186	188.4
H/Total	859	59	5	5	8	3	3	4	946	961	808	70	5	5	8	2	10	3	911	921.6
Total	10691	1686	226	148	86	72	106	30	13045	13421	9222	1483	221	148	93	78	91	32	11368	11762

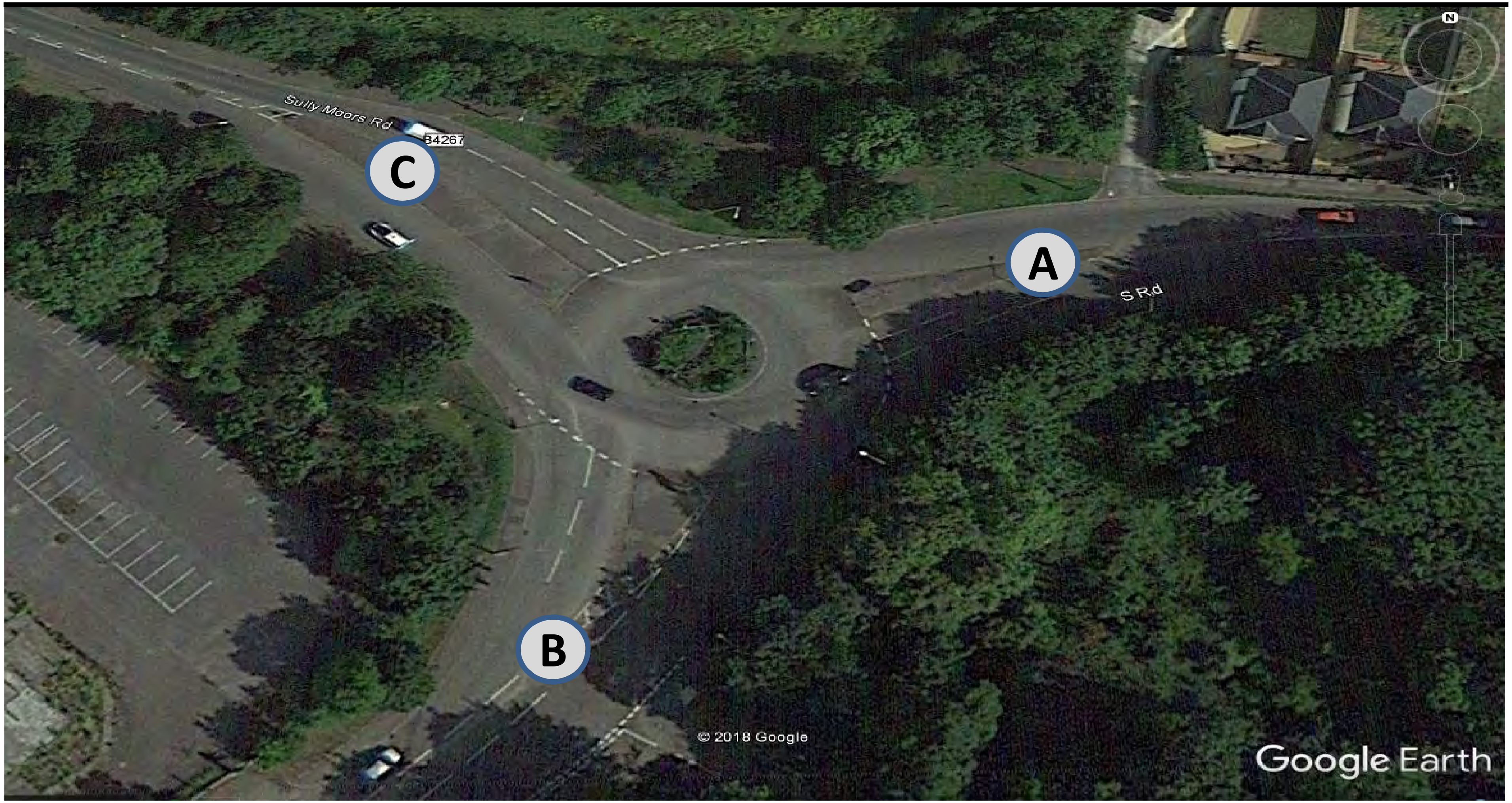
Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **1**
Location: **A4231 Barry Docks Link Road / A4055 Cardiff Road / B4267 Sully Moors Road**
Date: **15 May 2018, Tuesday**

Time	Whole Junction									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00	419	107	13	8	4	5	7	1	564	584.9
07:15	468	103	5	12	3	3	2	3	599	619.5
07:30	560	119	15	15	5	8	5	2	729	764.4
07:45	624	118	10	9	5	3	6	4	779	796.9
H/Total	2071	447	43	44	17	19	20	10	2671	2765.7
08:00	592	108	23	8	4	9	9	1	754	782.7
08:15	664	104	11	12	4	12	3	3	813	845.9
08:30	697	94	15	16	3	11	3	0	839	879.5
08:45	620	116	24	10	2	8	2	1	783	816
H/Total	2573	422	73	46	13	40	17	5	3189	3324.1
09:00	587	106	14	14	7	16	7	0	751	795
09:15	549	108	18	18	5	1	4	0	703	739
09:30	542	92	21	12	3	7	2	2	681	714.3
09:45	533	86	31	15	4	2	4	0	675	713.6
H/Total	2211	392	84	59	19	26	17	2	2810	2961.9
10:00	518	99	22	16	4	9	2	2	672	714
10:15	530	115	23	11	3	3	5	1	691	719
10:30	505	97	16	12	4	5	4	0	643	673.2
10:45	502	89	17	13	3	0	2	2	628	653.6
H/Total	2055	400	78	52	14	17	13	5	2634	2759.8
11:00	533	110	25	12	4	4	4	0	692	725.7
11:15	506	98	16	13	5	1	4	1	644	671.7
11:30	530	91	21	14	4	5	5	2	672	705.1
11:45	566	114	18	16	1	2	3	1	721	751.2
H/Total	2135	413	80	55	14	12	16	4	2729	2853.7
12:00	611	97	23	9	4	5	7	4	760	784.8
12:15	608	87	17	8	4	1	1	2	728	749.7
12:30	605	89	18	16	5	1	4	2	740	771.8
12:45	599	104	15	8	2	3	4	0	735	755.5
H/Total	2423	377	73	41	15	10	16	8	2963	3061.8
13:00	640	94	19	13	3	3	8	0	780	807.6
13:15	626	93	13	13	6	4	6	1	762	791
13:30	584	79	16	12	4	4	5	0	704	732.6
13:45	578	83	16	8	1	3	4	1	694	713.2
H/Total	2428	349	64	46	14	14	23	2	2940	3044.4
14:00	544	89	12	13	4	9	6	0	677	709.3
14:15	591	85	16	17	5	9	6	0	729	769.5
14:30	623	101	9	14	5	7	9	2	770	797.7
14:45	619	90	14	16	4	7	11	0	761	793.2
H/Total	2377	365	51	60	18	32	32	2	2937	3069.7
15:00	698	78	17	4	3	8	9	3	820	836.9
15:15	676	97	20	18	4	17	3	2	837	888
15:30	691	102	7	7	6	9	13	1	836	855
15:45	750	89	15	8	2	8	5	0	877	901.9
H/Total	2815	366	59	37	15	42	30	6	3370	3481.8
16:00	692	115	15	7	5	4	7	2	847	866.8
16:15	738	109	6	9	3	2	11	3	881	891.7
16:30	735	109	10	7	3	5	5	3	877	893.7
16:45	741	76	6	6	1	7	13	3	853	861.6
H/Total	2906	409	37	29	12	18	36	11	3458	3513.8
17:00	792	80	10	2	6	1	3	5	899	907.8
17:15	814	61	8	10	3	2	4	3	905	922.2
17:30	810	66	5	3	3	2	12	6	907	906.4
17:45	713	51	3	5	3	2	16	7	800	797.8
H/Total	3129	258	26	20	15	7	35	21	3511	3534.2
18:00	695	64	6	4	4	1	5	4	783	790
18:15	667	52	4	7	3	1	10	3	747	753.7
18:30	589	31	2	2	7	2	4	3	640	647.8
18:45	551	41	3	3	2	1	4	5	610	612
H/Total	2502	188	15	16	16	5	23	15	2780	2803.5
Total	29625	4386	683	505	182	242	278	91	35992	37174

Peak Hours		Totals
07:00	08:00	2671
07:15	08:15	2861
07:30	08:30	3075
07:45	08:45	3185
08:00	09:00	3189
08:15	09:15	3186
08:30	09:30	3076
08:45	09:45	2918
09:00	10:00	2810
09:15	10:15	2731
09:30	10:30	2719
09:45	10:45	2681
10:00	11:00	2634
10:15	11:15	2654
10:30	11:30	2607
10:45	11:45	2636
11:00	12:00	2729
11:15	12:15	2797
11:30	12:30	2881
11:45	12:45	2949
12:00	13:00	2963
12:15	13:15	2983
12:30	13:30	3017
12:45	13:45	2981
13:00	14:00	2940
13:15	14:15	2837
13:30	14:30	2804
13:45	14:45	2870
14:00	15:00	2937
14:15	15:15	3080
14:30	15:30	3188
14:45	15:45	3254
15:00	16:00	3370
15:15	16:15	3397
15:30	16:30	3441
15:45	16:45	3482
16:00	17:00	3458
16:15	17:15	3510
16:30	17:30	3534
16:45	17:45	3564
17:00	18:00	3511
17:15	18:15	3395
17:30	18:30	3237
17:45	18:45	2970
18:00	19:00	2780

Client:	Arcadis
Project Number:	TSP13819
Project Name:	Dinas Powys - May 2018
Survey Type:	Manual Classified Turning Count
Survey Date:	15 May 2018, Tuesday
Survey Time:	07:00 - 19:00
Weather:	Dry
Comments:	

Project Number: TSP13819
Project Name: Dinas Powys - May 2018
Survey Type: Manual Classified Turning Count
Site No: 2
Location: Sully Moors Road / B4267 South Road / Hayes Road



Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **2**
Location: **Sully Moors Road / B4267 South Road / Hayes Road**
Date: **15 May 2018, Tuesday**

	1	1	1.5	2.3	2	2	0.4	0.2												
Time	**A - A**										**A - B**									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00									0	0	6	1							7	7
07:15									0	0	11	3	1						15	15.5
07:30									0	0	13	5			1		1	1	21	20.6
07:45			1						1	1.5	27	2							29	29
H/Total	0	0	1	0	0	0	0	0	1	1.5	57	11	1	0	1	0	1	1	72	72.1
08:00									0	0	22	1				1			24	25
08:15	1								1	1	28	5				1			34	35
08:30									0	0	30		1		1				32	33.5
08:45									0	0	24	3							27	27
H/Total	1	0	0	0	0	0	0	0	1	1	104	9	1	0	1	2	0	0	117	120.5
09:00		1							1	1	36	1				1			38	39
09:15									0	0	26	1				1			28	29
09:30									0	0	11	2		1	1				15	17.3
09:45									0	0	22	3							25	25
H/Total	0	1	0	0	0	0	0	0	1	1	95	7	0	1	1	2	0	0	106	110.3
10:00									0	0	24	5	2			1			32	34
10:15									0	0	21	4	1						26	26.5
10:30		1							1	1	21	7	1		1				30	31.5
10:45	1	1							2	2	30	3							33	33
H/Total	1	2	0	0	0	0	0	0	3	3	96	19	4	0	1	1	0	0	121	125
11:00									0	0	32	2				1			35	36
11:15	1								1	1	31	3	1						35	35.5
11:30									0	0	17	2	2		1				22	24
11:45									0	0	17	3				1			21	22
H/Total	1	0	0	0	0	0	0	0	1	1	97	10	3	0	1	2	0	0	113	117.5
12:00	1								1	1	24	2							26	26
12:15									0	0	21	5	1					1	28	27.7
12:30									0	0	22	1	2		1		1		27	28.4
12:45	1								1	1	27	4	1						32	32.5
H/Total	2	0	0	0	0	0	0	0	2	2	94	12	4	0	1	0	1	1	113	114.6
13:00									0	0	26	4					1		31	30.4
13:15									0	0	21	7				1			29	30
13:30	3								3	3	28	3			1				32	33
13:45									0	0	28	4	1						33	33.5
H/Total	3	0	0	0	0	0	0	0	3	3	103	18	1	0	1	1	1	0	125	126.9
14:00	1								1	1	34	3	1						38	38.5
14:15	1								1	1	24	2						1	27	26.2
14:30	1	1							2	2	29	4			1			1	35	35.2
14:45	1								1	1	27	4	1	1		2			35	38.8
H/Total	4	1	0	0	0	0	0	0	5	5	114	13	2	1	1	2	0	2	135	138.7
15:00									0	0	29	8						1	38	37.2
15:15									0	0	56	4	2	1		3			66	71.3
15:30		1							1	1	47	3	2		1	2			55	59
15:45									0	0	36	5	1			2			44	46.5
H/Total	0	1	0	0	0	0	0	0	1	1	168	20	5	1	1	7	0	1	203	214
16:00	4								4	4	64	6	2			1			73	75
16:15									0	0	62	6	1			1			70	71.5
16:30									0	0	43	10	1		1			1	56	56.7
16:45	1								1	1	63	5	2				1	1	72	71.6
H/Total	5	0	0	0	0	0	0	0	5	5	232	27	6	0	1	2	1	2	271	274.8
17:00									0	0	53	6					1	1	61	59.6
17:15									0	0	59	5	2	1					67	69.3
17:30	1								1	1	52	3				1	1	2	59	57.8
17:45									0	0	42	5						3	50	47.6
H/Total	1	0	0	0	0	0	0	0	1	1	206	19	2	1	0	1	2	6	237	234.3
18:00	1								1	1	33							3	36	33.6
18:15									0	0	24	2					1	1	28	26.6
18:30	1								1	1	16				1			3	20	18.6
18:45									0	0	25	1						1	27	26.2
H/Total	2	0	0	0	0	0	0	0	2	2	98	3	0	0	1	0	1	8	111	105
Total	20	5	1	0	0	0	0	0	26	26.5	1464	168	29	4	11	20	7	21	1724	1753.7

