



CABINET - 27TH MARCH 2019

SUBJECT: HAFOD-YR-YNYS AIR QUALITY FEASIBILITY STUDY - FINAL PLAN

REPORT BY: INTERIM CORPORATE DIRECTOR, COMMUNITIES

1. PURPOSE OF REPORT

- 1.1 To inform Cabinet of the findings of the Final Plan (Appendix 1) for achieving compliance with the Ambient Air Quality Directive at Hafod-yr-ynys in accordance with the Air Quality Direction issued to the Authority by Welsh Government.
- 1.2 For Cabinet to agree their preferred option that secures compliance with the Air Quality Directive.
- 1.3 To seek Cabinet approval to undertake a 10 week public consultation on the Final Plan and the preferred option.

2. SUMMARY

- 2.1 The national nitrogen dioxide air quality objectives are being exceeded at receptor locations on Hafod-yr-ynys Road. The continuous nitrogen dioxide monitor at Hafod-yr-ynys forms part of DEFRA's national Automatic Urban and Rural Network (AURN). The AURN is a network of continuous monitors throughout the UK that inform a national Pollution Climate Model which is used for air quality reporting purposes to Europe to demonstrate compliance with the Ambient Air Quality Directive. Caerphilly County Borough Council and Cardiff City Council are two local authorities in Wales that are highlighted in the National Nitrogen Dioxide Plan as having locations that fail to comply with the Ambient Air Quality Directive.
- 2.2 In February 2018 Welsh Government issued an Air Quality Direction to Caerphilly CBC to undertake a feasibility study for the area and to determine a preferred option or basket of options which will achieve compliance with the Ambient Air Quality Directive air quality objectives in the 'shortest possible time'. In the Final Plan, 8 measures were modelled with 4 being discounted from further detailed analysis as modelling indicated that they would contribute negligible improvement to local air quality. Measures involving the introduction of a Clean Air Zone (also combined with traffic management/signal changes) and demolition of the properties on the south side of the A472 were considered in more detail.
- 2.3 As a result of the study findings it is anticipated that demolition of the properties would achieve compliance by 2023 and any measures including a Clean Air Zone would achieve compliance by 2026. Therefore demolition of the properties is assessed as achieving compliance in the shortest possible time. However, under the Do Minimum option modelling predicts delivery of air quality compliance by 2025. As demolition of the properties is likely to be preceded by a compulsory purchase process involving only market value payments to owners the potential for hardship to residents is a very real concern.

- 2.4 This report seeks Cabinet's decision on the preferred option and approval to undertake a 10 week public consultation on the Final Plan (attached as appendix 1) and the preferred option. The completed Final Plan and preferred option must be submitted to Welsh Government by the 30th June 2019 at the latest.

3. RECOMMENDATIONS

- 3.1 That Cabinet agrees the preferred option for securing compliance with the Air Quality Directive of either:
- a) demolition dwellings at Woodside Terrace, to include 1&2 Woodside Shops and Yr Adfa and re-align the footpath; or
 - b) the Do Minimum option.
- 3.2 That Cabinet approve the draft Final Plan and agrees a preferred option for a 10 week public consultation.

4. REASONS FOR THE RECOMMENDATIONS

- 4.1 To mitigate any potential impacts on health and to comply with the statutory obligations of the local authority.
- 4.2 To ensure that work required from the Air Quality Direction issued to the local authority by Welsh Government is progressed effectively and the Final plan is submitted by the deadline of the 30th June 2019.

5. THE REPORT

- 5.1 The national nitrogen dioxide air quality objectives are being exceeded at receptor locations on Hafod-yr-ynys Road. The local authority is required to designate any area failing the national air quality objectives as an Air Quality Management Area (AQMA) and produce an Air Quality Action Plan (AQAP) which details measures to bring the pollutant back within acceptable limits. The AQAP was approved by Cabinet and subsequently Welsh Government in March 2018.
- 5.2 In addition to providing results which inform the Local Air Quality Management regime and action planning process, the continuous nitrogen dioxide monitor at Hafod-yr-ynys also forms part of DEFRA's national Automatic Urban and Rural Network (AURN). The AURN is a network of continuous monitors throughout the UK that inform a national Pollution Climate Model which is used for air quality reporting purposes to demonstrate compliance with the Ambient Air Quality Directive. Hafod-yr-ynys and some locations in Cardiff are two areas in Wales showing non-compliance with the Ambient Air Quality Directive.
- 5.3 ClientEarth, a not for profit environmental law organisation, has successfully challenged UK and Welsh Governments in the courts in relation to compliance with the European Ambient Air Quality Directive. In February 2018 Welsh Government issued an Air Quality Direction to Caerphilly CBC to undertake a feasibility study for the area and to determine a preferred option or basket of options which will achieve compliance with the legal limits for nitrogen dioxide in the 'shortest possible time'. On 18th March 2019 the Council received a letter from ClientEarth setting out its position on the legal tests that the Council's plan must satisfy.
- 5.4 The Initial Plan submitted to Welsh Government in September 2018 considered a shortlist of 10 measures to bring about compliance with the Ambient Air Quality Directive at Hafod-yr-ynys. The report concluded that 4 out of 10 of those measures be ruled out on one of the key

criteria, namely timescales, effectiveness and deliverability. At the time of reporting the Initial Plan to Cabinet, another measure was added to reduce the speed limit to 30mph along Hafod-yr-ynys Road and to remove the climbing lane. However, modelling indicated that this proposal would deliver negligible improvement and was therefore removed from further consideration. During the modelling exercise measures 7 and 8 below were also added for further consideration.

For the purposes of the Final Plan, 7 out of 8 measures were modelled as follows:

1. Change signal timings at Crumlin Junction
2. Signalise the A472/B4471 Swyffryd Junction and introduce an east bound queue detector
3. Demolish dwellings at Woodside Terrace, to include 1&2 Woodside Shops and Yr Adfa and re-align the footpath
4. Peak hour HGV Ban
5. Clean Air Zone
6. Air Quality Public Awareness Campaign also referred to as the Do Minimum approach (not modelled)
7. Package 1: Change Signal timings at Crumlin Junction & signalise the A472/B4471 Swyffryd Junction
8. Package 2: Do maximum – change signal timings at Crumlin Junction & signalise the A472/B4471 Swyffryd Junction & Clean Air Zone

- 5.5 Of the above modelled measures, 1, 2, 4, and 7 were discounted from further detailed analysis as modelling indicated that they would contribute negligible improvement to local air quality. Measures 3, 5, 6 and 8 were considered in more detail as described below.
- 5.6 The findings of the Final Plan for this study at Appendix 1 conclude that demolition of the dwellings at Woodside Terrace, to include 1&2 Woodside Shops and Yr Adfa and re-alignment of the footpath will deliver compliance in the shortest possible time. Demolition is expected to be preceded by a compulsory purchase process which, allowing for the potential for a Public Inquiry should there be any objections, means that compliance is modelled to be achieved by 2023 (but could be sooner if the dwellings could be purchased by negotiation). This option does not reduce emissions though does remove receptors and therefore bring about compliance as required by the Direction.
- 5.7 A Clean Air Zone is modelled to result in significant reductions in NO₂ concentrations. However no legislation currently exists in Wales to enact a Clean Air Zone (CAZ) and national Guidance suggests that a CAZ would take approximately 5 years to implement. Welsh Government have indicated that a Clean Air Act incorporating Clean Air Zone legislation might be brought forward and commenced in 2021 meaning that a Clean Air Zone would not achieve compliance until 2026. Additionally, this option has significant adverse impacts on the local economy, road users and could potentially displace traffic through other Air Quality Management Areas and/or unsafe routes. The Health Impact Assessment and Distributional Analysis has identified unacceptable adverse impacts resulting from this option given the lack of alternate route choice on this part of the local highway network.
- 5.8 The study indicates that the NO₂ limit value can be met in 2025 in a Do Minimum scenario. This is because fleet renewal in years to come is predicted to deliver air quality improvements without local intervention. However, this is dependent on later iterations of Euro engine standards delivering predicted NO_x emission reductions.
- 5.9 The Air Quality Direction issued by Welsh Government requires the Council to identify in detail the preferred option for delivering compliance in the shortest possible time. Modelling predicts that a do minimum option will bring about compliance with the objective by the year 2025. Introduction of a Clean Air Zone is predicted to bring about compliance by the year 2026. However, demolition of dwellings at Woodside Terrace, 1&2 Woodside Shops and Yr Adfa with re-alignment of the footpath is predicted to bring about compliance by the year 2023. Therefore the compulsory purchase of the properties and demolition is predicted to achieve compliance in the shortest possible time.

- 5.10 As stated above, whilst demolition of the properties is predicted to achieve compliance in the shortest possible time it is envisaged that this will need to be preceded by the Council acquiring the properties and land through a compulsory purchase process. The Council will need to seek Welsh Government approval for the Compulsory Purchase Order and be able to demonstrate that taking the land is necessary and that there is a compelling case in the public interest.
- 5.11 The 23 properties at Woodside Terrace, Woodside Shops and Yr Adfa are a mix of owner occupiers and private rented tenants. In acquiring the properties the Council will only be able to pay market value for them (with some expenses for disbursements). For many, if not most, this is likely to present a challenge in terms of their ability to purchase equivalent properties in the locality. At a meeting held with residents on 12th March 2019, strong concerns were expressed regarding this issue. Some residents also expressed concerns regarding health impacts including asthma. At the meeting the Council was asked by residents to lobby Welsh Government to request additional compensation payments that would allow the residents to purchase homes in the general locality. Recognising the potential for disruption and hardship that the compulsory purchase of properties might bring to the families involved and in view of the fact that this is modelled to only bring about compliance just 2 years ahead of the Do Minimum scenario; Cabinet are requested to be mindful of these issues when considering their preferred option.

5.12 **Conclusion**

Demolition of the properties on the south side of the A472 is assessed as achieving compliance with the air quality directive in the shortest possible time. However, the Do Minimum option is assessed as achieving compliance just 2 years later and therefore Cabinet are asked to select the preferred option for public consultation along with the Final Plan.

6. **ASSUMPTIONS**

6.1 The following table details assumptions and comments for each of the four options:

Measure	Compliance Date	Assumptions and comments
Do Minimum	2025	<ul style="list-style-type: none"> • Initial Data used to feed model has been fairly robust; including traffic counts, fleet analysis, junction counts, emission studies of vehicles using the route, air quality data (real time and diffusion tubes). • The model is based on air quality data from 2017, which produced an annual average mean of 70 µg/m³, however the annual average mean for 2018 decreased to 62 µg/m³. This is an exceptional significant reduction; which if repeated may see compliance sooner. However, if it is an anomaly, compliance may take longer to achieve. • National growth factors are used to predict traffic in future years • In terms of air quality certain assumptions are made about the fleet becoming cleaner year on year and the reality is this may not happen as quickly, which can then affect the model outcomes. • Models have limitations and have to be treated with caution.