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **2**
Location: **Sully Moors Road / B4267 South Road / Hayes Road**
Date: **15 May 2018, Tuesday**

Time	**A - C**										**B - A**									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00	36	9	2						47	48	18	1	2			1		1	23	24.2
07:15	46	13						3	62	59.6	30	5	1					2	38	36.9
07:30	57	12	2		1	1	1	3	77	77	71	4				1	1	2	79	77.8
07:45	84	9	1				1	4	99	95.7	88	9	5			1	1		104	106.9
H/Total	223	43	5	0	1	1	2	10	285	280.3	207	19	8	0	0	3	2	5	244	245.8
08:00	109	10	1			2	3	1	126	125.9	85	9				3			97	100
08:15	148	15	1		1	4		2	171	174.9	76	17	1			3		1	98	100.7
08:30	129	9	1		1	2			142	145.5	50	4				3	1		58	60.4
08:45	117	9	2	1			1		130	131.7	36	3	1			1	1		42	42.9
H/Total	503	43	5	1	2	8	4	3	569	578	247	33	2	0	0	10	2	1	295	304
09:00	120	9				2	2		133	133.8	33	4				2			39	41
09:15	100	6	2	2	1		1	1	113	116.2	17	6				1			24	25
09:30	79	6	2		1		1		89	90.4	34	4						1	39	38.2
09:45	62	8	1	1				1	73	74	23	6	1			2			32	34.5
H/Total	361	29	5	3	2	2	4	2	408	414.4	107	20	1	0	0	5	0	1	134	138.7
10:00	77	21	3				1	1	103	103.1	21	6	1		1		1		30	30.9
10:15	81	6	1	1	1	1	1		92	95.2	22	6	1						29	29.5
10:30	72	12	2		1				87	89	23	6		1					30	31.3
10:45	84	15		1			1	1	102	101.9	28	3						1	32	31.2
H/Total	314	54	6	2	2	1	3	2	384	389.2	94	21	2	1	1	0	1	1	121	122.9
11:00	80	12	2					1	95	95.2	30	3	2					1	36	36.2
11:15	87	9			1				97	98	29	1			1				31	32
11:30	87	14	4		1		2		108	109.8	31	4					1	1	37	35.6
11:45	109	13	2				1		125	125.4	23	2					1		26	25.4
H/Total	363	48	8	0	2	0	3	1	425	428.4	113	10	2	0	1	0	2	2	130	129.2
12:00	130	11	1			2	1	2	147	147.3	27	2	2		1	1			33	36
12:15	83	8	2		1	1		1	96	98.2	25	4					1	1	31	29.6
12:30	86	12	1		1				100	101.5	30	3							33	33
12:45	102	15	1				1		119	118.9	20	5	1	1					27	28.8
H/Total	401	46	5	0	2	3	2	3	462	465.9	102	14	3	1	1	1	1	1	124	127.4
13:00	94	8					1		103	102.4	27	3		1		1		1	33	34.5
13:15	96	10	5		1		1	1	114	116.1	21	3	1	1		2			28	31.8
13:30	88	12	2	1	2				105	109.3	19	2							21	21
13:45	81	12	2						95	96	25	1	1				1		28	27.9
H/Total	359	42	9	1	3	0	2	1	417	423.8	92	9	2	2	0	3	1	1	110	115.2
14:00	88	11	3			1	1		104	105.9	27		1		1				29	30.5
14:15	113	14			1		3	2	133	130.6	22	1							23	23
14:30	90	16	1	1	1		1	1	111	112.4	30	9							39	39
14:45	105	7	1	2		1	1		117	120.5	25	4	1			1			31	32.5
H/Total	396	48	5	3	2	2	6	3	465	469.4	104	14	2	0	1	1	0	0	122	125
15:00	118	11	1			1	1		132	132.9	42	2	1						45	45.5
15:15	107	18	2		2	4	2		135	140.8	33	6	2		1	1	1	1	45	46.6
15:30	137	16	1	1	1	1	2		159	161.6	29	5						1	35	34.2
15:45	145	25	2	1					173	175.3	30	1						1	32	31.2
H/Total	507	70	6	2	3	6	5	0	599	610.6	134	14	3	0	1	1	1	3	157	157.5
16:00	106	10			1	1	1		119	120.4	49	3	1	1	1				55	57.8
16:15	125	19	1		1	1	1	2	150	150.3	31	1					1		33	32.4
16:30	101	11	1		1		2	2	118	116.7	34	4	1				1		40	39.9
16:45	100	12	1			3	2		118	120.3	33	3							36	36
H/Total	432	52	3	0	3	5	6	4	505	507.7	147	11	2	1	1	0	2	0	164	166.1
17:00	96	11	1			1		1	110	110.7	55	5			1		2		63	62.8
17:15	123	8		1	1	1		1	135	137.5	27	1						4	32	28.8
17:30	108	8	2		1		1	3	123	122	41	2							43	43
17:45	113	8					4	1	126	122.8	26								26	26
H/Total	440	35	3	1	2	2	5	6	494	493	149	8	0	0	1	0	2	4	164	160.6
18:00	109	9					1	2	121	118.8	24				1				25	26
18:15	113	5			1	1	2	1	123	123	13	4						1	18	17.2
18:30	90	5			1			2	98	97.4	14	1							15	15
18:45	102	3						3	108	105.6	12						1	2	15	12.8
H/Total	414	22	0	0	2	1	3	8	450	444.8	63	5	0	0	1	0	1	3	73	71
Total	4713	532	60	13	26	31	45	43	5463	5505.5	1559	178	27	5	8	24	15	22	1838	1863.4

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **2**
Location: **Sully Moors Road / B4267 South Road / Hayes Road**
Date: **15 May 2018, Tuesday**

traffic survey partners

Time	B - B										B - C									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00									0	0	10	7	3	5		1			26	35
07:15									0	0	15	2		4		1		1	23	28.4
07:30									0	0	19	11	1	1	1	2		1	36	40
07:45									0	0	15	4	1	1					21	22.8
H/Total	0	0	0	0	0	0	0	0	0	0	59	24	5	11	1	4	0	2	106	126.2
08:00									0	0	27	4	2	2					35	38.6
08:15									0	0	19	1	1	2					23	26.1
08:30									0	0	19	2	1	1	1				24	26.8
08:45									0	0	17		3	2					22	26.1
H/Total	0	0	0	0	0	0	0	0	0	0	82	7	7	7	1	0	0	0	104	117.6
09:00									0	0	16	6	6	3					31	37.9
09:15									0	0	9	8	2	3				1	23	27.1
09:30									0	0	22	4	1	2	1			1	31	34.3
09:45									0	0	17	7		3					27	30.9
H/Total	0	0	0	0	0	0	0	0	0	0	64	25	9	11	1	0	0	2	112	130.2
10:00									0	0	20	5	1	4					30	35.7
10:15									0	0	20	3		1					24	25.3
10:30									0	0	24	6		1	1				32	34.3
10:45									0	0	21	2	1	4					28	33.7
H/Total	0	0	0	0	0	0	0	0	0	0	85	16	2	10	1	0	0	0	114	129
11:00									0	0	25	8	2	2					37	40.6
11:15			1						1	1.5	24	7	1	2			1		35	37.5
11:30									0	0	14	4	3		1				22	24.5
11:45									0	0	18	6	2	1					27	29.3
H/Total	0	0	1	0	0	0	0	0	1	1.5	81	25	8	5	1	0	1	0	121	131.9
12:00									0	0	18	5		2					25	27.6
12:15									0	0	20	4	1						25	25.5
12:30									0	0	25	5		2	1				33	36.6
12:45									0	0	27	6	3	2					38	42.1
H/Total	0	0	0	0	0	0	0	0	0	0	90	20	4	6	1	0	0	0	121	131.8
13:00									0	0	14	7	2	1					24	26.3
13:15									0	0	24	6	3	2					35	39.1
13:30	1								1	1	16	5		2		1			24	27.6
13:45									0	0	21	5	2	1					29	31.3
H/Total	1	0	0	0	0	0	0	0	1	1	75	23	7	6	0	1	0	0	112	124.3
14:00									0	0	21	5	2	2		2			32	37.6
14:15									0	0	20	3	2	4					29	35.2
14:30									0	0	20	8	2		1	1			32	35
14:45									0	0	14	5		1		3	1		24	27.7
H/Total	0	0	0	0	0	0	0	0	0	0	75	21	6	7	1	6	1	0	117	135.5
15:00	1								1	1	36	3	1			1			41	42.5
15:15									0	0	26	7	2	3					38	42.9
15:30									0	0	19	3	1	2	1	1			27	32.1
15:45									0	0	26	6	2	1		1			36	39.3
H/Total	1	0	0	0	0	0	0	0	1	1	107	19	6	6	1	3	0	0	142	156.8
16:00	1								1	1	35	9	4	1				1	50	52.5
16:15	1								1	1	22	2		1					25	26.3
16:30									0	0	24	10			1				35	36
16:45									0	0	22	2							24	24
H/Total	2	0	0	0	0	0	0	0	2	2	103	23	4	2	1	0	0	1	134	138.8
17:00									0	0	43	3		1					47	48.3
17:15									0	0	20	1							21	21
17:30	1								1	1	29	2	2	1	1			1	36	38.5
17:45									0	0	14	1		1			2		18	18.1
H/Total	1	0	0	0	0	0	0	0	1	1	106	7	2	3	1	0	2	1	122	125.9
18:00									0	0	18						3		21	19.2
18:15									0	0	10								10	10
18:30	1								1	1	14				1				15	16
18:45									0	0	8	1						1	10	9.2
H/Total	1	0	0	0	0	0	0	0	1	1	50	1	0	0	1	0	3	1	56	54.4
Total	6	0	1	0	0	0	0	0	7	7.5	977	211	60	74	11	14	7	7	1361	1502.4

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **2**
Location: **Sully Moors Road / B4267 South Road / Hayes Road**
Date: **15 May 2018, Tuesday**

Time	C - A										C - B									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00	47	8	1			2	1		59	60.9	9	3	1			1			14	15.5
07:15	42	8			1			1	52	52.2	22	8	1						31	31.5
07:30	82	13	4			1	2		102	103.8	22	4	2	1					29	31.3
07:45	117	19			1	2	1	1	141	142.6	27	6		1			1		35	35.7
H/Total	288	48	5	0	2	5	4	2	354	359.5	80	21	4	2	0	1	1	0	109	114
08:00	139	18	1	1	1	4	1		165	171.2	23	7	1		1				32	33.5
08:15	96	15	2			3			116	120	13	1	1	2				1	18	20.3
08:30	110	9				3	1		123	125.4	30	4	1	2		2			39	44.1
08:45	102	21	6		1	1			131	136	31	5	2			3			41	45
H/Total	447	63	9	1	2	11	2	0	535	552.6	97	17	5	4	1	5	0	1	130	142.9
09:00	92	12	1			1	1		107	107.9	35	5		1	3	1			45	50.3
09:15	80	15	2	1	1		1		100	102.7	29	7		5				1	42	47.7
09:30	86	11	1					1	99	98.7	18	3	3	2					26	30.1
09:45	81	16	4	2		1	2		106	110.4	32	3	2	1					38	40.3
H/Total	339	54	8	3	1	2	4	1	412	419.7	114	18	5	9	3	1	0	1	151	168.4
10:00	71	10	4		1	2			88	93	24	7		1	1				33	35.3
10:15	83	6	6		1			1	97	100.2	29	10		3					42	45.9
10:30	74	13	2				1	1	91	90.6	21	2	1	2			1		27	29.5
10:45	88	11						1	100	99.2	17	5	1	1					24	25.8
H/Total	316	40	12	0	2	2	1	3	376	383	91	24	2	7	1	0	1	0	126	136.5
11:00	77	16	1		1				95	96.5	22	2	2		1				27	29
11:15	87	12	1		1	1	1		103	104.9	15	5		1					21	22.3
11:30	81	9	1			1			92	93.5	22	5	2	4					33	39.2
11:45	93	10							103	103	25	6		2		1			34	37.6
H/Total	338	47	3	0	2	2	1	0	393	397.9	84	18	4	7	1	1	0	0	115	128.1
12:00	86	12	2		1		1	1	103	103.6	15	6	1	2	1		1		26	29.5
12:15	89	9	1		1				100	101.5	19	2	3						24	25.5
12:30	95	14	2					1	112	112.2	23	4	2						29	30
12:45	106	7					1		114	113.4	25	3	1	1					30	31.8
H/Total	376	42	5	0	2	0	2	2	429	430.7	82	15	7	3	1	0	1	0	109	116.8
13:00	103	13	2	1	1		1		121	123.7	13	8	2	2	1				26	30.6
13:15	93	14			1		1		109	109.4	28	6	1	3					38	42.4
13:30	87	9	2			1	1		100	101.4	19	4	3	3			1		30	34.8
13:45	94	9					1		104	103.4	28	6		2		1			37	40.6
H/Total	377	45	4	1	2	1	4	0	434	437.9	88	24	6	10	1	1	1	0	131	148.4
14:00	72	10			1	1	1		85	86.4	25	4	2		1				32	34
14:15	72	8			1				81	82	18	3		2		1			24	27.6
14:30	82	11				2			95	97	24	9	1	1		1			36	38.8
14:45	111	14				1			126	127	22	6		3					31	34.9
H/Total	337	43	0	0	2	4	1	0	387	392.4	89	22	3	6	1	2	0	0	123	135.3
15:00	114	6	3		1	1	1	2	128	129.3	24	5	5	3	1				38	45.4
15:15	106	11		1	1	2	1	2	124	126.1	23	9	4	1					37	40.3
15:30	105	10	2			1	2		120	120.8	17	6	1	1					25	26.8
15:45	124	8				1	1		134	134.4	25		1	1					27	28.8
H/Total	449	35	5	1	2	5	5	4	506	510.6	89	20	11	6	1	0	0	0	127	141.3
16:00	107	9			1		2		119	118.8	20	2	2	1	1		1		27	29.7
16:15	105	7			1			1	114	114.2	23	5		4		1			33	39.2
16:30	87	14	1			1			103	104.5	18	1		3					22	25.9
16:45	117	8					2		127	125.8	16	2		2		1	3		24	25.8
H/Total	416	38	1	0	2	1	4	1	463	463.3	77	10	2	10	1	2	4	0	106	120.6
17:00	92	10			1		1	2	106	104.8	20	4	2			1			27	29
17:15	115	5				1			121	122	17	4	2	3					26	30.9
17:30	103	9					4	1	117	113.8	31	4	1						36	36.5
17:45	112	10					1		123	122.4	21	1	1	1					24	25.8
H/Total	422	34	0	0	1	1	6	3	467	463	89	13	6	4	0	1	0	0	113	122.2
18:00	89	14			1		2		106	105.8	14	4	3	2	1				24	29.1
18:15	103	5						1	109	108.2	15	1	2	2					20	23.6
18:30	80	5			1	1		1	88	89.2	12	2					1		15	14.4
18:45	102	6					1		109	108.4	18	4	1						23	23.5
H/Total	374	30	0	0	2	1	3	2	412	411.6	59	11	6	4	1	0	1	0	82	90.6
Total	4479	519	52	6	22	35	37	18	5168	5222.2	1039	213	61	72	12	14	9	2	1422	1565.1

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **2**
Location: **Sully Moors Road / B4267 South Road / Hayes Road**
Date: **15 May 2018, Tuesday**

Time	C - C									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00									0	0
07:15									0	0
07:30				1					1	2.3
07:45									0	0
H/Total	0	0	0	1	0	0	0	0	1	2.3
08:00									0	0
08:15									0	0
08:30									0	0
08:45									0	0
H/Total	0	0	0	0	0	0	0	0	0	0
09:00		1							1	1
09:15	1								1	1
09:30	2								2	2
09:45	2								2	2
H/Total	5	1	0	0	0	0	0	0	6	6
10:00									0	0
10:15	2								2	2
10:30	1								1	1
10:45	1								1	1
H/Total	4	0	0	0	0	0	0	0	4	4
11:00									0	0
11:15									0	0
11:30									0	0
11:45									0	0
H/Total	0	0	0	0	0	0	0	0	0	0
12:00									0	0
12:15	1								1	1
12:30									0	0
12:45									0	0
H/Total	1	0	0	0	0	0	0	0	1	1
13:00									0	0
13:15									0	0
13:30									0	0
13:45	2								2	2
H/Total	2	0	0	0	0	0	0	0	2	2
14:00	1								1	1
14:15	1	2							3	3
14:30									0	0
14:45									0	0
H/Total	2	2	0	0	0	0	0	0	4	4
15:00									0	0
15:15	1								1	1
15:30									0	0
15:45									0	0
H/Total	1	0	0	0	0	0	0	0	1	1
16:00	1								1	1
16:15									0	0
16:30									0	0
16:45	1								1	1
H/Total	2	0	0	0	0	0	0	0	2	2
17:00									0	0
17:15									0	0
17:30									0	0
17:45		1							1	1
H/Total	0	1	0	0	0	0	0	0	1	1
18:00									0	0
18:15									0	0
18:30									0	0
18:45									0	0
H/Total	0	0	0	0	0	0	0	0	0	0
Total	17	4	0	1	0	0	0	0	22	23.3

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **2**
Location: **Sully Moors Road / B4267 South Road / Hayes Road**
Date: **15 May 2018, Tuesday**

traffic survey partners

Time	From A										To A									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00	42	10	2	0	0	0	0	0	54	55	65	9	3	0	0	3	1	1	82	85.1
07:15	57	16	1	0	0	0	0	3	77	75.1	72	13	1	0	1	0	0	3	90	89.1
07:30	70	17	2	0	2	1	2	4	98	97.6	153	17	4	0	0	2	3	2	181	181.6
07:45	111	11	2	0	0	0	1	4	129	126.2	205	28	6	0	1	3	2	1	246	251
H/Total	280	54	7	0	2	1	3	11	358	353.9	495	67	14	0	2	8	6	7	599	606.8
08:00	131	11	1	0	0	3	3	1	150	150.9	224	27	1	1	1	7	1	0	262	271.2
08:15	177	20	1	0	1	5	0	2	206	210.9	173	32	3	0	0	6	0	1	215	221.7
08:30	159	9	2	0	2	2	0	0	174	179	160	13	0	0	0	6	2	0	181	185.8
08:45	141	12	2	1	0	0	1	0	157	158.7	138	24	7	0	1	2	1	0	173	178.9
H/Total	608	52	6	1	3	10	4	3	687	699.5	695	96	11	1	2	21	4	1	831	857.6
09:00	156	11	0	0	0	3	2	0	172	173.8	125	17	1	0	0	3	1	0	147	149.9
09:15	126	7	2	2	1	1	1	1	141	145.2	97	21	2	1	1	1	1	0	124	127.7
09:30	90	8	2	1	2	0	1	0	104	107.7	120	15	1	0	0	0	0	2	138	136.9
09:45	84	11	1	1	0	0	0	1	98	99	104	22	5	2	0	3	2	0	138	144.9
H/Total	456	37	5	4	3	4	4	2	515	525.7	446	75	9	3	1	7	4	2	547	559.4
10:00	101	26	5	0	0	1	1	1	135	137.1	92	16	5	0	2	2	1	0	118	123.9
10:15	102	10	2	1	1	1	1	0	118	121.7	105	12	7	0	1	0	0	1	126	129.7
10:30	93	20	3	0	2	0	0	0	118	121.5	97	20	2	1	0	0	1	1	122	122.9
10:45	115	19	0	1	0	0	1	1	137	136.9	117	15	0	0	0	0	0	2	134	132.4
H/Total	411	75	10	2	3	2	3	2	508	517.2	411	63	14	1	3	2	2	4	500	508.9
11:00	112	14	2	0	0	1	0	1	130	131.2	107	19	3	0	1	0	0	1	131	132.7
11:15	119	12	1	0	1	0	0	0	133	134.5	117	13	1	0	2	1	1	0	135	137.9
11:30	104	16	6	0	2	0	2	0	130	133.8	112	13	1	0	0	1	1	1	129	129.1
11:45	126	16	2	0	0	1	1	0	146	147.4	116	12	0	0	0	0	1	0	129	128.4
H/Total	461	58	11	0	3	2	3	1	539	546.9	452	57	5	0	3	2	3	2	524	528.1
12:00	155	13	1	0	0	2	1	2	174	174.3	114	14	4	0	2	1	1	1	137	140.6
12:15	104	13	3	0	1	1	0	2	124	125.9	114	13	1	0	1	0	1	1	131	131.1
12:30	108	13	3	0	2	0	1	0	127	129.9	125	17	2	0	0	0	0	1	145	145.2
12:45	130	19	2	0	0	0	1	0	152	152.4	127	12	1	1	0	0	1	0	142	143.2
H/Total	497	58	9	0	3	3	3	4	577	582.5	480	56	8	1	3	1	3	3	555	560.1
13:00	120	12	0	0	0	0	2	0	134	132.8	130	16	2	2	1	1	1	1	154	158.2
13:15	117	17	5	0	1	1	1	1	143	146.1	114	17	1	1	1	2	1	0	137	141.2
13:30	119	15	2	1	3	0	0	0	140	145.3	109	11	2	0	0	1	1	0	124	125.4
13:45	109	16	3	0	0	0	0	0	128	129.5	119	10	1	0	0	0	2	0	132	131.3
H/Total	465	60	10	1	4	1	3	1	545	553.7	472	54	6	3	2	4	5	1	547	556.1
14:00	123	14	4	0	0	1	1	0	143	145.4	100	10	1	0	2	1	1	0	115	117.9
14:15	138	16	0	0	1	0	3	3	161	157.8	95	9	0	0	1	0	0	0	105	106
14:30	120	21	1	1	2	0	1	2	148	149.6	113	21	0	0	0	2	0	0	136	138
14:45	133	11	2	3	0	3	1	0	153	160.3	137	18	1	0	0	2	0	0	158	160.5
H/Total	514	62	7	4	3	4	6	5	605	613.1	445	58	2	0	3	5	1	0	514	522.4
15:00	147	19	1	0	0	1	1	1	170	170.1	156	8	4	0	1	1	1	2	173	174.8
15:15	163	22	4	1	2	7	2	0	201	212.1	139	17	2	1	2	3	2	3	169	172.7
15:30	184	20	3	1	2	3	2	0	215	221.6	134	16	2	0	0	1	2	1	156	156
15:45	181	30	3	1	0	2	0	0	217	221.8	154	9	0	0	0	1	1	1	166	165.6
H/Total	675	91	11	3	4	13	5	1	803	825.6	583	50	8	1	3	6	6	7	664	669.1
16:00	174	16	2	0	1	2	1	0	196	199.4	160	12	1	1	2	0	2	0	178	180.6
16:15	187	25	2	0	1	2	1	2	220	221.8	136	8	0	0	1	0	1	1	147	146.6
16:30	144	21	2	0	2	0	2	3	174	173.4	121	18	2	0	0	1	1	0	143	144.4
16:45	164	17	3	0	0	3	3	1	191	192.9	151	11	0	0	0	0	2	0	164	162.8
H/Total	669	79	9	0	4	7	7	6	781	787.5	568	49	3	1	3	1	6	1	632	634.4
17:00	149	17	1	0	0	1	1	2	171	170.3	147	15	0	0	2	0	3	2	169	167.6
17:15	182	13	2	2	1	1	0	1	202	206.8	142	6	0	0	0	1	0	4	153	150.8
17:30	161	11	2	0	1	1	2	5	183	180.8	145	11	0	0	0	0	4	1	161	157.8
17:45	155	13	0	0	0	0	4	4	176	170.4	138	10	0	0	0	0	1	0	149	148.4
H/Total	647	54	5	2	2	3	7	12	732	728.3	572	42	0	0	2	1	8	7	632	624.6
18:00	143	9	0	0	0	0	1	5	158	153.4	114	14	0	0	2	0	2	0	132	132.8
18:15	137	7	0	0	1	1	3	2	151	149.6	116	9	0	0	0	0	0	2	127	125.4
18:30	107	5	0	0	2	0	0	5	119	117	95	6	0	0	1	1	0	1	104	105.2
18:45	127	4	0	0	0	0	0	4	135	131.8	114	6	0	0	0	0	2	2	124	121.2
H/Total	514	25	0	0	3	1	4	16	563	551.8	439	35	0	0	3	1	4	5	487	484.6
Total	6197	705	90	17	37	51	52	64	7213	7285.7	6058	702	80	11	30	59	52	40	7032	7112.1

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **2**
Location: **Sully Moors Road / B4267 South Road / Hayes Road**
Date: **15 May 2018, Tuesday**