<p>Compulsory Purchase Order (CPO) and Demolition</p>	<p>Some time during 2023 (latest) allowing 1 year for public enquiry and 1 year for residents to vacate</p>	<ul style="list-style-type: none"> • Would achieve compliance in the shortest possible time. • Removes the receptor (residents) from area - so positive health gain. • Could leave some families with financial deficit. • Stress/disruption of having to vacate family homes and relocate. • Residents have been given the opportunity to discuss their initial property valuations. • A meeting with residents has been held to discuss the outcomes of the study and the way forward with strong concerns being expressed regarding their ability to secure alternative homes in the locality. • There is the possibility that if the CPO process is challenged then the resultant Public Inquiry process may lengthen the timescale further and take compliance beyond 2023.
<p>Clean Air Zone only Plus Package 2: Do maximum – change signal timings at Crumlin Junction & signalise the A472/B4471 Swyffryd Junction & Clean Air Zone</p>	<p>Realistically around 2026 (assuming legislation exists by 2021)</p>	<ul style="list-style-type: none"> • No legislation currently exists to enact a Clean Air Zone (CAZ) • Joint Air Quality Unit Guidance suggests that a CAZ would take approx. 5 years to implement • Displacements effects of CAZ; could mean that vehicles will re-route to other areas causing exceedance elsewhere. • Detrimental to business / commuters who will all have to pay a charge to use the route. • Would have an adverse effect on the main cross valley link between Caerphilly and Torfaen.

7. LINKS TO RELEVANT COUNCIL POLICIES

- 7.1 Local Air Quality Management (LAQM) is a statutory requirement. Addressing air quality contributes to the Caerphilly Public Services Board Well-being Plan 2018-2023, supporting the Positive Change, Positive People and Positive Places objectives.

- 7.2 The work also supports the following Corporate Well-being Objectives, identified within the Council's Corporate Plan 2018-2023:
- WBO 4: Promote a modern, integrated and sustainable transport system that increases opportunity, promotes prosperity and minimises the adverse impacts on the environment
 - WBO 5: Creating a county borough that supports a healthy lifestyle in accordance with the Sustainable Development Principle within the Well-being of Future Generations (Wales) Act 2015
- 7.3 Addressing air quality contributes to the following Well-being goals within the Well-being of Future Generations Act (Wales) 2015:
- A prosperous Wales
 - A resilient Wales
 - A healthier Wales
 - A more equal Wales
 - A Wales of cohesive communities
 - A globally responsible Wales

8. WELL-BEING OF FUTURE GENERATIONS

- 8.1 Local Air Quality Management contributes to the Well-being Goals as set out in the Links to Strategy above. The service's activity in this regard is consistent with the five ways of working as defined within the sustainable development principle in the Act in that it is focussed on preventing harm to public health. The service follows a statutory process in relation to Local Air Quality Management and uses a range of strategies, activities and interventions that ensure an integrated and balanced approach to service delivery. This process seeks to balance the need for proactive intervention programmes with the need to promote, educate and inform both key stakeholders and the public; collaborating with them to promote and improve air quality over the long term.

9. EQUALITIES IMPLICATIONS

- 9.1 The equalities implications associated with the Final Plan have been considered and all protected groups will gain positive health benefits from reductions in nitrogen dioxide levels. An Equalities Impact Assessment has been drafted to be included in and informed by the proposed 10 week public consultation.

10. FINANCIAL IMPLICATIONS

- 10.1 The demolition option will cost approximately £4.5M. Welsh Government has given a commitment that it will meet the implementation cost. The Do Minimum option has no significant cost implications. Welsh Government are currently meeting costs associated with the feasibility study and have made £20M of funding available to local authorities to cover the costs of the feasibility process and implementation of any proposed actions.

11. PERSONNEL IMPLICATIONS

- 11.1 None.

12. CONSULTATIONS

- 12.1 This report has been sent to the Consultees listed below and all comments received are reflected in this report.

13. STATUTORY POWER

- 13.1 Environment Act 1995.
European Ambient Air Quality Directive (2008/50/EC).

14. URGENCY

- 14.1 The decision will be subject to the “call-in” procedure.

Author: Robert Hartshorn, Head of Public Protection, Community and Leisure Services
Consultees: Cllr Eluned Stenner, Cabinet Member for Environment and Public Protection
Cllr Sean Morgan, Deputy Leader and Cabinet Member for Economy, Infrastructure, Sustainability and Well-being of Future Generations
Councillor Carl Thomas, Crumlin Ward Member
Councillor Mike Davies, Crumlin Ward Member
Mark S. Williams, Interim Corporate Director Communities
Ceri Edwards, Environmental Health Manager
Maria Godfrey, Team Leader, Environmental Health
Rob Tranter, Head Of Legal Services and Monitoring Officer
Nicole Scammell, Head of Corporate Finance and S.151 Officer
Marcus Lloyd, Head of Infrastructure
Clive Campbell, Transportation Engineering Manager
Rhian Kyte, Head of Regeneration & Planning
Anwen Cullinane, Senior Policy Officer (Equalities and Welsh Language)
Shaun Watkins, HR Manager
Mike Eedy, Finance Manager

Background Papers:

Environment Act 1995 (feasibility Study for Nitrogen Dioxide Compliance) Air Quality Direction 2018, dated 15th February 2018
Hafodyrynys Initial Scoping Report
Hafodyrynys Initial Plan
Letter from ClientEarth dated 15th March 2019

Appendices:

Appendix 1 Hafodyrynys WelTAG Stage Three Final Plan



Caerphilly County Borough Council

HAFODYRYNYS, CAERPHILLY – WELTAG STAGE THREE REPORT

Consideration of Measures for Nitrogen Dioxide
Reduction





Caerphilly County Borough Council

HAFODYRYNYS, CAERPHILLY – WELTAG STAGE THREE REPORT

Consideration of Measures for Nitrogen Dioxide Reduction

FINAL PUBLIC

PROJECT NO. 70054924

DATE: MARCH 2019

WSP

1 Capital Quarter

Tyndall Street


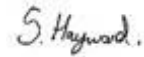

Cardiff

CF10 4BZ

Phone: +44 2920 769 200

WSP.com

QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks	Draft First Issue	Draft Second Issue	Draft Third Issue Response to comments from Second Issue	Final Updated the comments from the Third Issue
Date	18 February 2019	01 March 2019	12 March 2019	19 March 2019
Prepared by	Rares Ciurezu	Rares Ciurezu	Rares Ciurezu	Rares Ciurezu
Signature				
Checked by	Stephen Hayward	Stephen Hayward	Stephen Hayward	Stephen Hayward
Signature				
Authorised by	Peter Evans	Peter Evans	Peter Evans	Peter Evans
Signature				
Project number	70054924	70054924	70054924	70054924
Report number				
File reference	\\uk.wspgroup.com\central data\Projects\700549xx\70054924 - Hafodyrynys NO2 WelTAG Stage 3\03 WIP\TP Transport Planning\05 Reports\Stage Three Report\			

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APPENDICES

APPENDIX A

SUMMARY OF CHANGES TO 2017 WELTAG GUIDANCE

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LOCAL BUSINESS QUESTIONNAIRE

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OPTION DRAWINGS

EXECUTIVE SUMMARY

The European Union Ambient Air Quality Directive (2008/50/EC) sets legally binding limits for concentrations of certain air pollutants in outdoor air, termed 'limit values'. The only limit values that the UK currently fails to meet are those set in respect of nitrogen dioxide (NO₂). The A472, Hafodyrynys Road exceeds the limit value and Caerphilly County Borough Council are investigating measures to bring forward reductions in NO₂ to ensure compliance with the Ambient Air Quality Directive in the shortest possible time. This report presents the findings of WeITAG Stage Three (Full Business Case), for this study.



Since the inception of this study, another year of monitoring data for 2018 is available for the Stage Three assessment. The annual mean concentration, unratified data, for 2018 was 62 µg/m³, a reduction of 8 µg/m³ from 2017. While the data for 2018 showed a similar seasonal trend to previous years, the overall concentrations were lower than many of the preceding years. Traffic and Air Quality models were developed to predict the date of compliance with no interventions. The receptor locations are compliant in 2025.

This Stage Three study has appraised five measures, and two packages of measures, brought forward from Stage Two. These are:

- Change Signal Timings at Crumlin Junction
- Signalise the A472/B4471 Swyffryd Junction
- Demolish Dwellings at Woodside Terrace
- Peak Period HGV Bans
- Clean Air Zone / Low Emission Zone
- Traffic Management Package (Changing Signal Timings at Crumlin Junction & Signalise the A472/B4471 Swyffryd Junction)
- Do Maximum Package (Changing Signal Timings at Crumlin Junction & Signalise the A472/B4471 Swyffryd Junction & Clean Air Zone / Low Emission Zone)

The appraisals demonstrated that 'Changing the Signal Timings at Crumlin Junction' and 'Signalisation of the A472/B4471 Junction had imperceptible benefits with respect to reductions in NO₂. Similarly, the cumulative benefits of both measures (the Traffic Management Package) do not bring forward tangible reductions in NO₂.

The 'Peak Period HGV Bans' reduces NO₂ on the A472 corridor by displacing HGV traffic and smoothing the flow traffic on the corridor, though the air quality benefits are small and the potential adverse impacts of this option on the local economy (including loss of jobs) could be significant.



A 'Clean Air Zone' would result in significant reductions in NO₂ concentrations on the A472 corridor and would likely bring forward compliance with the limit value in the year of implementation (2026). The modelling has demonstrated that the compliance year with no intervention is 2025 and therefore this option fails to meet one of the key criteria of the objective (timescales). It has been identified that this option would have significant adverse impacts on local communities and businesses. Furthermore, a Clean Air Zone in this location would displace traffic from this corridor, resulting in potential road safety issues and could even lead to increases in NO₂ through areas which already exceed the limit value (M4 J25-26, Newport). The 'Do Max Package' which includes the Clean Air Zone has similar impacts.

The 'Demolition of Dwellings at Woodside Terrace' would bring forward compliance with the limit value in the year of implementation (2023). This option may have significant impacts on the residents of Woodside Terrace, though the overall impacts on local communities and business is marginal. Given the expected implementation date, this option should bring forward reductions in NO₂, and compliance with the limit value, in the shortest possible time. For this option to be progressed further, topographical and geotechnical surveys need to be undertaken so that detailed design can be completed. This will minimise any risks associated with this option and mitigate any potential delays to programme in respect to implementation.