traffic survey partners

Time	From B										To B									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00	28	8	5	5	0	2	0	1	49	59.2	15	4	1	0	0	1	0	0	21	22.5
07:15	45	7	1	4	0	1	0	3	61	65.3	33	11	2	0	0	0	0	0	46	47
07:30	90	15	1	1	1	3	1	3	115	117.8	35	9	2	1	1	0	1	1	50	51.9
07:45	103	13	6	1	0	1	1	0	125	129.7	54	8	0	1	0	0	1	0	64	64.7
H/Total	266	43	13	11	1	7	2	7	350	372	137	32	5	2	1	1	2	1	181	186.1
08:00	112	13	2	2	0	3	0	0	132	138.6	45	8	1	0	1	1	0	0	56	58.5
08:15	95	18	2	2	0	3	0	1	121	126.8	41	6	1	2	0	1	0	1	52	55.3
08:30	69	6	1	1	1	3	1	0	82	87.2	60	4	2	2	1	2	0	0	71	77.6
08:45	53	3	4	2	0	1	1	0	64	69	55	8	2	0	0	3	0	0	68	72
H/Total	329	40	9	7	1	10	2	1	399	421.6	201	26	6	4	2	7	0	1	247	263.4
09:00	49	10	6	3	0	2	0	0	70	78.9	71	6	0	1	3	2	0	0	83	89.3
09:15	26	14	2	3	0	1	0	1	47	52.1	55	8	0	5	0	1	0	1	70	76.7
09:30	56	8	1	2	1	0	0	2	70	72.5	29	5	3	3	1	0	0	0	41	47.4
09:45	40	13	1	3	0	2	0	0	59	65.4	54	6	2	1	0	0	0	0	63	65.3
H/Total	171	45	10	11	1	5	0	3	246	268.9	209	25	5	10	4	3	0	1	257	278.7
10:00	41	11	2	4	1	0	1	0	60	66.6	48	12	2	1	1	1	0	0	65	69.3
10:15	42	9	1	1	0	0	0	0	53	54.8	50	14	1	3	0	0	0	0	68	72.4
10:30	47	12	0	2	1	0	0	0	62	65.6	42	9	2	2	1	0	1	0	57	61
10:45	49	5	1	4	0	0	0	1	60	64.9	47	8	1	1	0	0	0	0	57	58.8
H/Total	179	37	4	11	2	0	1	1	235	251.9	187	43	6	7	2	1	1	0	247	261.5
11:00	55	11	4	2	0	0	0	1	73	76.8	54	4	2	0	1	1	0	0	62	65
11:15	53	8	2	2	1	0	1	0	67	71	46	8	2	1	0	0	0	0	57	59.3
11:30	45	8	3	0	1	0	1	1	59	60.1	39	7	4	4	1	0	0	0	55	63.2
11:45	41	8	2	1	0	0	1	0	53	54.7	42	9	0	2	0	2	0	0	55	59.6
H/Total	194	35	11	5	2	0	3	2	252	262.6	181	28	8	7	2	3	0	0	229	247.1
12:00	45	7	2	2	1	1	0	0	58	63.6	39	8	1	2	1	0	1	0	52	55.5
12:15	45	8	1	0	0	0	1	1	56	55.1	40	7	4	0	0	0	0	1	52	53.2
12:30	55	8	0	2	1	0	0	0	66	69.6	45	5	4	0	1	0	1	0	56	58.4
12:45	47	11	4	3	0	0	0	0	65	70.9	52	7	2	1	0	0	0	0	62	64.3
H/Total	192	34	7	7	2	1	1	1	245	259.2	176	27	11	3	2	0	2	1	222	231.4
13:00	41	10	2	2	0	1	0	1	57	60.8	39	12	2	2	1	0	1	0	57	61
13:15	45	9	4	3	0	2	0	0	63	70.9	49	13	1	3	0	1	0	0	67	72.4
13:30	36	7	0	2	0	1	0	0	46	49.6	48	7	3	3	1	0	1	0	63	68.8
13:45	46	6	3	1	0	0	1	0	57	59.2	56	10	1	2	0	1	0	0	70	74.1
H/Total	168	32	9	8	0	4	1	1	223	240.5	192	42	7	10	2	2	2	0	257	276.3
14:00	48	5	3	2	1	2	0	0	61	68.1	59	7	3	0	1	0	0	0	70	72.5
14:15	42	4	2	4	0	0	0	0	52	58.2	42	5	0	2	0	1	0	1	51	53.8
14:30	50	17	2	0	1	1	0	0	71	74	53	13	1	1	1	1	0	1	71	74
14:45	39	9	1	1	0	4	1	0	55	60.2	49	10	1	4	0	2	0	0	66	73.7
H/Total	179	35	8	7	2	7	1	0	239	260.5	203	35	5	7	2	4	0	2	258	274
15:00	79	5	2	0	0	1	0	0	87	89	54	13	5	3	1	0	0	1	77	83.6
15:15	59	13	4	3	1	1	1	1	83	89.5	79	13	6	2	0	3	0	0	103	111.6
15:30	48	8	1	2	1	1	0	1	62	66.3	64	9	3	1	1	2	0	0	80	85.8
15:45	56	7	2	1	0	1	0	1	68	70.5	61	5	2	1	0	2	0	0	71	75.3
H/Total	242	33	9	6	2	4	1	3	300	315.3	258	40	16	7	2	7	0	1	331	356.3
16:00	85	12	5	2	1	0	0	1	106	111.3	85	8	4	1	1	1	1	0	101	105.7
16:15	54	3	0	1	0	0	1	0	59	59.7	86	11	1	4	0	2	0	0	104	111.7
16:30	58	14	1	0	1	0	1	0	75	75.9	61	11	1	3	1	0	0	1	78	82.6
16:45	55	5	0	0	0	0	0	0	60	60	79	7	2	2	0	1	4	1	96	97.4
H/Total	252	34	6	3	2	0	2	1	300	306.9	311	37	8	10	2	4	5	2	379	397.4
17:00	98	8	0	1	1	0	2	0	110	111.1	73	10	2	0	0	1	1	1	88	88.6
17:15	47	2	0	0	0	0	0	4	53	49.8	76	9	4	4	0	0	0	0	93	100.2
17:30	71	4	2	1	1	0	0	1	80	82.5	84	7	1	0	0	1	1	2	96	95.3
17:45	40	1	0	1	0	0	2	0	44	44.1	63	6	1	1	0	0	0	3	74	73.4
H/Total	256	15	2	3	2	0	4	5	287	287.5	296	32	8	5	0	2	2	6	351	357.5
18:00	42	0	0	0	1	0	3	0	46	45.2	47	4	3	2	1	0	0	3	60	62.7
18:15	23	4	0	0	0	0	0	1	28	27.2	39	3	2	2	0	0	1	1	48	50.2
18:30	29	1	0	0	1	0	0	0	31	32	29	2	0	0	1	0	1	3	36	34
18:45	20	1	0	0	0	0	1	3	25	22	43	5	1	0	0	0	0	1	50	49.7
H/Total	114	6	0	0	2	0	4	4	130	126.4	158	14	6	4	2	0	2	8	194	196.6
Total	2542	389	88	79	19	38	22	29	3206	3373.3	2509	381	91	76	23	34	16	23	3153	3326.3

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **2**
Location: **Sully Moors Road / B4267 South Road / Hayes Road**
Date: **15 May 2018, Tuesday**

Time	From C										To C									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00	56	11	2	0	0	3	1	0	73	76.4	46	16	5	5	0	1	0	0	73	83
07:15	64	16	1	0	1	0	0	1	83	83.7	61	15	0	4	0	1	0	4	85	88
07:30	104	17	6	2	0	1	2	0	132	137.4	76	23	3	2	2	3	1	4	114	119.3
07:45	144	25	0	1	1	2	2	1	176	178.3	99	13	2	1	0	0	1	4	120	118.5
H/Total	368	69	9	3	2	6	5	2	464	475.8	282	67	10	12	2	5	2	12	392	408.8
08:00	162	25	2	1	2	4	1	0	197	204.7	136	14	3	2	0	2	3	1	161	164.5
08:15	109	16	3	2	0	3	0	1	134	140.3	167	16	2	2	1	4	0	2	194	201
08:30	140	13	1	2	0	5	1	0	162	169.5	148	11	2	1	2	2	0	0	166	172.3
08:45	133	26	8	0	1	4	0	0	172	181	134	9	5	3	0	0	1	0	152	157.8
H/Total	544	80	14	5	3	16	2	1	665	695.5	585	50	12	8	3	8	4	3	673	695.6
09:00	127	18	1	1	3	2	1	0	153	159.2	136	16	6	3	0	2	2	0	165	172.7
09:15	110	22	2	6	1	0	1	1	143	151.4	110	14	4	5	1	0	1	2	137	144.3
09:30	106	14	4	2	0	0	0	1	127	130.8	103	10	3	2	2	0	1	1	122	126.7
09:45	115	19	6	3	0	1	2	0	146	152.7	81	15	1	4	0	0	0	1	102	106.9
H/Total	458	73	13	12	4	3	4	2	569	594.1	430	55	14	14	3	2	4	4	526	550.6
10:00	95	17	4	1	2	2	0	0	121	128.3	97	26	4	4	0	0	1	1	133	138.8
10:15	114	16	6	3	1	0	0	1	141	148.1	103	9	1	2	1	1	1	0	118	122.5
10:30	96	15	3	2	0	0	2	1	119	121.1	97	18	2	1	2	0	0	0	120	124.3
10:45	106	16	1	1	0	0	0	1	125	126	106	17	1	5	0	0	1	1	131	136.6
H/Total	411	64	14	7	3	2	2	3	506	523.5	403	70	8	12	3	1	3	2	502	522.2
11:00	99	18	3	0	2	0	0	0	122	125.5	105	20	4	2	0	0	0	1	132	135.8
11:15	102	17	1	1	1	1	1	0	124	127.2	111	16	1	2	1	0	1	0	132	135.5
11:30	103	14	3	4	0	1	0	0	125	132.7	101	18	7	0	2	0	2	0	130	134.3
11:45	118	16	0	2	0	1	0	0	137	140.6	127	19	4	1	0	0	1	0	152	154.7
H/Total	422	65	7	7	3	3	1	0	508	526	444	73	16	5	3	0	4	1	546	560.3
12:00	101	18	3	2	2	0	2	1	129	133.1	148	16	1	2	0	2	1	2	172	174.9
12:15	109	11	4	0	1	0	0	0	125	128	104	12	3	0	1	1	0	1	122	124.7
12:30	118	18	4	0	0	0	0	1	141	142.2	111	17	1	2	2	0	0	0	133	138.1
12:45	131	10	1	1	0	0	1	0	144	145.2	129	21	4	2	0	0	1	0	157	161
H/Total	459	57	12	3	3	0	3	2	539	548.5	492	66	9	6	3	3	2	3	584	598.7
13:00	116	21	4	3	2	0	1	0	147	154.3	108	15	2	1	0	0	1	0	127	128.7
13:15	121	20	1	3	1	0	1	0	147	151.8	120	16	8	2	1	0	1	1	149	155.2
13:30	106	13	5	3	0	1	2	0	130	136.2	104	17	2	3	2	1	0	0	129	136.9
13:45	124	15	0	2	0	1	1	0	143	146	104	17	4	1	0	0	0	0	126	129.3
H/Total	467	69	10	11	3	2	5	0	567	588.3	436	65	16	7	3	1	2	1	531	550.1
14:00	98	14	2	0	2	1	1	0	118	121.4	110	16	5	2	0	3	1	0	137	144.5
14:15	91	13	0	2	1	1	0	0	108	112.6	134	19	2	4	1	0	3	2	165	168.8
14:30	106	20	1	1	0	3	0	0	131	135.8	110	24	3	1	2	1	1	1	143	147.4
14:45	133	20	0	3	0	1	0	0	157	161.9	119	12	1	3	0	4	2	0	141	148.2
H/Total	428	67	3	6	3	6	1	0	514	531.7	473	71	11	10	3	8	7	3	586	608.9
15:00	138	11	8	3	2	1	1	2	166	174.7	154	14	2	0	0	2	1	0	173	175.4
15:15	130	20	4	2	1	2	1	2	162	167.4	134	25	4	3	2	4	2	0	174	184.7
15:30	122	16	3	1	0	1	2	0	145	147.6	156	19	2	3	2	2	2	0	186	193.7
15:45	149	8	1	1	0	1	1	0	161	163.2	171	31	4	2	0	1	0	0	209	214.6
H/Total	539	55	16	7	3	5	5	4	634	652.9	615	89	12	8	4	9	5	0	742	768.4
16:00	128	11	2	1	2	0	3	0	147	149.5	142	19	4	1	1	1	1	1	170	173.9
16:15	128	12	0	4	1	1	0	1	147	153.4	147	21	1	1	1	1	1	2	175	176.6
16:30	105	15	1	3	0	1	0	0	125	130.4	125	21	1	0	2	0	2	2	153	152.7
16:45	134	10	0	2	0	1	5	0	152	152.6	123	14	1	0	0	3	2	0	143	145.3
H/Total	495	48	3	10	3	3	8	1	571	585.9	537	75	7	2	4	5	6	5	641	648.5
17:00	112	14	2	0	1	1	1	2	133	133.8	139	14	1	1	0	1	0	1	157	159
17:15	132	9	2	3	0	1	0	0	147	152.9	143	9	0	1	1	1	0	1	156	158.5
17:30	134	13	1	0	0	0	4	1	153	150.3	137	10	4	1	2	0	1	4	159	160.5
17:45	133	12	1	1	0	0	1	0	148	149.2	127	10	0	1	0	0	6	1	145	141.9
H/Total	511	48	6	4	1	2	6	3	581	586.2	546	43	5	4	3	2	7	7	617	619.9
18:00	103	18	3	2	2	0	2	0	130	134.9	127	9	0	0	0	0	4	2	142	138
18:15	118	6	2	2	0	0	0	1	129	131.8	123	5	0	0	1	1	2	1	133	133
18:30	92	7	0	0	1	1	1	1	103	103.6	104	5	0	0	2	0	0	2	113	113.4
18:45	120	10	1	0	0	0	1	0	132	131.9	110	4	0	0	0	0	0	4	118	114.8
H/Total	433	41	6	4	3	1	4	2	494	502.2	464	23	0	0	3	1	6	9	506	499.2
Total	5535	736	113	79	34	49	46	20	6612	6810.6	5707	747	120	88	37	45	52	50	6846	7031.2

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **2**
Location: **Sully Moors Road / B4267 South Road / Hayes Road**
Date: **15 May 2018, Tuesday**