1 INTRODUCTION

1.1 CONTEXT

The European Union Ambient Air Quality Directive (2008/50/EC) sets legally binding limits for concentrations of certain air pollutants in outdoor air, termed 'limit values'. The Directive requires that Member States report annually on air quality within zones designated under the Directive and, where the concentration of pollutants in air exceeds limit values, to develop air quality plans that set out measures in order to attain the limit values. The only limit values that the UK currently fails to meet are those set in respect of nitrogen dioxide (NO₂).

In July 2017, the UK Government published its Air Quality Plan (the 2017 Plan) for tackling roadside NO₂ concentrations¹. The 2017 Plan set out details of the authorities responsible for delivering air quality improvements including devolved administrations and Local Authorities.

Wales is divided into four zones under the Directive, the Hafodyrynys study falls in to the non-agglomeration zone of South Wales:

- Two urban agglomeration zones (Cardiff and Swansea)
- Two non-agglomeration zones (North Wales and South Wales)

Caerphilly County Borough Council (CCBC) is exploring additional measures which could be implemented on the A472 to bring forward compliance with NO₂ Limit Values in the shortest possible time.

WSP and Ricardo have been commissioned to undertake a WeITAG Stage Three (Full Business Case) to appraise potential measures deliverable by CCBC for reducing NO₂ levels arising from traffic emissions at this location. This work follows on from the WeITAG Stage One (Strategic Outline case), and WeITAG Stage Two (Outline Business Case) completed by WSP and Ricardo in September 2018. As part of the Stage One appraisal, a long list of 30 measures were put forward. The 10 measures that met the criteria of the objective at Stage One were taken forward as part of WeITAG Stage Two. Of the 10 measures, 6 were identified at Stage Two WeITAG to have potential benefits to the reduction of NO₂. The measures were split into short, medium and long-term sub categories. This Stage Three study presents a full and detailed assessment of the 6 preferred options identified at WeITAG Stage Two.

Where measures have been considered as not being deliverable by CCBC using its powers as Highway or Traffic Authority for the local road network, these will be considered further in the overarching Welsh Government appraisal which is independent of this study.

The Stage Two WeITAG identified that the following elements need to be undertaken at Stage Three:

¹ UK plan for tackling roadside nitrogen dioxide concentrations; Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/633269/air-quality-plan-overview.pdf - Accessed 10th November 2017

- Qualitative analysis of impacts against WelTAG impact areas where appropriate. This should include all relevant traffic and air quality modelling and outline quantifiable benefits in order to determine a Present Value of Benefits (PVB) for each measure assessed;
- Detailed scheme drawings;
- Detailed cost estimates;
- Assessment of Technical, Operational and Financial Feasibility, and Deliverability and Risk;
- Quantitative Value for Money assessment.

This report presents the Stage Three: Full Business Case of the WelTAG process for reducing the levels of NO₂ at A472 Hafodyrynys Road, Caerphilly.

1.2 APPROACH

WelTAG is the Welsh Transport Appraisal Guidance, and provides a framework for appraising changes to the transport network. The latest version of this guidance (WelTAG 2017²) has been used as the basis for this appraisal. As well as embedding the Well-being of Future Generations (Wales) Act 2015, WelTAG combines the principles of the HM Treasury Green Book and the Five Case Model for Better Business Cases, with WebTAG best practice for transport appraisal. The process covers the complete lifecycle of a proposed intervention, from problem identification to scheme design, and implementation and evaluation.

A summary of the changes to WelTAG from the draft to final release of the 2017 WelTAG guidance is contained within Appendix A.

The objective of this study is to further investigate potential measures and identify a measure or package of measures for implementation by CCBC to bring forward reductions in NO₂ in the shortest possible time, to ensure compliance with the Air Quality Framework Directive requirements along the A472. Therefore, the Transport Case focuses on air quality and reflects the key considerations in relation to the EU Air Quality Directive and bringing forward compliance with limit values.

The WelTAG guidance states that the purpose of the Stage Three (Full Business Case) is to:

'make a full and detailed assessment of the preferred option to inform a decision as to whether or not to proceed to implementation'.

As such, this Stage Three (Full Business Case) report:

- Determines whether a transport option exists that can address the issues identified, contributes positively to the well-being goals and objectives, and can be delivered within technical and financial constraints, although is mainly driven by if a measure can achieve compliance in the shortest possible time;

² Source: <https://beta.gov.wales/sites/default/files/publications/2017-12/welsh-transport-appraisal-guidance.pdf>

- Presents the preferred option(s), to be taken forward to procurement and implementation;
- Identifies each dimension of the Five Cases with a level of detail proportionate to scale and/or significance of the impacts and the associated risks; and
- Outlines issues affecting the deliverability of options, the realisation of the anticipated benefits and the mitigation of adverse impacts.

1.3 AIR QUALITY DIRECTION, INDEPENDENT REVIEW PANEL, NOVEMBER 2018

Welsh Government appointed an Independent Review Panel to provide expert advice to the Welsh Government on plans produced by Caerphilly County Borough Council and Cardiff Council to deliver compliance with legal limits for nitrogen dioxide. The review process is intended to ensure that proposed measures are robust, and are likely to bring about compliance.

1.4 REPORT STRUCTURE

The structure of this Stage Three report is as follows:

Chapter 2: Strategic case – Study Overview

This chapter presents a summary of the existing situation presented in WelTAG Stage One and Two studies. It outlines the objective and the EU Air Quality Directive and includes an evidence-based description of the current problem. It identifies the process undertaken and the measures that are included within Stage Three.

Chapter 3: Strategic case – Baseline

This chapter provides a summary of the air quality baseline, traffic baseline and other baseline data.

Chapter 4: Transport case

This chapter provides a summary of the appraisal against the objective through consideration of the key and secondary criteria and appraisal against the aspects of the future generation objectives. Supporting technical information is provided within the WelTAG Stage Three Impact Assessment Report (IAR).

Chapter 5: Financial case

This chapter identifies whether the costs for each of the shortlist of measures appraised at Stage Three are affordable, and the potential funding mechanisms for delivery.

Chapter 6: Commercial case

This chapter includes a description as to whether the measures are commercially viable, and provides an analysis as to whether measures could be packaged together for a phased delivery.

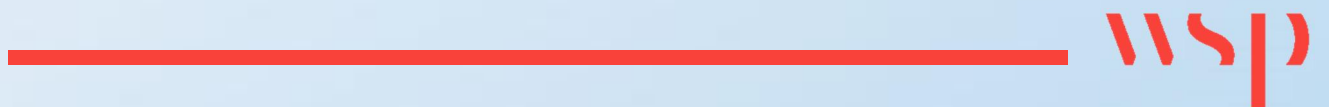
Chapter 7: Management case

This chapter identifies the delivery arrangements of the likely measures and then its management during its life time.

The conclusion of this Stage Three report identifies the likely measures that will be implemented to bring forward reductions in NO₂ in the shortest possible time and to do so in a way that reduces personal exposure for the protection of public health as quickly as possible to ensure compliance with the Ambient Air Quality Directive, as per the objective of the study.

2

STRATEGIC CASE - STUDY OVERVIEW



2 STRATEGIC CASE - STUDY OVERVIEW

2.1 OVERVIEW

The Strategic Case 'tells us if we need change and why. It presents an evidence based description of the current situation, describes the likely future situation if no action is taken, and presents the reasons why an intervention is required'.

WelTAG Stages One and Two of this study were finalised in August 2018 and September 2018 respectively, and include a complete Strategic Case. This Stage Three report therefore provides additional and updated information where relevant, and is intended to be read in conjunction with the previous reports.

2.2 STUDY CORRIDOR

The study area has been selected based on data from an air quality monitoring site, which is part of the UK Automatic Urban and Rural Network (AURN). This monitor complies with requirements detailed in the EU Directive (2008/50/EC) to report on the concentrations of particular pollutants in the atmosphere.

The A472 study corridor is the focus of this WelTAG study, however it is acknowledged that the measures and their subsequent impacts may be realised beyond the identified area with NO₂ exceedances.

Hafodyrynys is a small village community that sits within the Caerphilly County Borough Council boundary between Crumlin and Pontypool on the A472. Woodside Terrace is the row of houses that are situated in the foot of a high sided valley on the southern side of the A472, between Crumlin junction and Hafodyrynys village.

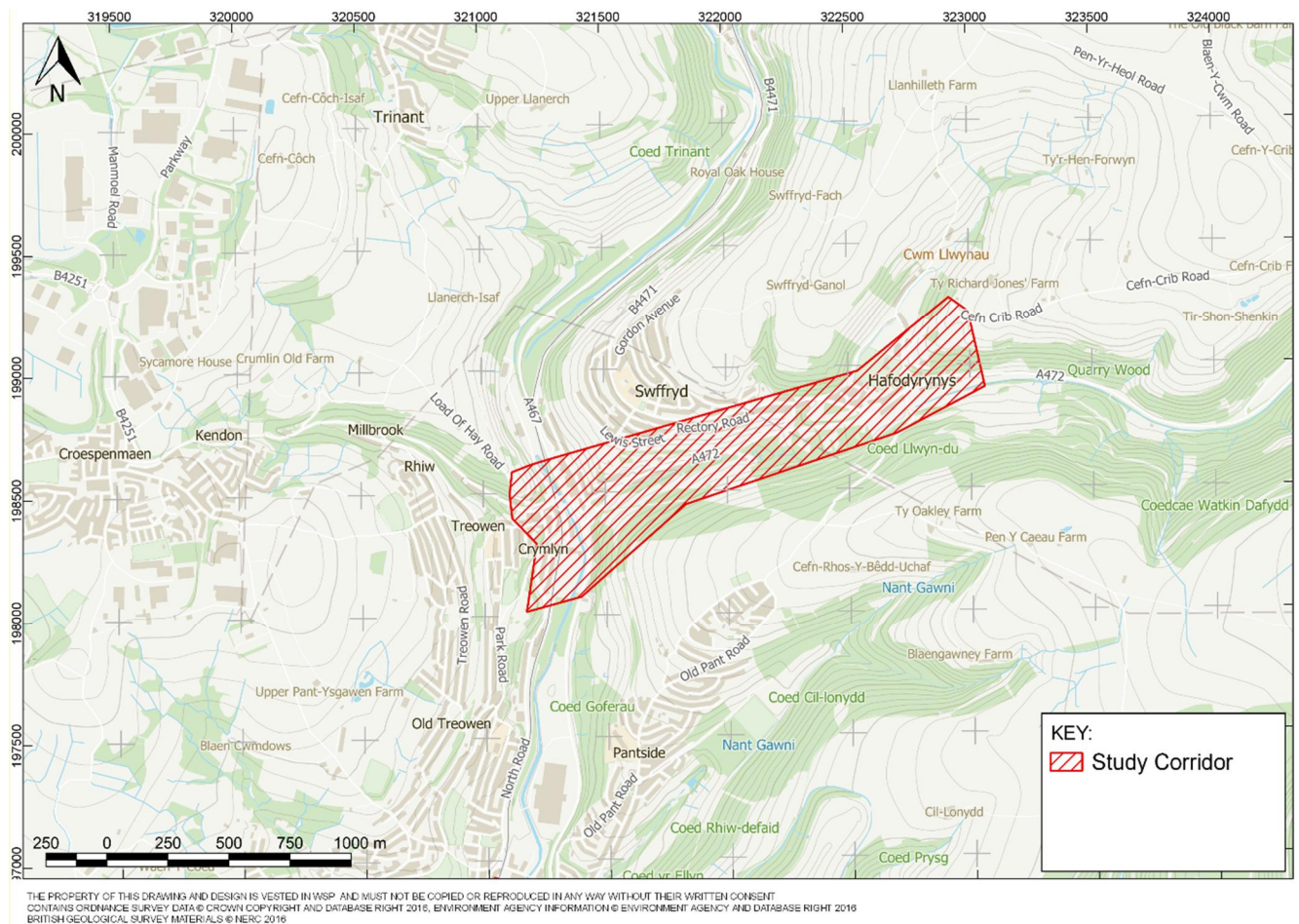
Woodside Terrace is a row of three storey terraced houses with entrances to the first floor from street level and a large supporting wall on the north side. Immediately adjacent to Woodside Terrace and also on the south side of the A472 is Woodside shops, a pair of semi-detached, two-storey properties and 'Yr Adfa', a two-storey detached property.