traffic survey partners

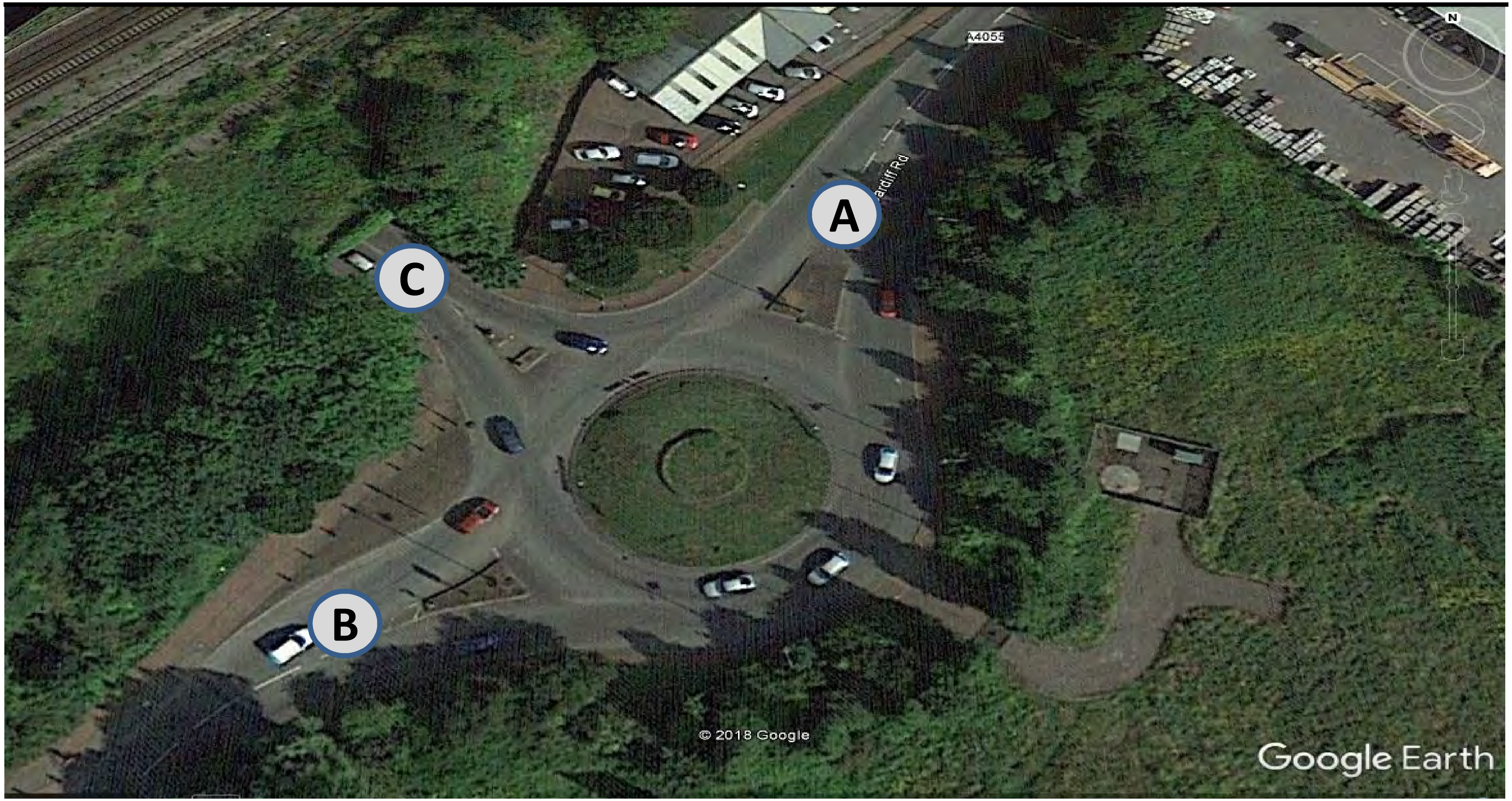
Time	Whole Junction									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00	126	29	9	5	0	5	1	1	176	190.6
07:15	166	39	3	4	1	1	0	7	221	224.1
07:30	264	49	9	3	3	5	5	7	345	352.8
07:45	358	49	8	2	1	3	4	5	430	434.2
H/Total	914	166	29	14	5	14	10	20	1172	1201.7
08:00	405	49	5	3	2	10	4	1	479	494.2
08:15	381	54	6	4	1	11	0	4	461	478
08:30	368	28	4	3	3	10	2	0	418	435.7
08:45	327	41	14	3	1	5	2	0	393	408.7
H/Total	1481	172	29	13	7	36	8	5	1751	1816.6
09:00	332	39	7	4	3	7	3	0	395	411.9
09:15	262	43	6	11	2	2	2	3	331	348.7
09:30	252	30	7	5	3	0	1	3	301	311
09:45	239	43	8	7	0	3	2	1	303	317.1
H/Total	1085	155	28	27	8	12	8	7	1330	1388.7
10:00	237	54	11	5	3	3	2	1	316	332
10:15	258	35	9	5	2	1	1	1	312	324.6
10:30	236	47	6	4	3	0	2	1	299	308.2
10:45	270	40	2	6	0	0	1	3	322	327.8
H/Total	1001	176	28	20	8	4	6	6	1249	1292.6
11:00	266	43	9	2	2	1	0	2	325	333.5
11:15	274	37	4	3	3	1	2	0	324	332.7
11:30	252	38	12	4	3	1	3	1	314	326.6
11:45	285	40	4	3	0	2	2	0	336	342.7
H/Total	1077	158	29	12	8	5	7	3	1299	1335.5
12:00	301	38	6	4	3	3	3	3	361	371
12:15	258	32	8	0	2	1	1	3	305	309
12:30	281	39	7	2	3	0	1	1	334	341.7
12:45	308	40	7	4	0	0	2	0	361	368.5
H/Total	1148	149	28	10	8	4	7	7	1361	1390.2
13:00	277	43	6	5	2	1	3	1	338	347.9
13:15	283	46	10	6	2	3	2	1	353	368.8
13:30	261	35	7	6	3	2	2	0	316	331.1
13:45	279	37	6	3	0	1	2	0	328	334.7
H/Total	1100	161	29	20	7	7	9	2	1335	1382.5
14:00	269	33	9	2	3	4	2	0	322	334.9
14:15	271	33	2	6	2	1	3	3	321	328.6
14:30	276	58	4	2	3	4	1	2	350	359.4
14:45	305	40	3	7	0	8	2	0	365	382.4
H/Total	1121	164	18	17	8	17	8	5	1358	1405.3
15:00	364	35	11	3	2	3	2	3	423	433.8
15:15	352	55	12	6	4	10	4	3	446	469
15:30	354	44	7	4	3	5	4	1	422	435.5
15:45	386	45	6	3	0	4	1	1	446	455.5
H/Total	1456	179	36	16	9	22	11	8	1737	1793.8
16:00	387	39	9	3	4	2	4	1	449	460.2
16:15	369	40	2	5	2	3	2	3	426	434.9
16:30	307	50	4	3	3	1	3	3	374	379.7
16:45	353	32	3	2	0	4	8	1	403	405.5
H/Total	1416	161	18	13	9	10	17	8	1652	1680.3
17:00	359	39	3	1	2	2	4	4	414	415.2
17:15	361	24	4	5	1	2	0	5	402	409.5
17:30	366	28	5	1	2	1	6	7	416	413.6
17:45	328	26	1	2	0	0	7	4	368	363.7
H/Total	1414	117	13	9	5	5	17	20	1600	1602
18:00	288	27	3	2	3	0	6	5	334	333.5
18:15	278	17	2	2	1	1	3	4	308	308.6
18:30	228	13	0	0	4	1	1	6	253	252.6
18:45	267	15	1	0	0	0	2	7	292	285.7
H/Total	1061	72	6	4	8	2	12	22	1187	1180.4
Total	14274	1830	291	175	90	138	120	113	17031	17470

Peak Hours		Totals
07:00	08:00	1172
07:15	08:15	1475
07:30	08:30	1715
07:45	08:45	1788
08:00	09:00	1751
08:15	09:15	1667
08:30	09:30	1537
08:45	09:45	1420
09:00	10:00	1330
09:15	10:15	1251
09:30	10:30	1232
09:45	10:45	1230
10:00	11:00	1249
10:15	11:15	1258
10:30	11:30	1270
10:45	11:45	1285
11:00	12:00	1299
11:15	12:15	1335
11:30	12:30	1316
11:45	12:45	1336
12:00	13:00	1361
12:15	13:15	1338
12:30	13:30	1386
12:45	13:45	1368
13:00	14:00	1335
13:15	14:15	1319
13:30	14:30	1287
13:45	14:45	1321
14:00	15:00	1358
14:15	15:15	1459
14:30	15:30	1584
14:45	15:45	1656
15:00	16:00	1737
15:15	16:15	1763
15:30	16:30	1743
15:45	16:45	1695
16:00	17:00	1652
16:15	17:15	1617
16:30	17:30	1593
16:45	17:45	1635
17:00	18:00	1600
17:15	18:15	1520
17:30	18:30	1426
17:45	18:45	1263
18:00	19:00	1187

traffic survey partners

Client:	Arcadis
Project Number:	TSP13819
Project Name:	Dinas Powys - May 2018
Survey Type:	Manual Classified Turning Count
Survey Date:	15 May 2018, Tuesday
Survey Time:	07:00 - 19:00
Weather:	Dry
Comments:	

Project Number:	TSP13819
Project Name:	Dinas Powys - May 2018
Survey Type:	Manual Classified Turning Count
Site No:	3
Location:	Ffordd Y Mileniwm / A4055 Roundabout / western arm routes under the rail line



Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **3**
Location: **Ffordd Y Mileniwm / A4055 Roundabout / western arm routes under the rail line**
Date: **15 May 2018, Tuesday**

traffic survey partners

	1	1	1.5	2.3	2	2	0.4	0.2												
Time	**A - A**										**A - B**									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00									0	0	37	12	2	1					52	54.3
07:15									0	0	39	14	1	2		1			57	61.1
07:30									0	0	43	16	2	4		1		1	67	73.4
07:45									0	0	65	22	4	1		2		2	96	99.7
H/Total	0	0	0	0	0	0	0	0	0	0	184	64	9	8	0	4	0	3	272	288.5
08:00									0	0	80	16	4	3		1	1		105	111.3
08:15	1	1							2	2	75	19	2	1				1	98	99.5
08:30	2	1							3	3	91	16	2	1					110	112.3
08:45	1								1	1	96	12	6	3			1		118	124.3
H/Total	4	2	0	0	0	0	0	0	6	6	342	63	14	8	0	1	2	1	431	447.4
09:00	4	1	1						6	6.5	102	20	1	3		3	1		130	136.8
09:15	2								2	2	73	18		7					98	107.1
09:30									0	0	94	15	7	2		2	2		122	128.9
09:45	2								2	2	78	16	8	2		3		1	108	116.8
H/Total	8	1	1	0	0	0	0	0	10	10.5	347	69	16	14	0	8	3	1	458	489.6
10:00	3								3	3	86	15	4	4		3	1		113	122.6
10:15	2								2	2	99	11	4	5					119	127.5
10:30	2								2	2	73	17	1	5					96	103
10:45	2	1							3	3	107	14	5	1			1	1	129	131.4
H/Total	9	1	0	0	0	0	0	0	10	10	365	57	14	15	0	3	2	1	457	484.5
11:00	3	1							4	4	88	18	4	1		2	1		114	118.7
11:15	2								2	2	99	13	4	3			2	1	122	125.9
11:30	1			1					2	3.3	102	14	3	4		2		2	127	134.1
11:45	3	1							4	4	92	14	2	7		1			116	127.1
H/Total	9	2	0	1	0	0	0	0	12	13.3	381	59	13	15	0	5	3	3	479	505.8
12:00	1	1	1						3	3.5	121	16	5	4		1	2		149	156.5
12:15	1								1	1	108	17	2	2					129	132.6
12:30	3								3	3	106	15	5	5			1	1	133	140.6
12:45	4								4	4	109	14	2	3		2			130	136.9
H/Total	9	1	1	0	0	0	0	0	11	11.5	444	62	14	14	0	3	3	1	541	566.6
13:00	3	2							5	5	102	11	6	7		1	2		129	140.9
13:15	1								1	1	124	15	1			2		1	143	144.7
13:30			1	1					2	3.8	115	7	2	5			1		130	136.9
13:45	1								1	1	103	14	3	3				1	124	128.6
H/Total	5	2	1	1	0	0	0	0	9	10.8	444	47	12	15	0	3	3	2	526	551.1
14:00		1					1		2	1.4	94	11		4					109	114.2
14:15	2								2	2	108	9	4	9		1	2		133	146.5
14:30	3								3	3	121	15	2	5				2	145	150.9
14:45	3								3	3	84	20	3	5			2		114	120.8
H/Total	8	1	0	0	0	0	1	0	10	9.4	407	55	9	23	0	1	4	2	501	532.4
15:00	3	1							4	4	109	12	3	1					125	127.8
15:15	7								7	7	119	13	3	5		2	1		143	152.4
15:30	3								3	3	106	12	2	1		2	4		127	128.9
15:45	3	1							4	4	108	18	2			5			133	139
H/Total	16	2	0	0	0	0	0	0	18	18	442	55	10	7	0	9	5	0	528	548.1
16:00	2								2	2	124	17	3	3		1	1	1	150	155
16:15	2								2	2	114	19	3				2		138	138.3
16:30	2								2	2	135	15	3	1		2			156	160.8
16:45									0	0	132	17	2	1					152	154.3
H/Total	6	0	0	0	0	0	0	0	6	6	505	68	11	5	0	3	3	1	596	608.4
17:00									0	0	128	10	2				2	1	143	142
17:15	4						1		5	4.4	125	16	1	3				2	147	149.8
17:30	4								4	4	124	7		2		1	1		135	138
17:45	2								2	2	130	10		1				5	146	143.3
H/Total	10	0	0	0	0	0	1	0	11	10.4	507	43	3	6	0	1	3	8	571	573.1
18:00									0	0	160	9		1				1	171	171.5
18:15	2	1							3	3	118	11	2	3				1	135	139.1
18:30	1								1	1	111	8					2		121	119.8
18:45	1								1	1	91	9		1			1	1	103	102.9
H/Total	4	1	0	0	0	0	0	0	5	5	480	37	2	5	0	0	3	3	530	533.3
Total	88	13	3	2	0	0	2	0	108	110.9	4848	679	127	135	0	41	34	26	5890	6128.8

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **3**
Location: **Ffordd Y Mileniwm / A4055 Roundabout / western arm routes under the rail line**
Date: **15 May 2018, Tuesday**