On top of the north side supporting wall there is a mixture of two storey semi-detached and detached housing.

The A472 is part of the Local Authority's strategic highway network and is a major commuter and cross-country freight route where traffic is known to become congested along Woodside Terrace, especially during the AM peak.

The study corridor is located on the A472 between the signal controlled junction with the A467 in Crumlin (west) and Hafodyrynys village (east), a distance of approximately 1.6 kilometres. Over this route there is a considerable increase in elevation (approximately 97m). The study corridor is illustrated in Figure 2-1.

Figure 2-1 – Study Corridor



2.3 OBJECTIVE OF THIS STUDY

Whilst WeITAG provides a fixed framework for appraisal, the guidance acknowledges that the level of detail provided in the report should be proportionate to the impacts under consideration.

Following on from the WeITAG Stage One and Two reports, the objective of this Stage Three study is to carry out further investigation and identify potential measures that can be implemented by CCBC, which will assist in bringing forward reductions in NO₂ in the shortest possible time to ensure compliance with the Ambient Air Quality Directive requirements on the A472 Hafodyrynys Road, Caerphilly.

2.4 THE PROCESS

This study has been undertaken following the 2017 WeITAG guidance and with due consideration to the goals of the Well-being of Future Generations (Wales) Act 2015.

2.4.1 WELTAG STAGE ONE AND TWO

The WeITAG Stage One identified the issues and objective, and developed a long list of 30 possible measures. The measures were appraised against the key criteria of the objective based on their ability to bring forward the date of compliance with EU Limit Values (Effectiveness, Timescales and Deliverability). This resulted in a short list of 10 measures that were taken forward to Stage Two.

The WelTAG Stage Two appraisal examined in greater detail the short list of 10 measures for tackling the problem under consideration. The measures were reappraised against the key criteria for the objective, as well as the WelTAG aspects of well-being.

The appraisal of air quality impacts was undertaken quantitatively using detailed emission and dispersion modelling, underpinned by assumed changes in traffic flow characteristics and volume for each measure.

WelTAG Stage Two recommended a list of 6 preferred measures to take forward to Stage Three, differentiating these as long, medium, and short-term options.

The Well-being of Future Generations (Wales) Act 2015 is an integral part of the WelTAG framework. Whilst due consideration was given to the Future Generations Act at Stage One and Two, the Independent Review Panel felt that this needed to be more clearly defined. Therefore, this Stage Three report builds upon the previous two Stages, demonstrating the studies fit with the five ways of working and the consideration of impacts of each option against the seven well-being goals.

WelTAG Stage Two has predicted the maximum NO₂ concentration on the A472 with no interventions, to be compliant by 2029, instead of 2026 as initially indicated by a national assessment. Analysis into the temporal variation in NO₂ highlighted the highest exceedance to occur in the January and February months. An investigation in the variation by hour of day and temperature took place to consider all emission sources that are contributing to the high concentrations, such as cold engine starts and domestic heating.

The analysis showed little influence of domestic heating, as high concentrations were not extended into evening hours. An initial first analysis on temperature showed a positive correlation between low temperatures and a high concentration. However, when looking at data between January 2012 – July 2017, no strong correlations were found between the colder winter years and concentrations. Analysis in wind speed identified a positive correlation between low wind speed and higher concentration of NO₂.

2.5 THE FUTURE GENERATIONS FRAMEWORK

‘The Future Generations Framework expresses the Five Ways of Working and the seven well-being goals as statutory prompts for consideration to inform thinking and shape the development of major projects, as well as reviewing the effectiveness of projects’. The Five Ways of Working seeks to look at how to develop and run the project, while the seven well-being goals will form part of the strategic case and the options appraisal.

The Five Ways of Working are designed to be the starting point of maximising the contribution to the seven well-being goals. In a short summary, the goals have been identified below:

■ Long-term

- How does the project support long-term well-being of people in Wales?
- Will the project be self-sustaining, or require significant additional or different resources?
- Consider what will happen to the project at the end of its proposed lifespan.

■ Prevention

- The broad consideration of all types of problems that the project can help prevent

- How does the project support the break of negative cycles such as poverty, poor health, environmental damage? Advice to refer to local well-being assessments.
- How can the project minimise its own negative impacts? (resources, emissions, social, community)

■ **Integration**

- How your project integrates with other public bodies well-being objectives.
- How can your project maximise its contribution to all of the goals by aligning with relevant public body strategies and well-being objectives?
- What measures are in place to ensure that the project continues to positively contribute to the well-being goals throughout its life?

■ **Collaboration**

- What other stakeholders are working towards similar goals around sustainability and well-being?
- How does the project ensure collaboration will continue throughout the lifetime of the project?

■ **Involvement**

- How has the project been shaped by key stakeholders affected by the project, and particularly their needs and challenges?
- How will key stakeholders affected by the project continue to influence the project throughout its life?

The well-being goals that are part of the Future Generation Act should be considered as an integrated set and not in isolation. These goals must in turn maximise contribution to the following Seven Well-being Goals. The Seven Goals form part of a parallel appraisal for the options at Stage Three. More details can be found in the ‘appraisal against objectives’ section (within the Transport Case).

The Seven Well-being Goals are:

1. A Prosperous Wales;
2. A Resilient Wales;
3. A Healthier Wales;
4. A More equal Wales;
5. A Wales of Cohesive Communities;
6. A Wales of Vibrant Culture and Thriving Welsh Language; and
7. A Globally Responsible Wales.

2.5.1 THE FIVE WAYS OF WORKING

Long-term

The project aims to decrease the air pollution impacts from NO₂ on the people in Wales and the local community by implementing measures for tackling roadside emissions. The WelTAG Stage Two appraisal identified options which have the potential to provide short term implementation timeframes with immediate benefits and those with long-term timeframes which have the potential to bring forward significant reductions in NO₂.

The monitoring and evaluation section describes what will happen to the project after its lifetime.

Prevention

The project aims to bring the NO₂ concentrations on the A472 within compliance before 2029 (the predicted year of compliance with no intervention), through implementation of measures.

The project understands the economic situation of the study area and through the options put forward it aims to overcome the negative cycles associated with poverty, poor health from NO₂ and further damage to the environment and the ecosystem.

This includes involving 'The Caerphilly We Want'³ in the well-being assessment. Well-being, as expressed by residents is "having access to a personal vehicle, ensuring jobs for their family, ease of commuting and access to local amenities".

As part of the 7 Well-being Objectives, the use of resources for option implementation will be qualitatively appraised to minimise the project's own negative impacts. Considerations are also made for the emissions, and social and community impacts of the project.

Integration

The Caerphilly Local Development Plan Up to 2021 created in 2010, included a target for implementing improvements to the existing transport infrastructure through reducing the level of traffic movements and/or congestion, within any identified air quality management area.

The same Plan from 2010 highlighted that air quality standards were failing in some strategic regions of the Council such as Caerphilly and NO₂ air pollution policy is reported also in the 2012 Annual Monitoring Report. The safeguarding aspect of the report highlighted that an investigation into the sources of the problem and alternative options needed to be undertaken.

Other existing strategies and policies relevant to Air Quality in Caerphilly County Borough that have been examined and identified by WSP or Ricardo and will be supported and not impeded upon are:

- Noise Action Planning Priority Area (NAPPA)
- Caerphilly Local Development Plan (mentioned above)
- South East Wales Valleys Local Transport Plan
- Well-being of Future Generations Act (Wales) 2015
- Air Quality Regulations (Wales) Regulations 2010
- Relevant policies in relation to Carbon Reduction Strategy, Housing, and Climate Adaptation Plan for the Borough
- Planning Policy Wales (Edition 10)
- Caerphilly Corporate Plan 2018-2023

Collaboration

The project will ensure that collaboration will continue throughout the lifetime of the project through working closely with the stakeholders and taking account of completing mutual goals.

³ Reference: <https://your.caerphilly.gov.uk/publicservicesboard/content/what-does-wellbeing-mean-you>

Involvement

A stakeholder workshop and consultation was undertaken in July 2018 and formed part of WelTAG Stage One, with key representatives from Caerphilly CBC and Stagecoach. This consultation identified their challenges and problems.

CCBC will be undertaking a 10 week public consultation as part of WelTAG Stage Three. This will allow the public to inform the study and inform the final outcomes.

2.6 SHORT TERM MEASURES

As part of the WelTAG Stage Two, it was recognised that many of the measures identified within this assessment have the potential for immediate implementation, with potential benefits to the reduction of NO₂. Immediate measures include the low cost, short timeframe measures, and other low to medium costs measures that could be implemented on a trial basis and then considered for longer term use. For the A472 these include:

- **Measure 1:** Change Signal Timings at Crumlin Junction
- **Measure 27:** Air Quality Public Awareness Campaign

By implementing measures on a trial basis, on-site monitoring can be utilised to evidence the effectiveness of these measures before applying them permanently.

2.7 MEDIUM TERM MEASURES

Medium term measures require further consultation and analysis to be undertaken prior to implementation. This includes:

- **Measure 13:** Peak Period HGV Bans

Prior to implementing peak period HGV bans, consideration would need to be given to enforcement of this measure and this may involve consultation with the police. Similarly, local business have been consulted as part of a business questionnaire presented in Appendix B, to identify the acceptability of the proposals and further understand the likely impacts as the potential loss of business and subsequent loss of jobs would have significant adverse impacts on the local economy.