Time	A - C										B - A									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00	15	3	1		1				20	21.5	89	15							104	104
07:15	19	4	1						24	24.5	99	12							111	111
07:30	24	9	4		2				39	43	105	22	3	2		3		1	136	142.3
07:45	58	10	1			2		2	73	73.9	94	20	3	3			2	1	123	126.4
H/Total	116	26	7	0	3	2	0	2	156	162.9	387	69	6	5	0	3	2	2	474	483.7
08:00	44	9	1		1	1			56	58.5	96	13	4	5				1	119	126.7
08:15	75	15				2		1	93	94.2	71	11	2	1					85	87.3
08:30	82	13	2		1	2			100	104	103	17	5	6		1	1		133	143.7
08:45	83	10	1	1					95	96.8	111	9	5	2		1	1		129	134.5
H/Total	284	47	4	1	2	5	0	1	344	353.5	381	50	16	14	0	2	2	1	466	492.2
09:00	75	7	1		2	3	1		89	93.9	128	18	4	4			2		156	162
09:15	95	14	2			2	2		115	116.8	78	14	3	3		1	1		100	105.8
09:30	72	6	1	1	1				81	83.8	116	17	2	2		1	1		139	143
09:45	72	14	1				1		88	87.9	110	16	7	2		4			139	149.1
H/Total	314	41	5	1	3	5	4	0	373	382.4	432	65	16	11	0	6	4	0	534	559.9
10:00	66	17	2						85	86	101	10	1	4		1		1	118	123.9
10:15	60	15	2	1		1			79	82.3	104	11	4	2		1	1	1	124	128.2
10:30	61	6				1	1		69	69.4	114	15	5	5					139	148
10:45	50	11			1	1			63	65	103	21	3	6		1	1		135	144.7
H/Total	237	49	4	1	1	3	1	0	296	302.7	422	57	13	17	0	3	2	2	516	544.8
11:00	65	10		1			1		77	77.7	101	20	1	3		1			126	131.4
11:15	71	14	1		1				87	88.5	107	20	4	3			1	1	136	140.5
11:30	63	13	3		1	1	1	1	83	85.1	109	14	2				3		128	127.2
11:45	77	15	1				1		94	93.9	126	19	4	2		1	1	1	154	158.2
H/Total	276	52	5	1	2	1	3	1	341	345.2	443	73	11	8	0	2	5	2	544	557.3
12:00	92	8	1						101	101.5	110	17	4	2					133	137.6
12:15	83	19				1	2		105	104.8	111	22	4	2					139	143.6
12:30	74	11	1	2	1	1		1	91	95.3	119	10	3	4		2	1		139	147.1
12:45	77	10				1			88	89	127	13	2	4					146	152.2
H/Total	326	48	2	2	1	3	2	1	385	390.6	467	62	13	12	0	2	1	0	557	580.5
13:00	71	10		1					82	83.3	121	16	2			1	2		142	142.8
13:15	81	8	1						90	90.5	127	13	2	4		1	1	1	149	154.8
13:30	66	15	4		2				87	91	110	8	2	5		1	2		128	135.3
13:45	70	9	1				1		81	80.9	126	22	8	2		1			159	166.6
H/Total	288	42	6	1	2	0	1	0	340	345.7	484	59	14	11	0	4	5	1	578	599.5
14:00	65	11	1				3		80	78.7	103	23	4	5		2			137	147.5
14:15	98	8	1			1			108	109.5	89	10	1	3	1	4	1		109	117.8
14:30	79	8							87	87	132	7	4	4		2	3		152	159.4
14:45	99	7	1	1	1				109	111.8	130	22	3	3		1	4	1	164	167.2
H/Total	341	34	3	1	1	1	3	0	384	387	454	62	12	15	1	9	8	1	562	591.9
15:00	85	13	1			4	1		104	107.9	134	17	4	4		1	2	1	163	169.2
15:15	88	10	1		1	2		1	103	105.7	98	11	1	4	1	2			117	125.7
15:30	96	14			1	1	1		113	114.4	139	22		1					162	163.3
15:45	92	10	3			3			108	112.5	104	18	4	2					128	132.6
H/Total	361	47	5	0	2	10	2	1	428	440.5	475	68	9	11	1	3	2	1	570	590.8
16:00	103	29	1					1	134	133.7	139	21	2	1		3	2		168	172.1
16:15	103	17				1	2		123	122.8	115	22	1	4					142	147.7
16:30	117	18				2	2		139	139.8	124	15	3	2			2		146	148.9
16:45	119	15			1	2	3		140	141.2	128	14	2	1			2	2	149	148.5
H/Total	442	79	1	0	1	5	7	1	536	537.5	506	72	8	8	0	3	6	2	605	617.2
17:00	115	16		1		2	1	1	136	137.9	126	5	1	1		2		1	136	139
17:15	106	7	2				2		117	116.8	138	14	2						154	155
17:30	110	7			1		1	2	121	119.8	129	12	1						142	142.5
17:45	100	3	2			1	5		111	110	92	6			1	1		1	101	102.2
H/Total	431	33	4	1	1	3	9	3	485	484.5	485	37	4	1	1	3	0	2	533	538.7
18:00	96						1		97	96.4	96	11	1		1			1	110	110.7
18:15	114						1	1	116	114.6	93	4	1	1	1		1	1	102	103.4
18:30	86				1		1		88	88.4	104	9	1	1	1	1			117	120.8
18:45	73	1				1			75	76	81	7		3		1		2	94	97.3
H/Total	369	1	0	0	1	1	3	1	376	375.4	374	31	3	5	3	2	1	4	423	432.2
Total	3785	499	46	9	20	39	35	11	4444	4507.9	5310	705	125	118	6	42	38	18	6362	6588.7

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **3**
Location: **Ffordd Y Mileniwm / A4055 Roundabout / western arm routes under the rail line**
Date: **15 May 2018, Tuesday**

Time	B - B										B - C									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	TOTAL	TOTAL (PCU)	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	TOTAL	TOTAL (PCU)
07:00									0	0	8	2	1						11	11.5
07:15									0	0	7	2							9	9
07:30									0	0	8	4	1			1			14	15.5
07:45	1	1							2	2	12	4	2			1			19	21
H/Total	1	1	0	0	0	0	0	0	2	2	35	12	4	0	0	2	0	0	53	57
08:00	1								1	1	21	4				1			26	27
08:15	1	1							2	2	18	7							25	25
08:30	2								2	2	19	3							22	22
08:45	1								1	1	19	6	1						26	26.5
H/Total	5	1	0	0	0	0	0	0	6	6	77	20	1	0	0	1	0	0	99	100.5
09:00	1								1	1	27	6							33	33
09:15	1								1	1	30	4	1						35	35.5
09:30									0	0	31	4	1				1		37	36.9
09:45	1								1	1	32	7	2				1		42	42.4
H/Total	3	0	0	0	0	0	0	0	3	3	120	21	4	0	0	0	2	0	147	147.8
10:00									0	0	27	4	1			1			33	34.5
10:15									0	0	25	4				1			30	31
10:30	1								1	1	30	5					1		36	35.4
10:45									0	0	28	5	1					2	36	34.9
H/Total	1	0	0	0	0	0	0	0	1	1	110	18	2	0	0	2	1	2	135	135.8
11:00									0	0	23	7	1						31	31.5
11:15									0	0	38	5	2			2			47	50
11:30									0	0	37	5	2						44	45
11:45	1								1	1	30	7				1			38	39
H/Total	1	0	0	0	0	0	0	0	1	1	128	24	5	0	0	3	0	0	160	165.5
12:00	3								3	3	28	6					1		35	34.4
12:15	1								1	1	30	3							33	33
12:30	1								1	1	31	6				1	2		40	39.8
12:45	2								2	2	46	5					2		53	51.8
H/Total	7	0	0	0	0	0	0	0	7	7	135	20	0	0	0	1	5	0	161	159
13:00									0	0	35	7	1				1		44	43.9
13:15									0	0	22	2	1						25	25.5
13:30									0	0	40	6				1			47	48
13:45									0	0	27	5				1			33	34
H/Total	0	0	0	0	0	0	0	0	0	0	124	20	2	0	0	2	1	0	149	151.4
14:00	1								1	1	32	4							36	36
14:15	1						1		2	1.4	26	4				3	1		34	36.4
14:30									0	0	27	5	1			1			34	35.5
14:45	1								1	1	32	7	3				1		43	43.9
H/Total	3	0	0	0	0	0	1	0	4	3.4	117	20	4	0	0	4	2	0	147	151.8
15:00									0	0	47	8					1		56	55.4
15:15									0	0	45	5	1				2		53	52.3
15:30									0	0	59	8	1						68	68.5
15:45									0	0	48	10	1				1		60	59.9
H/Total	0	0	0	0	0	0	0	0	0	0	199	31	3	0	0	0	4	0	237	236.1
16:00									0	0	49	2				1	1		53	53.4
16:15	1								1	1	57	11					1		69	68.4
16:30									0	0	51	9				1	1		62	62.4
16:45									0	0	55	2							57	57
H/Total	1	0	0	0	0	0	0	0	1	1	212	24	0	0	0	2	3	0	241	241.2
17:00									0	0	74	5							79	79
17:15									0	0	51	7	2				2		62	61.8
17:30									0	0	44	4							48	48
17:45	1								1	1	35	5	1				1	1	43	42.1
H/Total	1	0	0	0	0	0	0	0	1	1	204	21	3	0	0	0	3	1	232	230.9
18:00									0	0	22	4						1	27	26.2
18:15									0	0	33	8					1		42	41.4
18:30		1							1	1	34	5							39	39
18:45									0	0	33	2	1						36	36.5
H/Total	0	1	0	0	0	0	0	0	1	1	122	19	1	0	0	0	1	1	144	143.1
Total	23	3	0	0	0	0	1	0	27	26.4	1583	250	29	0	0	17	22	4	1905	1920.1

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **3**
Location: **Ffordd Y Mileniwm / A4055 Roundabout / western arm routes under the rail line**
Date: **15 May 2018, Tuesday**

Time	C - A										C - B									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00	77	4							81	81	20	4							24	24
07:15	75	8	1			1			85	86.5	22	5	1						28	28.5
07:30	73	10	2		1	1	2	2	91	91.2	23	7	1			1	1		33	33.9
07:45	68	11			1	1			81	83	25	9	1			1	1		37	37.9
H/Total	293	33	3	0	2	3	2	2	338	341.7	90	25	3	0	0	2	2	0	122	124.3
08:00	63	8	1			2	1		75	76.9	35	2							37	37
08:15	58	9	1	1	1	1	1	1	73	75.4	38	6	1			1			46	47.5
08:30	76	10	2		1				89	91	19	2	1						22	22.5
08:45	58	10					1	1	70	68.6	33	4					1		38	37.4
H/Total	255	37	4	1	2	3	3	2	307	311.9	125	14	2	0	0	1	1	0	143	144.4
09:00	91	13	1				1		106	105.9	32	8	1			1			42	43.5
09:15	72	8			1	2			83	86	22	3							25	25
09:30	63	6	5	1	1	1			77	82.8	20	3	1						24	24.5
09:45	71	9					1		81	80.4	27	4					1		32	31.4
H/Total	297	36	6	1	2	3	2	0	347	355.1	101	18	2	0	0	1	1	0	123	124.4
10:00	88	14				3			105	108	16	2							18	18
10:15	57	14				1			72	73	24	3							27	27
10:30	70	8			1	3	2		84	86.8	30	3	1			1	1		36	36.9
10:45	63	11	3	1					78	80.8	34	3	3			1	1		42	43.9
H/Total	278	47	3	1	1	7	2	0	339	348.6	104	11	4	0	0	2	2	0	123	125.8
11:00	74	11				1			86	87	26	4	1			1			32	33.5
11:15	65	11		1	1		1	1	80	80.9	30	4	3				1		38	38.9
11:30	68	10	2						80	81	30	5	1					1	37	36.7
11:45	78	12					1		91	90.4	20	3				1			24	25
H/Total	285	44	2	1	1	1	2	1	337	339.3	106	16	5	0	0	2	1	1	131	134.1
12:00	58	11	1				4		74	72.1	22	6							28	28
12:15	90	8	2		1		1	1	103	103.6	12	1							13	13
12:30	93	7	1	1			1		103	104.2	30	4							34	34
12:45	70	11	2				1		84	84.4	25	4				1			30	31
H/Total	311	37	6	1	1	0	7	1	364	364.3	89	15	0	0	0	1	0	0	105	106
13:00	80	8				1	1		90	90.4	32	5					1		38	37.4
13:15	75	8	1	1	1		1		87	89.2	26	4	1						31	31.5
13:30	66	4	1	1			1		73	74.2	18	5	2			1			26	28
13:45	72	11	1			1	1	1	87	87.1	31	1							32	32
H/Total	293	31	3	2	1	2	4	1	337	340.9	107	15	3	0	0	1	1	0	127	128.9
14:00	52	5		1		3	2		63	66.1	32	3							35	35
14:15	51	9	1			1	1		63	63.9	20	6				2			28	30
14:30	67	12			2	1	1		83	85.4	24	6	1			1			32	33.5
14:45	74	8	1			1			84	85.5	26	3							29	29
H/Total	244	34	2	1	2	6	4	0	293	300.9	102	18	1	0	0	3	0	0	124	127.5
15:00	70	14	2			1	1		88	89.4	30	5	1						36	36.5
15:15	83	7	1		1	1			93	95.5	28	5							33	33
15:30	106	5					1		112	111.4	25	6							31	31
15:45	78	9				1			88	89	29	4	1			1			35	36.5
H/Total	337	35	3	0	1	3	2	0	381	385.3	112	20	2	0	0	1	0	0	135	137
16:00	86	10	4					1	101	102.2	21	3	1			3			28	31.5
16:15	79	5	1		1		1		87	87.9	25	4				3			32	35
16:30	99	9							108	108	17	3				1			21	22
16:45	79	6				1			86	87	32	2							34	34
H/Total	343	30	5	0	1	1	1	1	382	385.1	95	12	1	0	0	7	0	0	115	122.5
17:00	95	10	2				1		108	108.4	22								22	22
17:15	92	9	1		1			1	104	104.7	23								23	23
17:30	76	8					3		87	85.2	24	3							27	27
17:45	64	5		2			1	1	73	74.2	22	1					2		25	23.8
H/Total	327	32	3	2	1	0	5	2	372	372.5	91	4	0	0	0	0	2	0	97	95.8
18:00	75	6	1				1	1	84	83.1	13	2							15	15
18:15	59	7	1			1			68	69.5	22	2				1	2		27	26.8
18:30	66	4			1	1			72	74	17								17	17
18:45	50	3	2						55	56	15	1							16	16
H/Total	250	20	4	0	1	2	1	1	279	282.6	67	5	0	0	0	1	2	0	75	74.8
Total	3513	416	44	10	16	31	35	11	4076	4128.2	1189	173	23	0	0	22	12	1	1420	1445.5

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **3**
Location: **Ffordd Y Mileniwm / A4055 Roundabout / western arm routes under the rail line**
Date: **15 May 2018, Tuesday**

Time	C - C									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	TOTAL	TOTAL (PCU)
07:00									0	0
07:15									0	0
07:30									0	0
07:45									0	0
H/Total	0	0	0	0	0	0	0	0	0	0
08:00									0	0
08:15									0	0
08:30									0	0
08:45									0	0
H/Total	0	0	0	0	0	0	0	0	0	0
09:00									0	0
09:15									0	0
09:30									0	0
09:45									0	0
H/Total	0	0	0	0	0	0	0	0	0	0
10:00									0	0
10:15									0	0
10:30									0	0
10:45									0	0
H/Total	0	0	0	0	0	0	0	0	0	0
11:00									0	0
11:15									0	0
11:30									0	0
11:45									0	0
H/Total	0	0	0	0	0	0	0	0	0	0
12:00									0	0
12:15									0	0
12:30									0	0
12:45									0	0
H/Total	0	0	0	0	0	0	0	0	0	0
13:00									0	0
13:15									0	0
13:30	1								1	1
13:45									0	0
H/Total	1	0	0	0	0	0	0	0	1	1
14:00									0	0
14:15									0	0
14:30									0	0
14:45									0	0
H/Total	0	0	0	0	0	0	0	0	0	0
15:00									0	0
15:15									0	0
15:30									0	0
15:45									0	0
H/Total	0	0	0	0	0	0	0	0	0	0
16:00									0	0
16:15									0	0
16:30									0	0
16:45									0	0
H/Total	0	0	0	0	0	0	0	0	0	0
17:00									0	0
17:15									0	0
17:30	1								1	1
17:45									0	0
H/Total	1	0	0	0	0	0	0	0	1	1
18:00									0	0
18:15									0	0
18:30									0	0
18:45	1								1	1
H/Total	1	0	0	0	0	0	0	0	1	1
Total	3	0	0	0	0	0	0	0	3	3