2.8 LONG TERM MEASURES

Long term measures can be implemented on a permanent basis and Stage Three (Business Case) will appraise the full impacts of these measures. For the A472 these include:

- **Measure 2:** Signalise A472/B4471 Swyffryd Junction and introduce an eastbound queue detector
- **Measure 11:** Demolish Dwellings at Woodside Terrace and re-align footpath.
- **Measure 26:** Clean Air Zone / Low Emission Zone

The Automatic Number Plate Recognition (ANPR) survey carried out on the study corridor in 2018 identified that 58% of articulated HGVs and 38% of rigid HGVs are Euro 6 compliant and would therefore not be impacted by a CAZ.

It is considered that for some of the options, there are likely to be perceivable impacts on the local businesses. Consideration will be given to displacement effects of where alternative routes bypass class restrictions or charging zones. Such routes could be via the Panside, Old Pant Road and the Central Avenue to join the A467.

This Stage Three assessment will explore the effectiveness of the measures above, identifying which measures should be taken forward to implementation.

2.9 NEW MEASURE IDENTIFIED POST COMPLETION OF STAGE TWO

Following completion of WeITAG Stage Two, a new measure has been identified by CCBC for consideration at Stage Three. This option put forward the introduction of a new 30mph speed limit and removal of the climbing lane between Woodside Terrace and the B4471 Swyfydd Road / A472 Hafodyrynys Road Junction. This option has been introduced post completion of WeITAG Stage Two and was not in the shortlist of options carried forward. However, this option has been modelled for both traffic and air quality modelling and has been given full consideration in a similar way to the other options presented in the Transport Case chapter. Furthermore, the findings show no impact on reducing NO₂ levels or bringing forward compliance. On this basis it fails on the following essential criteria of effectiveness:

- To Deliver reductions in roadside concentrations proportionate to the scale of the exceedance above the 40µg/m³ legal limit.

This option will not be carried forward throughout the report. However, the results of the modelling will be available in the Impact Assessment Report (IAR).

2.10 STAKEHOLDER CONSULTATION

A stakeholder consultation was undertaken at WeITAG Stage One on 31 July 2018 at Penalta House, Caerphilly. The attendees included members from CCBC, local Councillors and Stagecoach South Wales. The workshop findings were used to develop the objectives and the initial options. More information on the stakeholder consultation can be found in WeITAG Stage One.

2.11 PACKAGING OF MEASURES

The six preferred measures have been subdivided into 'hard measures' with tangible benefits and 'soft measures' resulting in marginal indirect benefits. The soft measures are those that passively reduce NO₂ levels by increasing peoples' awareness to the problem and encouraging a behaviour change, which positively impacts upon the problem. The soft measures could provide benefits at A472 Hafodyrynys Road, Caerphilly, and potentially across Wales.

Furthermore, the Stage Three appraisal has also considered the cumulative benefits of the packaging of measures. The packaging of measures is as follows:

- **Traffic Management Package - Measure 1:** Change Signal Timings at Crumlin Junction, and **Measure 2:** Signalise A472/B4471 Swyffryd Junction and introduce an eastbound queue detector.
- **Do Maximum Package - Measure 1:** Change Signal Timings at Crumlin Junction, **Measure 2:** Signalise A472/B4471 Swyffryd Junction and introduce an eastbound queue detector, and **Measure 26:** Clean Air Zone / Low Emission Zone

2.11.1 COMPLEMENTARY PACKAGE – 'SOFT MEASURE'

- **Measure 27:** Air Quality Public Awareness Campaign

It is expected that the above soft measure will be achieved initially with a significant communications campaign using social media, press and signs on the network to highlight the air quality issues. This campaign will be reiterated throughout the year at key periods when the air quality is measured to be

at a high level from the roadside monitors. The complementary measures will engage and involve the public to prevent the worsening of the problem.

The Pollution Control team within the Council have undertaken monitoring studies in a number of schools throughout the borough and have followed these studies up with talks to key stage 2 pupils on air quality. Some of the key messages communicated are:

- Explaining the sources that give rise to air pollution
- Traffic Pollution – the biggest polluter
- How air pollution affects health
- What can be done to improve air quality – use less energy/renewable energy/walk to school/car share etc.
- Promotion of anti-idling whilst stationary

This measure integrates well with the Future Generations Act and other key policies. Due to the expected small-scale intangible benefits of this option, and minimum impacts, this complementary package has not been appraised.

2.11.2 MEASURES TO BE APPRAISED

The WeITAG Stage Two appraisal identified ‘slight to large beneficial’ benefits to the NO₂ reduction from a number of hard and soft measures. As outlined previously, the measures can be distinguished between short-, medium- and long-term, depending on the implementation period. For the A472 Hafodyrynys Road, the hard measures that have been appraised at Stage Three are presented in Table 2-1.

For simplicity, the option referencing notation used at Stage Two has been replaced by a new consecutive referencing at Stage Three. This is presented in the second column of Table 2-1.

Table 2-1 – Hard Measures to be Appraised

WeITAG Stage One / Two Reference	WeITAG Stage Two Option Referencing	Measure Description	Subdivision
Measure 1	S1	Change Signal Timings at Crumlin Junction	Short-term
Measure 2	S2	Signalise the A472/B4471 Swyffryd Junction	Long-term
Measure 11	S3	Demolish Dwellings at Woodside Terrace	Long-term
Measure 13	S4	Peak Period HGV Bans	Medium-term
Measure 26	S5	Clean Air Zone / Low Emission Zone	Long-term
N/A	S6	Traffic Management Option (Changing Signal Timings at Crumlin Junction & Signalise the A472/B4471 Swyffryd Junction)	Short to long-term
N/A	S7	Do Maximum Option (Changing Signal Timings at Crumlin Junction & Signalise the A472/B4471 Swyffryd Junction & Clean Air Zone / Low Emission Zone)	Short to long-term

S1 - Change Signal Timings at Crumlin Junction (A472 Hafodyrynys Road / A467)

To improve the flow of traffic and HGVs travelling Eastbound on the steep gradient A472 Hafodyrynys Road after the A467 junction. This option involves reducing the green time for traffic on the A467 and improves traffic flow eastbound on the A472 Hafodyrynys Road. This option would potentially increase queues on the A467. A drawing of this option is available in Appendix C.

S2 - Signalise the A472/B4471 Swyffryd Junction

To improve the flow of vehicles travelling on the A472 Hafodyrynys Road by signalising the junction with B4471 Swyffryd Road. The current priority junction layout results in vehicles travelling on the A472 Hafodyrynys Road to stop, out of courtesy, letting other vehicles pull out of the B4471 road. This results in traffic backing up and queuing outside Woodside Terrace. The signalisation will give priority to A472 Hafodyrynys Road traffic especially in peak periods, though may increase queuing on B4471. A queue loop or detector can be utilised to manage the queue on the A472. A drawing of this option is available in Appendix C.

S3 - Demolish Dwellings at Woodside Terrace

To remove the southern properties at Woodside Terrace. The footpath to the south would be realigned by c.6 metres with a new edging kerb and grass topsoil separating the footpath from the main carriageway. The length of the footpath proposed is up to the B4471 Swyffryd Road junction. A drawing of this option is available in Appendix C.

S4 - Peak Period HGV Bans

To introduce a traffic prohibition order for vehicles exceeding a gross weight of 7.5T. The heavy goods vehicles (HGV) affected are likely to be both OGV1 and the articulated OGV2. The prohibition is likely to be achieved through the usage of regulatory signs and ANPR enforcement. The ban is anticipated to be on both the morning and evening peak periods. A drawing of this option is available in Appendix C.

S5 – Clean Air Zone

To implement a Clean Air Zone (CAZ) for the A472 Hafodyrynys Road corridor, starting from the A4042 Pontypool junction. Using the Clean Air Zone Framework for Wales, it defines a CAZ as;

“A geographical target area where a range of co-ordinated actions are applied with the purpose of ensuring, in the soonest time possible, a significant reduction in public an environmental exposure to harmful airborne pollutants from all sources.”⁴

The Clean Air Zone Framework for Wales is currently in consultation. The current stage as of March 2019 is reviewing results from June 2018. This is likely to increase the implementation period for this

⁴ Clean Air Zone Framework for Wales – April 2018 <https://beta.gov.wales/sites/default/files/consultations/2018-04/180424-clean-air-zone-framework-en.pdf>

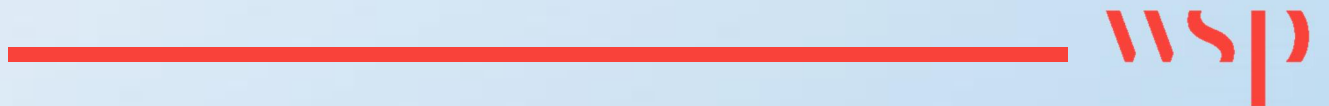


option. The Class D⁵ CAZ is initially the preferred for implementation. A drawing of this option is available in Appendix C.

⁵ Class A - Buses, coaches, taxis and private hire vehicles (PHVs); Class B - Buses, coaches, taxis, PHVs and heavy goods vehicles (HGVs); Class C - Buses, coaches, taxis, PHVs, HGVs and light goods vehicles (LGVs); Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards

3

STRATEGIC CASE - BASELINE



3 STRATEGIC CASE – BASELINE

3.1 OVERVIEW

At WelTAG Stage One and Two, a baseline for the study was established. This has been further developed in light of the preferred options which were brought forward from Stage Two. This updated baseline will further our understanding of the current conditions so that the full impacts of the options can be adequately appraised. For the previous baseline for this study, refer to WelTAG Stage One and Two. The additional baselining since the completion of Stage Two is presented within this chapter.

3.2 ECONOMY

The Labour Market Profile of CCBC⁶ has identified that between October 2017 and September 2018, 75.3% of residents were economically active (for those aged 16-64), which is slightly below the Welsh average of 76.2%. There are 10,900 workless households in CCBC, which equates to 19.1% of households (an increase of 0.5% from 2016), 1.6% higher than across Wales in 2017. Based on 2018 data. The county's average out-of-work benefits claimants are 2.5%, in comparison to the Welsh average of 2.3% (May 2018).

Table 3-1 below shows that Caerphilly has a slightly higher economic inactivity of 24.7% compared to the Welsh average of 23.8%. The majority (33.6%) are made up of Long-term Sick. A higher proportion (26.3%) of residents are classed as wanting a job compared to the Welsh average of 22.3%.

Of the 75.3% residents that are economically active, 63.5% are employees and 5.8% are self-employed. The remaining 5.7% are unemployed. There are a higher percentage of employees in Caerphilly when comparing to the Welsh average, with a higher unemployment when compared to the Welsh average.

⁶ Caerphilly County Borough Council Labour Market Profile
<https://www.nomisweb.co.uk/reports/lmp/la/1946157400/report.aspx> Accessed January-February 2019

Table 3-1 – Economic Inactivity ⁴

All People	Caerphilly	Caerphilly %	Wales %
Total	27,500	24.7%	23.8%
Student	5,600	20.4%	25.4%
Looking After Family/Home	5,400	19.5%	19.7%
Temporary Sick	#	#	1.7%
Long-Term Sick	9,300	33.6%	28%
Discouraged	!	!	0.4%
Retired	4,500	16.5%	14.7%
Other	2,300	8.2%	10.1%
Wants A Job	7,300	26.3%	22.3%
Does Not Want A Job	20,300	73.7%	77.7%

(October 2017 – September 2018 Data)

Source: ONS annual population survey

Sample size too small for reliable estimate

! Estimate is not available since sample size is disclosive

Table 3-2 – Employment & Unemployment ⁷

All People	Caerphilly	Caerphilly %	Wales %
Economically Active	85,800	75.3%	76.2%
In Employment	80,000	70%	72.6%
Employees	71,900	63.5%	62.5%
Self Employed	7,000	5.8%	9.5%
Unemployed	4,800	5.7%	4.6%

(October 2017 – September 2018 Data)

Source: NOMIS labour supply – based on the ONS annual population. Figures taken directly from the source.

⁷ <https://www.nomisweb.co.uk/reports/imp/la/1946157400/report.aspx?pc=NP11%205ES#tabjobs>

There are a high number of workless households in Caerphilly at 19.1% which is higher than both the Wales and Great Britain averages at 17.5% and 14.5% respectively. Data from January to December 2017 shows that there were 10,900 workless households in Caerphilly.

Table 3-3 – Workless Households ⁴

	Caerphilly	Wales	Great Britain
Number Of Workless Households	10,900	166,000	2,943,800
Percentage Of Households That Are Workless	19.1%	17.5%	14.5%
Number Of Children In Workless Households	#	67,100	1,280,500
Percentage Of Children Who Are In Households That Are Workless	#	12.6	10.7

(January – December 2017)

Source: ONS annual population survey - households by combined economic activity status

Sample size too small for reliable estimate

Notes: Only includes those households that have at least one person aged 16 to 64.

Children refers to all children aged under 16.

The average earning per week for a Caerphilly resident equates to £504, which is lower than the Welsh and Great Britain averages which are £518.60 and £571.10 respectively. The difference between the Caerphilly and Wales full-time workers gross weekly pay is of £14.30 lower than the Welsh average. The hourly pay excluding overtime is £12.97 which is in line with the Welsh average of £13, but considerably lower than the £14.36 Great Britain average.

Table 3-4 – Earnings by place of residence ⁴

	Caerphilly (£)	Wales (£)	Great Britain (£)
GROSS WEEKLY PAY			
Full-Time Workers	504.30	518.60	571.10
Male Full-Time Workers	550.20	551.90	612.20
Female Full-Time Workers	467.50	474.10	510.00
Hourly Pay - Excluding Overtime			
Full-Time Workers	12.97	13.00	14.36
Male Full-Time Workers	13.46	13.42	14.89
Female Full-Time Workers	12.35	12.32	13.56

(2018 Data)

Source: ONS annual survey of hours and earnings - resident analysis

Notes: Median earnings in pounds for employees living in the area.

The earnings based on the place of work shows a difference of £12.30 per week for full time workers when compared to the place of residence. This highlights that certain residents commute outside of the Caerphilly boundary to access higher paid jobs. The difference between the Caerphilly and Wales full-time workers gross weekly pay based on place of work is of £17.00 in favour of the national average.

Table 3-5 – Earnings by place of work ⁴

	Caerphilly (£)	Wales (£)	Great Britain (£)
GROSS WEEKLY PAY			
Full-Time Workers	492.00	509.00	570.90
Male Full-Time Workers	501.40	541.60	611.80
Female Full-Time Workers	463.90	469.50	509.80
Hourly Pay - Excluding Overtime			
Full-Time Workers	12.69	12.67	14.35
Male Full-Time Workers	13.07	13.02	14.88
Female Full-Time Workers	12.31	12.08	13.55

(2018 Data)

Source: ONS annual survey of hours and earnings - workplace analysis

Notes: Median earnings in pounds for employees working in the area.

There were 3,935 registered businesses in Caerphilly as of 2018 and over 4,895 local business units. There is a higher percentage of medium and large enterprises in Caerphilly at 1.9% and 0.5% when compared to the Welsh averages of 1.4% and 0.3% respectively.

Table 3-6 – UK Business Counts

	Caerphilly (Numbers)	Caerphilly (%)	Wales (Numbers)	Wales (%)
Enterprises				
Micro (0 To 9)	3,450	87.7%	92,235	89.1
Small (10 To 49)	390	9.9%	9,550	9.2
Medium (50 To 249)	75	1.9%	1,430	1.4
Large (250+)	20	0.5%	315	0.3
Total	3,935	-	103,530	-
Local Units				
Micro (0 To 9)	3,990	81.5%	105,095	83.1
Small (10 To 49)	725	14.8%	17,665	14
Medium (50 To 249)	150	3.1%	3,210	2.5
Large (250+)	30	0.6%	500	0.4
Total	4,895	-	126,470	-

(2018 Data)

Source: Inter Departmental Business Register (ONS)

Note: % is as a proportion of total (enterprises or local units)

3.3 AIR QUALITY BASELINE

The WelTAG Stage Two's problem identification section found the elevated concentrations in NO₂ to be associated with the high traffic volumes and congestion with the eastbound morning peak. This is caused by vehicles climbing the A472 towards Hafodyrynys village. A map of this is available in Figure 3-7.

As part of WelTAG Stage Two, the PCM model projections presented in support of the 2017 Plan indicate that annual mean NO₂ concentrations on the section of the A472 under consideration will reach compliance with air quality limit values by 2026. However, this was based on 2015 monitoring data and since then there has been no reduction in NO₂ levels. Using national projection factors which account for the effect of improved emissions from the turnover in the vehicle fleet, the estimated year of compliance is 2025 from a 2017 baseline.

As part of the Stage Three assessment a Do Minimum traffic model was used as a basis for estimating the year of compliance with no interventions.

3.3.1 PREDICTED MAXIMUM NO₂ CONCENTRATIONS AT THE A472 – NO INTERVENTIONS, STAGE THREE UPDATE

The future of compliance has been re-assessed at Stage 3 through modelling. Receptors have been used in the model at residential locations, CCBC monitoring points, locations along the existing north path, existing south path and the new south path. In total 97 receptors have been used. The receptor network is shown as the dots in the Figure 3-1.

3.3.2 MODEL FORECASTING YEARS

In the WelTAG Stage Two it was identified that the compliance year without any local intervention was 2029. The 2029 compliance at WelTAG Stage Two was based on 2017 baseline monitoring data and used a national projection factor for the vehicle emissions rather than a local traffic data. The implementation year for most of the options is found to be no earlier than 2021. Therefore, the Stage Three assessment utilises 2021 and 2029 as the forecast assessment years. The base traffic model was validated to 2018 data. The air quality modelling results for the scenarios are primarily compared between the two forecast years and secondary the base year if deemed appropriate. The list of the forecasting years is as follows:

- 2021 (first implementation year for most of the options)
- 2029 (compliance year for NO₂ without any local intervention as identified at WelTAG Stage Two)

Figure 3-1 – Receptor Network Location Diagram

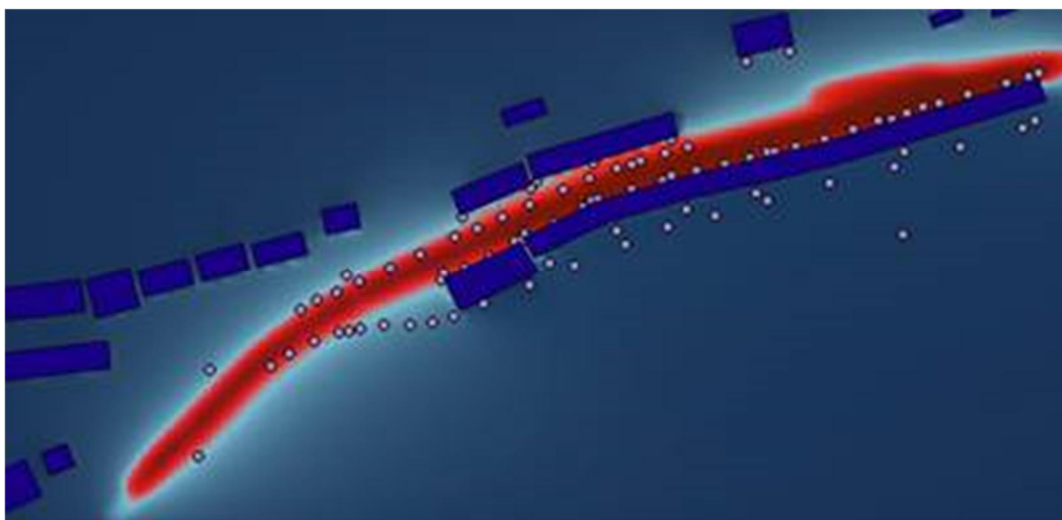


Table 3-7 below shows a count the number of points less than or higher than 40µg/m³ of NO₂. The clear majority of 70 receptor locations are compliant by 2023/2024. **The table shows that by 2025 all receptors will be compliant with the limit of 40µg/m³ of NO₂.**

Table 3-7 – Future Compliance of NO₂ (Do Minimum)

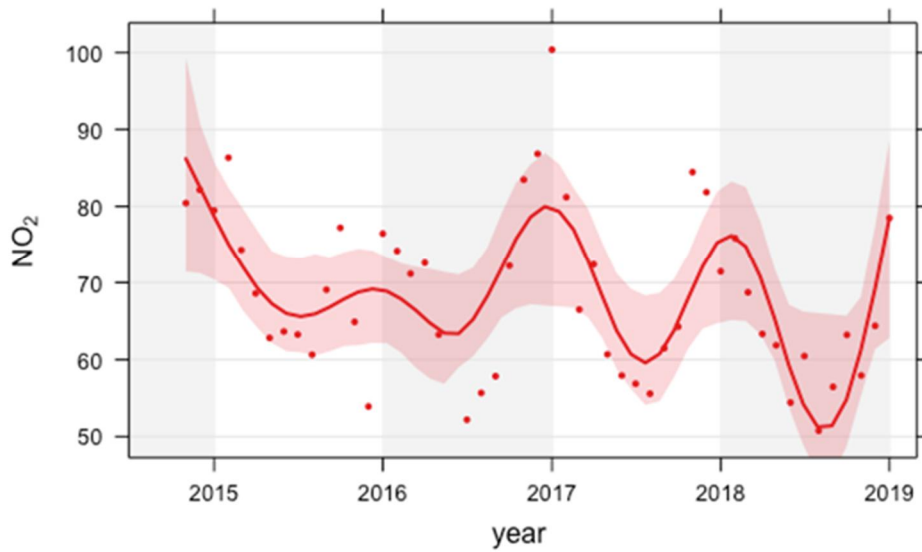
Scenario	Total Number of Receptors	
	NO ₂ >40	NO ₂ <40
2017	56	41
2021	35	62
2022	31	66
2023	25	72
2024	10	87
2025	0	97
2026	0	97
2027	0	97
2028	0	97
2029	0	97