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **3**
Location: **Ffordd Y Mileniwm / A4055 Roundabout / western arm routes under the rail line**
Date: **15 May 2018, Tuesday**

Time	From A										To A									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00	52	15	3	1	1	0	0	0	72	75.8	166	19	0	0	0	0	0	0	185	185
07:15	58	18	2	2	0	1	0	0	81	85.6	174	20	1	0	0	1	0	0	196	197.5
07:30	67	25	6	4	2	1	0	1	106	116.4	178	32	5	2	1	4	2	3	227	233.5
07:45	123	32	5	1	0	4	0	4	169	173.6	162	31	3	3	1	1	2	1	204	209.4
H/Total	300	90	16	8	3	6	0	5	428	451.4	680	102	9	5	2	6	4	4	812	825.4
08:00	124	25	5	3	1	2	1	0	161	169.8	159	21	5	5	0	2	1	1	194	203.6
08:15	151	35	2	1	0	2	0	2	193	195.7	130	21	3	2	1	1	1	1	160	164.7
08:30	175	30	4	1	1	2	0	0	213	219.3	181	28	7	6	1	1	1	0	225	237.7
08:45	180	22	7	4	0	0	1	0	214	222.1	170	19	5	2	0	1	2	1	200	204.1
H/Total	630	112	18	9	2	6	2	2	781	806.9	640	89	20	15	2	5	5	3	779	810.1
09:00	181	28	3	3	2	6	2	0	225	237.2	223	32	6	4	0	0	3	0	268	274.4
09:15	170	32	2	7	0	2	2	0	215	225.9	152	22	3	3	1	3	1	0	185	193.8
09:30	166	21	8	3	1	2	2	0	203	212.7	179	23	7	3	1	2	1	0	216	225.8
09:45	152	30	9	2	0	3	1	1	198	206.7	183	25	7	2	0	4	1	0	222	231.5
H/Total	669	111	22	15	3	13	7	1	841	882.5	737	102	23	12	2	9	6	0	891	925.5
10:00	155	32	6	4	0	3	1	0	201	211.6	192	24	1	4	0	4	0	1	226	234.9
10:15	161	26	6	6	0	1	0	0	200	211.8	163	25	4	2	0	2	1	1	198	203.2
10:30	136	23	1	5	0	1	1	0	167	174.4	186	23	5	5	1	3	2	0	225	236.8
10:45	159	26	5	1	1	1	1	1	195	199.4	168	33	6	7	0	1	1	0	216	228.5
H/Total	611	107	18	16	1	6	3	1	763	797.2	709	105	16	18	1	10	4	2	865	903.4
11:00	156	29	4	2	0	2	2	0	195	200.4	178	32	1	3	0	2	0	0	216	222.4
11:15	172	27	5	3	1	0	2	1	211	216.4	174	31	4	4	1	0	2	2	218	223.4
11:30	166	27	6	5	1	3	1	3	212	222.5	178	24	4	1	0	0	3	0	210	211.5
11:45	172	30	3	7	0	1	1	0	214	225	207	32	4	2	0	1	2	1	249	252.6
H/Total	666	113	18	17	2	6	6	4	832	864.3	737	119	13	10	1	3	7	3	893	909.9
12:00	214	25	7	4	0	1	2	0	253	261.5	169	29	6	2	0	0	4	0	210	213.2
12:15	192	36	2	2	0	1	2	0	235	238.4	202	30	6	2	1	0	1	1	243	248.2
12:30	183	26	6	7	1	1	1	2	227	238.9	215	17	4	5	0	2	2	0	245	254.3
12:45	190	24	2	3	0	3	0	0	222	229.9	201	24	4	4	0	0	1	0	234	240.6
H/Total	779	111	17	16	1	6	5	2	937	968.7	787	100	20	13	1	2	8	1	932	956.3
13:00	176	23	6	8	0	1	2	0	216	229.2	204	26	2	0	0	2	3	0	237	238.2
13:15	206	23	2	0	0	2	0	1	234	236.2	203	21	3	5	1	1	2	1	237	245
13:30	181	22	7	6	2	0	1	0	219	231.7	176	12	4	7	0	1	3	0	203	213.3
13:45	174	23	4	3	0	0	1	1	206	210.5	199	33	9	2	0	2	1	1	247	254.7
H/Total	737	91	19	17	2	3	4	2	875	907.6	782	92	18	14	1	6	9	2	924	951.2
14:00	159	23	1	4	0	0	4	0	191	194.3	155	29	4	6	0	5	3	0	202	215
14:15	208	17	5	9	0	2	2	0	243	258	142	19	2	3	1	5	2	0	174	183.7
14:30	203	23	2	5	0	0	0	2	235	240.9	202	19	4	4	2	3	4	0	238	247.8
14:45	186	27	4	6	1	0	2	0	226	235.6	207	30	4	3	0	2	4	1	251	255.7
H/Total	756	90	12	24	1	2	8	2	895	928.8	706	97	14	16	3	15	13	1	865	902.2
15:00	197	26	4	1	0	4	1	0	233	239.7	207	32	6	4	0	2	3	1	255	262.6
15:15	214	23	4	5	1	4	1	1	253	265.1	188	18	2	4	2	3	0	0	217	228.2
15:30	205	26	2	1	1	3	5	0	243	246.3	248	27	0	1	0	0	1	0	277	277.7
15:45	203	29	5	0	0	8	0	0	245	255.5	185	28	4	2	0	1	0	0	220	225.6
H/Total	819	104	15	7	2	19	7	1	974	1006.6	828	105	12	11	2	6	4	1	969	994.1
16:00	229	46	4	3	0	1	1	2	286	290.7	227	31	6	1	0	3	2	1	271	276.3
16:15	219	36	3	0	0	1	4	0	263	263.1	196	27	2	4	1	0	1	0	231	237.6
16:30	254	33	3	1	0	4	2	0	297	302.6	225	24	3	2	0	0	2	0	256	258.9
16:45	251	32	2	1	1	2	3	0	292	295.5	207	20	2	1	0	1	2	2	235	235.5
H/Total	953	147	12	5	1	8	10	2	1138	1151.9	855	102	13	8	1	4	7	3	993	1008.3
17:00	243	26	2	1	0	2	3	2	279	279.9	221	15	3	1	0	2	1	1	244	247.4
17:15	235	23	3	3	0	0	3	2	269	271	234	23	3	0	1	0	1	1	263	264.1
17:30	238	14	0	2	1	1	2	2	260	261.8	209	20	1	0	0	0	3	0	233	231.7
17:45	232	13	2	1	0	1	5	5	259	255.3	158	11	0	2	1	1	1	2	176	178.4
H/Total	948	76	7	7	1	4	13	11	1067	1068	822	69	7	3	2	3	6	4	916	921.6
18:00	256	9	0	1	0	0	1	1	268	267.9	171	17	2	0	1	0	1	2	194	193.8
18:15	234	12	2	3	0	0	1	2	254	256.7	154	12	2	1	1	1	1	1	173	175.9
18:30	198	8	0	0	1	0	3	0	210	209.2	171	13	1	1	2	2	0	0	190	195.8
18:45	165	10	0	1	0	1	1	1	179	179.9	132	10	2	3	0	1	0	2	150	154.3
H/Total	853	39	2	5	1	1	6	4	911	913.7	628	52	7	5	4	4	2	5	707	719.8
Total	8721	1191	176	146	20	80	71	37	10442	10748	8911	1134	172	130	22	73	75	29	10546	10828

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **3**
Location: **Ffordd Y Mileniwm / A4055 Roundabout / western arm routes under the rail line**
Date: **15 May 2018, Tuesday**

Time	From B										To B									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00	97	17	1	0	0	0	0	0	115	115.5	57	16	2	1	0	0	0	0	76	78.3
07:15	106	14	0	0	0	0	0	0	120	120	61	19	2	2	0	1	0	0	85	89.6
07:30	113	26	4	2	0	4	0	1	150	157.8	66	23	3	4	0	2	1	1	100	107.3
07:45	107	25	5	3	0	1	2	1	144	149.4	91	32	5	1	0	3	1	2	135	139.6
H/Total	423	82	10	5	0	5	2	2	529	542.7	275	90	12	8	0	6	2	3	396	414.8
08:00	118	17	4	5	0	1	0	1	146	154.7	116	18	4	3	0	1	1	0	143	149.3
08:15	90	19	2	1	0	0	0	0	112	114.3	114	26	3	1	0	1	0	1	146	149
08:30	124	20	5	6	0	1	1	0	157	167.7	112	18	3	1	0	0	0	0	134	136.8
08:45	131	15	6	2	0	1	1	0	156	162	130	16	6	3	0	0	2	0	157	162.7
H/Total	463	71	17	14	0	3	2	1	571	598.7	472	78	16	8	0	2	3	1	580	597.8
09:00	156	24	4	4	0	0	2	0	190	196	135	28	2	3	0	4	1	0	173	181.3
09:15	109	18	4	3	0	1	1	0	136	142.3	96	21	0	7	0	0	0	0	124	133.1
09:30	147	21	3	2	0	1	2	0	176	179.9	114	18	8	2	0	2	2	0	146	153.4
09:45	143	23	9	2	0	4	1	0	182	192.5	106	20	8	2	0	3	1	1	141	149.2
H/Total	555	86	20	11	0	6	6	0	684	710.7	451	87	18	14	0	9	4	1	584	617
10:00	128	14	2	4	0	2	0	1	151	158.4	102	17	4	4	0	3	1	0	131	140.6
10:15	129	15	4	2	0	2	1	1	154	159.2	123	14	4	5	0	0	0	0	146	154.5
10:30	145	20	5	5	0	0	1	0	176	184.4	104	20	2	5	0	1	1	0	133	140.9
10:45	131	26	4	6	0	1	1	2	171	179.6	141	17	8	1	0	1	2	1	171	175.3
H/Total	533	75	15	17	0	5	3	4	652	681.6	470	68	18	15	0	5	4	1	581	611.3
11:00	124	27	2	3	0	1	0	0	157	162.9	114	22	5	1	0	3	1	0	146	152.2
11:15	145	25	6	3	0	2	1	1	183	190.5	129	17	7	3	0	0	3	1	160	164.8
11:30	146	19	4	0	0	0	3	0	172	172.2	132	19	4	4	0	2	0	3	164	170.8
11:45	157	26	4	2	0	2	1	1	193	198.2	113	17	2	7	0	2	0	0	141	153.1
H/Total	572	97	16	8	0	5	5	2	705	723.8	488	75	18	15	0	7	4	4	611	640.9
12:00	141	23	4	2	0	0	1	0	171	175	146	22	5	4	0	1	2	0	180	187.5
12:15	142	25	4	2	0	0	0	0	173	177.6	121	18	2	2	0	0	0	0	143	146.6
12:30	151	16	3	4	0	3	3	0	180	187.9	137	19	5	5	0	0	1	1	168	175.6
12:45	175	18	2	4	0	0	2	0	201	206	136	18	2	3	0	3	0	0	162	169.9
H/Total	609	82	13	12	0	3	6	0	725	746.5	540	77	14	14	0	4	3	1	653	679.6
13:00	156	23	3	0	0	1	3	0	186	186.7	134	16	6	7	0	1	3	0	167	178.3
13:15	149	15	3	4	0	1	1	1	174	180.3	150	19	2	0	0	2	0	1	174	176.2
13:30	150	14	2	5	0	2	2	0	175	183.3	133	12	4	5	0	1	1	0	156	164.9
13:45	153	27	8	2	0	2	0	0	192	200.6	134	15	3	3	0	0	0	1	156	160.6
H/Total	608	79	16	11	0	6	6	1	727	750.9	551	62	15	15	0	4	4	2	653	680
14:00	136	27	4	5	0	2	0	0	174	184.5	127	14	0	4	0	0	0	0	145	150.2
14:15	116	14	1	3	1	7	3	0	145	155.6	129	15	4	9	0	3	3	0	163	177.9
14:30	159	12	5	4	0	3	3	0	186	194.9	145	21	3	5	0	1	0	2	177	184.4
14:45	163	29	6	3	0	1	5	1	208	212.1	111	23	3	5	0	0	2	0	144	150.8
H/Total	574	82	16	15	1	13	11	1	713	747.1	512	73	10	23	0	4	5	2	629	663.3
15:00	181	25	4	4	0	1	3	1	219	224.6	139	17	4	1	0	0	0	0	161	164.3
15:15	143	16	2	4	1	2	2	0	170	178	147	18	3	5	0	2	1	0	176	185.4
15:30	198	30	1	1	0	0	0	0	230	231.8	131	18	2	1	0	2	4	0	158	159.9
15:45	152	28	5	2	0	0	1	0	188	192.5	137	22	3	0	0	6	0	0	168	175.5
H/Total	674	99	12	11	1	3	6	1	807	826.9	554	75	12	7	0	10	5	0	663	685.1
16:00	188	23	2	1	0	4	3	0	221	225.5	145	20	4	3	0	4	1	1	178	186.5
16:15	173	33	1	4	0	0	1	0	212	217.1	140	23	3	0	0	3	2	0	171	174.3
16:30	175	24	3	2	0	1	3	0	208	211.3	152	18	3	1	0	3	0	0	177	182.8
16:45	183	16	2	1	0	0	2	2	206	205.5	164	19	2	1	0	0	0	0	186	188.3
H/Total	719	96	8	8	0	5	9	2	847	859.4	601	80	12	5	0	10	3	1	712	731.9
17:00	200	10	1	1	0	2	0	1	215	218	150	10	2	0	0	0	2	1	165	164
17:15	189	21	4	0	0	0	2	0	216	216.8	148	16	1	3	0	0	0	2	170	172.8
17:30	173	16	1	0	0	0	0	0	190	190.5	148	10	0	2	0	1	1	0	162	165
17:45	128	11	1	0	1	1	1	2	145	145.3	153	11	0	1	0	0	2	5	172	168.1
H/Total	690	58	7	1	1	3	3	3	766	770.6	599	47	3	6	0	1	5	8	669	669.9
18:00	118	15	1	0	1	0	0	2	137	136.9	173	11	0	1	0	0	0	1	186	186.5
18:15	126	12	1	1	1	0	2	1	144	144.8	140	13	2	3	0	1	2	1	162	165.9
18:30	138	15	1	1	1	1	0	0	157	160.8	128	9	0	0	0	0	2	0	139	137.8
18:45	114	9	1	3	0	1	0	2	130	133.8	106	10	0	1	0	0	1	1	119	118.9
H/Total	496	51	4	5	3	2	2	5	568	576.3	547	43	2	5	0	1	5	3	606	609.1
Total	6916	958	154	118	6	59	61	22	8294	8535.2	6060	855	150	135	0	63	47	27	7337	7600.7

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **3**
Location: **Ffordd Y Mileniwm / A4055 Roundabout / western arm routes under the rail line**
Date: **15 May 2018, Tuesday**

Time	From C										To C									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00	97	8	0	0	0	0	0	0	105	105	23	5	2	0	1	0	0	0	31	33
07:15	97	13	2	0	0	1	0	0	113	115	26	6	1	0	0	0	0	0	33	33.5
07:30	96	17	3	0	1	2	3	2	124	125.1	32	13	5	0	2	1	0	0	53	58.5
07:45	93	20	1	0	1	2	1	0	118	120.9	70	14	3	0	0	3	0	2	92	94.9
H/Total	383	58	6	0	2	5	4	2	460	466	151	38	11	0	3	4	0	2	209	219.9
08:00	98	10	1	0	0	2	1	0	112	113.9	65	13	1	0	1	2	0	0	82	85.5
08:15	96	15	2	1	1	2	1	1	119	122.9	93	22	0	0	0	2	0	1	118	119.2
08:30	95	12	3	0	1	0	0	0	111	113.5	101	16	2	0	1	2	0	0	122	126
08:45	91	14	0	0	0	0	2	1	108	106	102	16	2	1	0	0	0	0	121	123.3
H/Total	380	51	6	1	2	4	4	2	450	456.3	361	67	5	1	2	6	0	1	443	454
09:00	123	21	2	0	0	1	1	0	148	149.4	102	13	1	0	2	3	1	0	122	126.9
09:15	94	11	0	0	1	2	0	0	108	111	125	18	3	0	0	2	2	0	150	152.3
09:30	83	9	6	1	1	1	0	0	101	107.3	103	10	2	1	1	0	1	0	118	120.7
09:45	98	13	0	0	0	0	2	0	113	111.8	104	21	3	0	0	0	2	0	130	130.3
H/Total	398	54	8	1	2	4	3	0	470	479.5	434	62	9	1	3	5	6	0	520	530.2
10:00	104	16	0	0	0	3	0	0	123	126	93	21	3	0	0	1	0	0	118	120.5
10:15	81	17	0	0	0	1	0	0	99	100	85	19	2	1	0	2	0	0	109	113.3
10:30	100	11	1	0	1	4	3	0	120	123.7	91	11	0	0	0	1	2	0	105	104.8
10:45	97	14	6	1	0	1	1	0	120	124.7	78	16	1	0	1	1	0	2	99	99.9
H/Total	382	58	7	1	1	9	4	0	462	474.4	347	67	6	1	1	5	2	2	431	438.5
11:00	100	15	1	0	0	2	0	0	118	120.5	88	17	1	1	0	0	1	0	108	109.2
11:15	95	15	3	1	1	0	2	1	118	119.8	109	19	3	0	1	2	0	0	134	138.5
11:30	98	15	3	0	0	0	0	1	117	117.7	100	18	5	0	1	1	1	1	127	130.1
11:45	98	15	0	0	0	1	1	0	115	115.4	107	22	1	0	0	1	1	0	132	132.9
H/Total	391	60	7	1	1	3	3	2	468	473.4	404	76	10	1	2	4	3	1	501	510.7
12:00	80	17	1	0	0	0	4	0	102	100.1	120	14	1	0	0	0	1	0	136	135.9
12:15	102	9	2	0	1	0	1	1	116	116.6	113	22	0	0	0	1	2	0	138	137.8
12:30	123	11	1	1	0	0	1	0	137	138.2	105	17	1	2	1	2	2	1	131	135.1
12:45	95	15	2	0	0	1	1	0	114	115.4	123	15	0	0	0	1	2	0	141	140.8
H/Total	400	52	6	1	1	1	7	1	469	470.3	461	68	2	2	1	4	7	1	546	549.6
13:00	112	13	0	0	0	1	2	0	128	127.8	106	17	1	1	0	0	1	0	126	127.2
13:15	101	12	2	1	1	0	1	0	118	120.7	103	10	2	0	0	0	0	0	115	116
13:30	85	9	3	1	0	1	1	0	100	103.2	107	21	4	0	2	1	0	0	135	140
13:45	103	12	1	0	0	1	1	1	119	119.1	97	14	1	0	0	1	1	0	114	114.9
H/Total	401	46	6	2	1	3	5	1	465	470.8	413	62	8	1	2	2	2	0	490	498.1
14:00	84	8	0	1	0	3	2	0	98	101.1	97	15	1	0	0	0	3	0	116	114.7
14:15	71	15	1	0	0	3	1	0	91	93.9	124	12	1	0	0	4	1	0	142	145.9
14:30	91	18	1	0	2	2	1	0	115	118.9	106	13	1	0	0	1	0	0	121	122.5
14:45	100	11	1	0	0	1	0	0	113	114.5	131	14	4	1	1	0	1	0	152	155.7
H/Total	346	52	3	1	2	9	4	0	417	428.4	458	54	7	1	1	5	5	0	531	538.8
15:00	100	19	3	0	0	1	1	0	124	125.9	132	21	1	0	0	4	2	0	160	163.3
15:15	111	12	1	0	1	1	0	0	126	128.5	133	15	2	0	1	2	2	1	156	158
15:30	131	11	0	0	0	0	1	0	143	142.4	155	22	1	0	1	1	1	0	181	182.9
15:45	107	13	1	0	0	2	0	0	123	125.5	140	20	4	0	0	3	1	0	168	172.4
H/Total	449	55	5	0	1	4	2	0	516	522.3	560	78	8	0	2	10	6	1	665	676.6
16:00	107	13	5	0	0	3	0	1	129	133.7	152	31	1	0	0	1	1	1	187	187.1
16:15	104	9	1	0	1	3	1	0	119	122.9	160	28	0	0	0	1	3	0	192	191.2
16:30	116	12	0	0	0	1	0	0	129	130	168	27	0	0	0	3	3	0	201	202.2
16:45	111	8	0	0	0	1	0	0	120	121	174	17	0	0	1	2	3	0	197	198.2
H/Total	438	42	6	0	1	8	1	1	497	507.6	654	103	1	0	1	7	10	1	777	778.7
17:00	117	10	2	0	0	0	1	0	130	130.4	189	21	0	1	0	2	1	1	215	216.9
17:15	115	9	1	0	1	0	0	1	127	127.7	157	14	4	0	0	0	4	0	179	178.6
17:30	101	11	0	0	0	0	3	0	115	113.2	155	11	0	0	1	0	1	2	170	168.8
17:45	86	6	0	2	0	0	3	1	98	98	135	8	3	0	0	1	6	1	154	152.1
H/Total	419	36	3	2	1	0	7	2	470	469.3	636	54	7	1	1	3	12	4	718	716.4
18:00	88	8	1	0	0	0	1	1	99	98.1	118	4	0	0	0	0	1	1	124	122.6
18:15	81	9	1	0	0	2	2	0	95	96.3	147	8	0	0	0	0	2	1	158	156
18:30	83	4	0	0	1	1	0	0	89	91	120	5	0	0	1	0	1	0	127	127.4
18:45	66	4	2	0	0	0	0	0	72	73	107	3	1	0	0	1	0	0	112	113.5
H/Total	318	25	4	0	1	3	3	1	355	358.4	492	20	1	0	1	1	4	2	521	519.5
Total	4705	589	67	10	16	53	47	12	5499	5576.7	5371	749	75	9	20	56	57	15	6352	6431

Project Number: **TSP13819**
Project Name: **Dinas Powys - May 2018**
Survey Type: **Manual Classified Turning Count**
Site No: **3**
Location: **Ffordd Y Mileniwm / A4055 Roundabout / western arm routes under the rail line**
Date: **15 May 2018, Tuesday**

tsp
traffic survey partners

Time	Whole Junction									
	CAR	LGV	OGV 1	OGV 2	BUS	COACH	MCY	PCY	**TOTAL**	**TOTAL (PCU)**
07:00	246	40	4	1	1	0	0	0	292	296.3
07:15	261	45	4	2	0	2	0	0	314	320.6
07:30	276	68	13	6	3	7	3	4	380	399.3
07:45	323	77	11	4	1	7	3	5	431	443.9
H/Total	1106	230	32	13	5	16	6	9	1417	1460.1
08:00	340	52	10	8	1	5	2	1	419	438.4
08:15	337	69	6	3	1	4	1	3	424	432.9
08:30	394	62	12	7	2	3	1	0	481	500.5
08:45	402	51	13	6	0	1	4	1	478	490.1
H/Total	1473	234	41	24	4	13	8	5	1802	1861.9
09:00	460	73	9	7	2	7	5	0	563	582.6
09:15	373	61	6	10	1	5	3	0	459	479.2
09:30	396	51	17	6	2	4	4	0	480	499.9
09:45	393	66	18	4	0	7	4	1	493	511
H/Total	1622	251	50	27	5	23	16	1	1995	2072.7
10:00	387	62	8	8	0	8	1	1	475	496
10:15	371	58	10	8	0	4	1	1	453	471
10:30	381	54	7	10	1	5	5	0	463	482.5
10:45	387	66	15	8	1	3	3	3	486	503.7
H/Total	1526	240	40	34	2	20	10	5	1877	1953.2
11:00	380	71	7	5	0	5	2	0	470	483.8
11:15	412	67	14	7	2	2	5	3	512	526.7
11:30	410	61	13	5	1	3	4	4	501	512.4
11:45	427	71	7	9	0	4	3	1	522	538.6
H/Total	1629	270	41	26	3	14	14	8	2005	2061.5
12:00	435	65	12	6	0	1	7	0	526	536.6
12:15	436	70	8	4	1	1	3	1	524	532.6
12:30	457	53	10	12	1	4	5	2	544	565
12:45	460	57	6	7	0	4	3	0	537	551.3
H/Total	1788	245	36	29	2	10	18	3	2131	2185.5
13:00	444	59	9	8	0	3	7	0	530	543.7
13:15	456	50	7	5	1	3	2	2	526	537.2
13:30	416	45	12	12	2	3	4	0	494	518.2
13:45	430	62	13	5	0	3	2	2	517	530.2
H/Total	1746	216	41	30	3	12	15	4	2067	2129.3
14:00	379	58	5	10	0	5	6	0	463	479.9
14:15	395	46	7	12	1	12	6	0	479	507.5
14:30	453	53	8	9	2	5	4	2	536	554.7
14:45	449	67	11	9	1	2	7	1	547	562.2
H/Total	1676	224	31	40	4	24	23	3	2025	2104.3
15:00	478	70	11	5	0	6	5	1	576	590.2
15:15	468	51	7	9	3	7	3	1	549	571.6
15:30	534	67	3	2	1	3	6	0	616	620.5
15:45	462	70	11	2	0	10	1	0	556	573.5
H/Total	1942	258	32	18	4	26	15	2	2297	2355.8
16:00	524	82	11	4	0	8	4	3	636	649.9
16:15	496	78	5	4	1	4	6	0	594	603.1
16:30	545	69	6	3	0	6	5	0	634	643.9
16:45	545	56	4	2	1	3	5	2	618	622
H/Total	2110	285	26	13	2	21	20	5	2482	2518.9
17:00	560	46	5	2	0	4	4	3	624	628.3
17:15	539	53	8	3	1	0	5	3	612	615.5
17:30	512	41	1	2	1	1	5	2	565	565.5
17:45	446	30	3	3	1	2	9	8	502	498.6
H/Total	2057	170	17	10	3	7	23	16	2303	2307.9
18:00	462	32	2	1	1	0	2	4	504	502.9
18:15	441	33	4	4	1	2	5	3	493	497.8
18:30	419	27	1	1	3	2	3	0	456	461
18:45	345	23	3	4	0	2	1	3	381	386.7
H/Total	1667	115	10	10	5	6	11	10	1834	1848.4
Total	20342	2738	397	274	42	192	179	71	24235	24860

Peak Hours		Totals
07:00	08:00	1417
07:15	08:15	1544
07:30	08:30	1654
07:45	08:45	1755
08:00	09:00	1802
08:15	09:15	1946
08:30	09:30	1981
08:45	09:45	1980
09:00	10:00	1995
09:15	10:15	1907
09:30	10:30	1901
09:45	10:45	1884
10:00	11:00	1877
10:15	11:15	1872
10:30	11:30	1931
10:45	11:45	1969
11:00	12:00	2005
11:15	12:15	2061
11:30	12:30	2073
11:45	12:45	2116
12:00	13:00	2131
12:15	13:15	2135
12:30	13:30	2137
12:45	13:45	2087
13:00	14:00	2067
13:15	14:15	2000
13:30	14:30	1953
13:45	14:45	1995
14:00	15:00	2025
14:15	15:15	2138
14:30	15:30	2208
14:45	15:45	2288
15:00	16:00	2297
15:15	16:15	2357
15:30	16:30	2402
15:45	16:45	2420
16:00	17:00	2482
16:15	17:15	2470
16:30	17:30	2488
16:45	17:45	2419
17:00	18:00	2303
17:15	18:15	2183
17:30	18:30	2064
17:45	18:45	1955
18:00	19:00	1834

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