This table is the number of receptor points <40, or >40 µg/m³

Another year of monitoring data for 2018 is available for the Stage 3 assessment. The annual mean concentration, unratified data, for 2018 was 62 µg/m³, a reduction of 8 µg/m³ from 2017. While the data for 2018 showed a similar seasonal trend to previous years, the overall concentrations were lower than many of the preceding years. This is shown in Figure 3-2 and Note: *The data is up to 2019, but not including 2019*

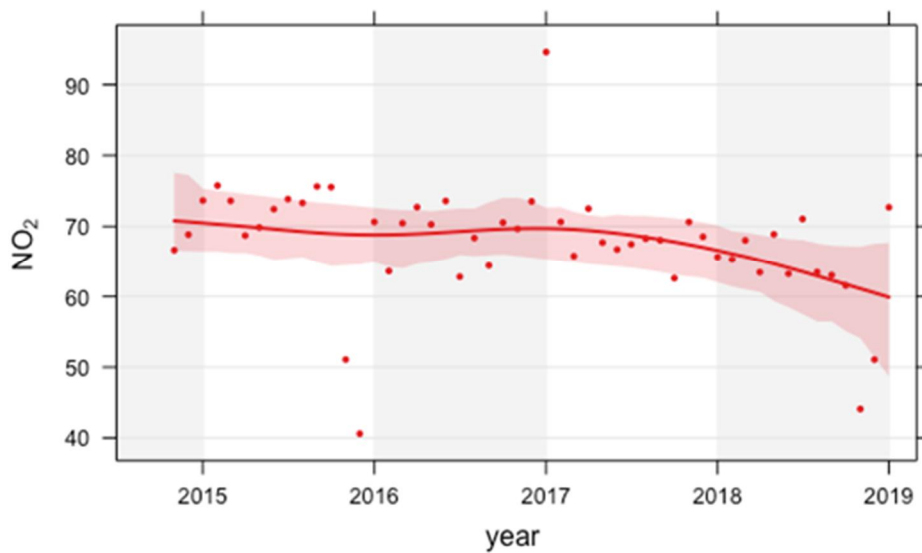
Figure 3-3. It is unclear as to why the 2018 concentrations have decreased and there is little evidence, at present to indicate this is a widespread trend.

Figure 3-2 - Seasonal trend in NO₂ at Hafodyrynys automatic monitoring site



Note: The data is up to 2019, but not including 2019

Figure 3-3 - Annual trend in NO₂ at Hafodyrynys automatic monitoring site

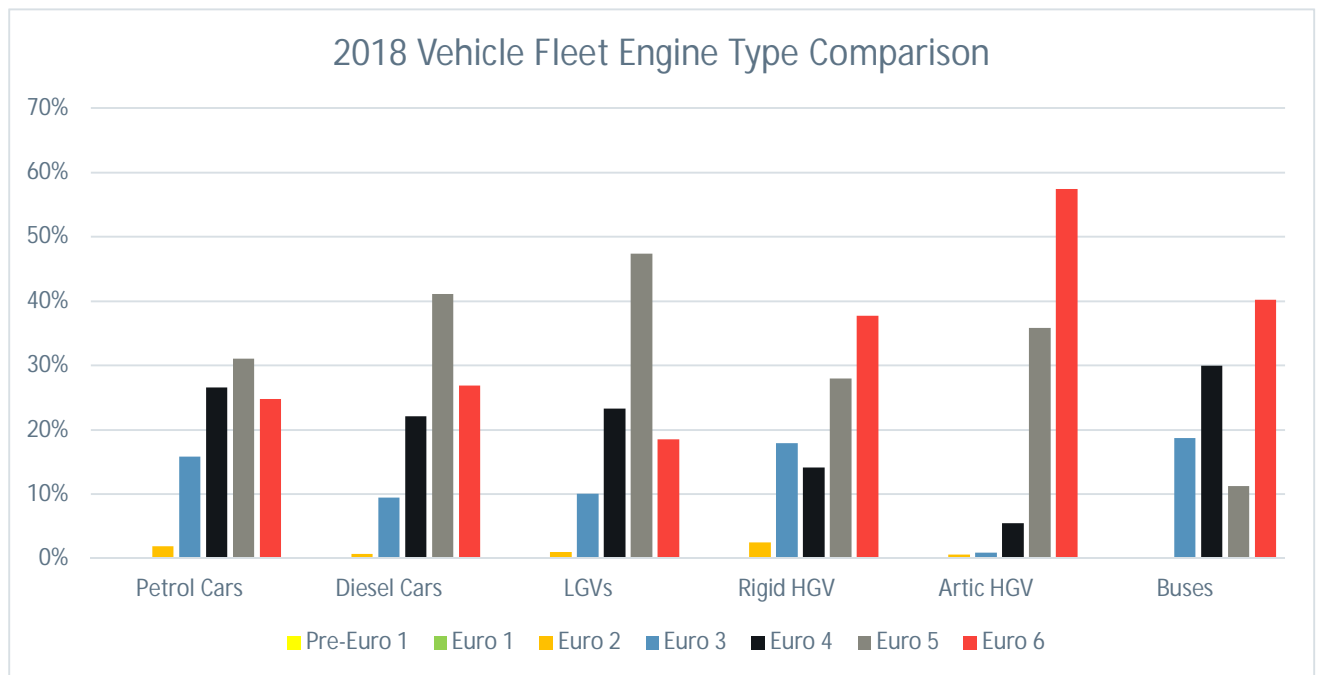


Note: The data is up to 2019, but not including 2019

3.4 TRAFFIC BASELINE

An Automatic Number-plate Recognition (ANPR) Survey has been carried out on the study corridor, A472 (Crumlin) in 2018. This has identified the emissions standards of the vehicle fleet in this location. This is broken down by European emissions standards, Euro 1 to Euro 6. The Figure 3-4 below identifies that there are no vehicles currently using the A472 on the study corridor which are Euro 1 (passenger vehicles registered from January 1993 up to January 1997), (LGVs registered from October 1994 up to October 1997) and (HGVs & Buses registered between 1992-1995).

Figure 3-4 – Base Year Vehicle emissions standards



In 2018 the following percentage of vehicles which are older than Euro 4 Petrol Car and older than Euro 6 Diesel, would not be compliant and would therefore be impacted by a Clean Air Zone (CAZ):

- Petrol Car – 18%
- Diesel Car – 73%
- Diesel LGVs – 82%
- Articulated HGV – 43%
- Rigid HGV - 62%
- Buses – 60%

Note – this assumes implementation of the CAZ in the base year – a false scenario. Following the Joint Air Quality Unit (JAQU) principle of implementing a CAZ, it was likely to take approx. another 5 years from 2021 to implement due to the current status of the CAZ legislation in Wales. The numbers above are likely to reduce due to turnover and modernisation of the fleet.

Further to this, data from the National Atmospheric Emissions Inventory (NAEI) has been used to calculate projection factors and then applying this to the local fleet data to give future year annual forecasts up to 2030. The base year vehicle emissions standards are shown is shown in Figure 3-4. The forecast years for Stage Three are 2021, shown in Figure 3-5 and 2029 in Figure 3-6.

Figure 3-5 – 2021 Vehicle Engine Type Forecast Comparison

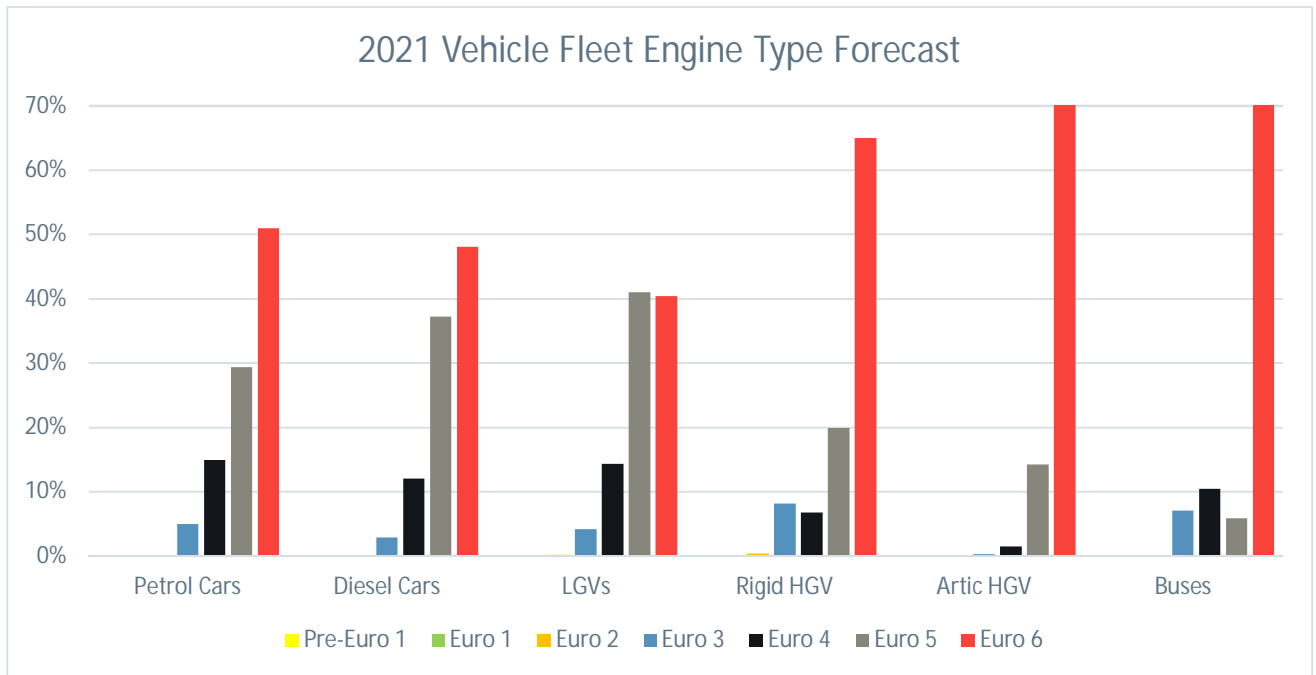


Figure 3-6 – 2029 Vehicle Engine Type Forecast Comparison

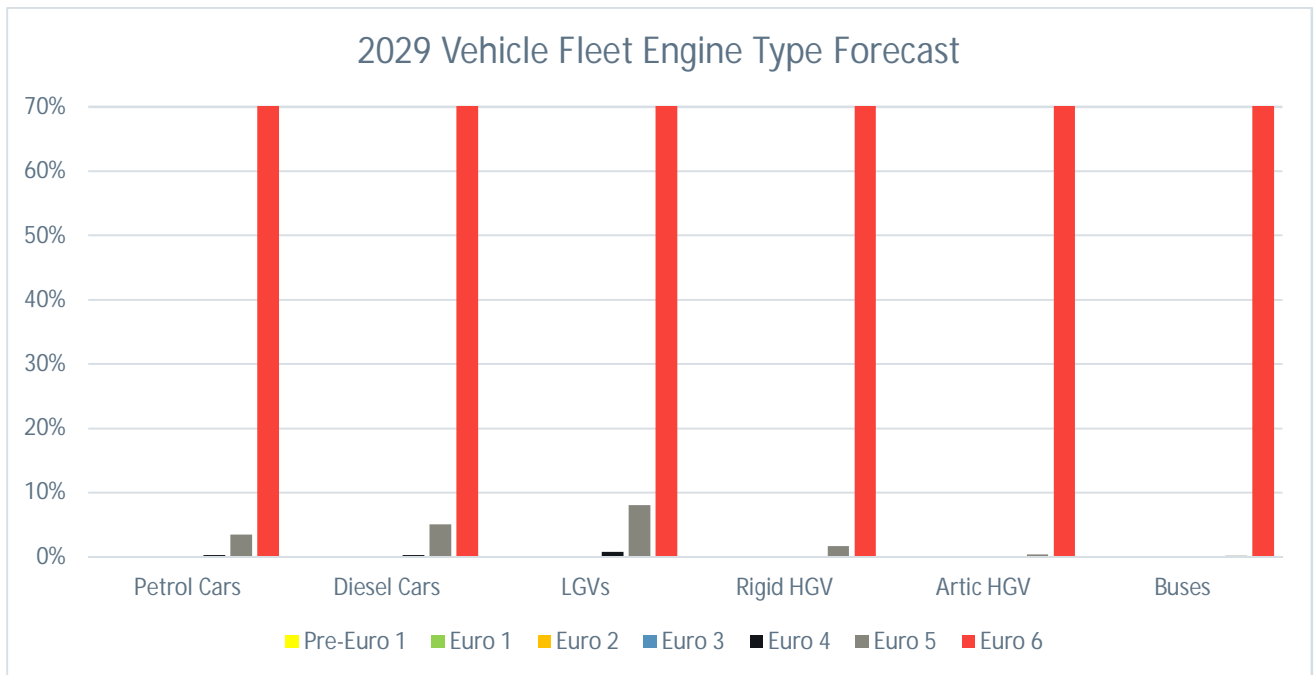


Table 3-8 shows the percentage of vehicles which are older than Euro 4 Petrol and older than Euro 6 Diesel, that are not compliant and would therefore be impacted by a Clean Air Zone (CAZ). The projections show that by 2021, around 5% of petrol cars will not be compliant with the emissions standards and would be subject to a CAZ charge, while just over half of diesel cars in the study area

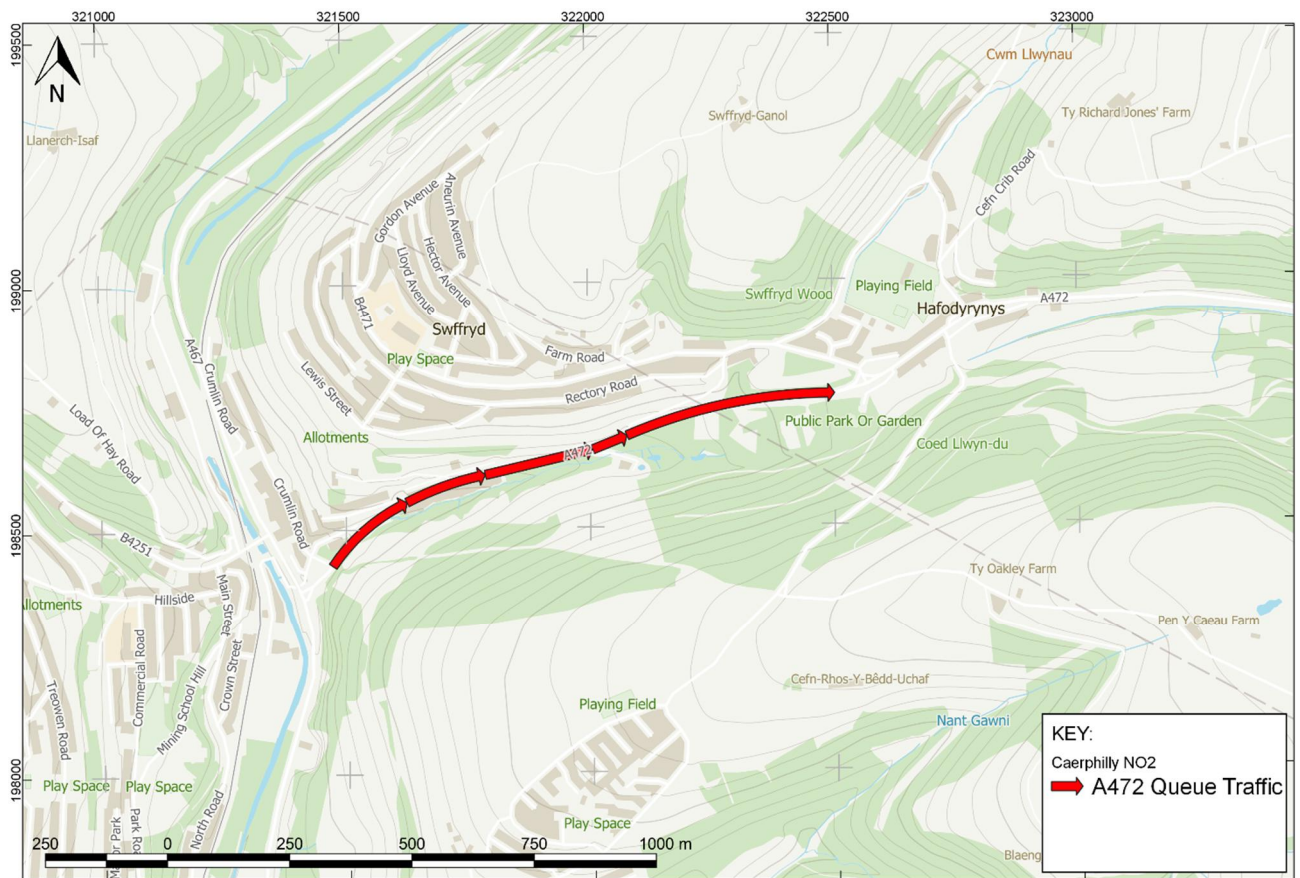
would be affected. By 2029 it is projected that most vehicles will be compliant with the standards, with the highest impact of the CAZ being for diesel car and LGVs users at 5% and 9% respectively.

Table 3-8 – Clean Air Zone (CAZ) Impact (% of total) by Vehicle Type

Vehicle Type	2018 Baseline	2021	2029
Petrol Car	18%	5%	0.3%
Diesel Car	73%	52%	5%
LGVs	82%	60%	9%
Arctic HGV	43%	16%	0.3%
Rigid HGV	62%	35%	2%
Buses	60%	23%	0.2%

The Figure 3-7 shows the eastbound traffic queue that is currently visible on the A472 towards Hafodyrynys in the morning period.

Figure 3-7 – AM Peak Eastbound Traffic Towards Hafodyrynys

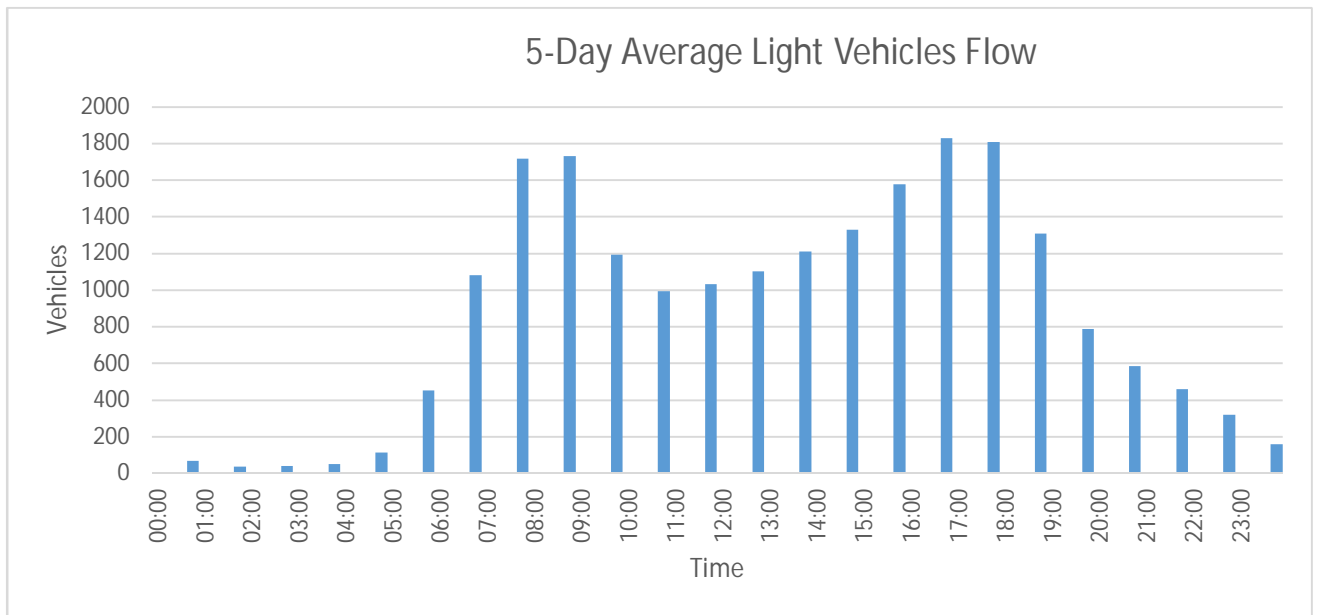


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An Automatic Traffic Count (ATC) survey has been undertaken on A472 Hafodyrynys Road, in direct vicinity of Woodside Terrace. The data collected through the survey, collated the vehicle flows with the 15-minute intervals and distinguish the vehicles by their class.

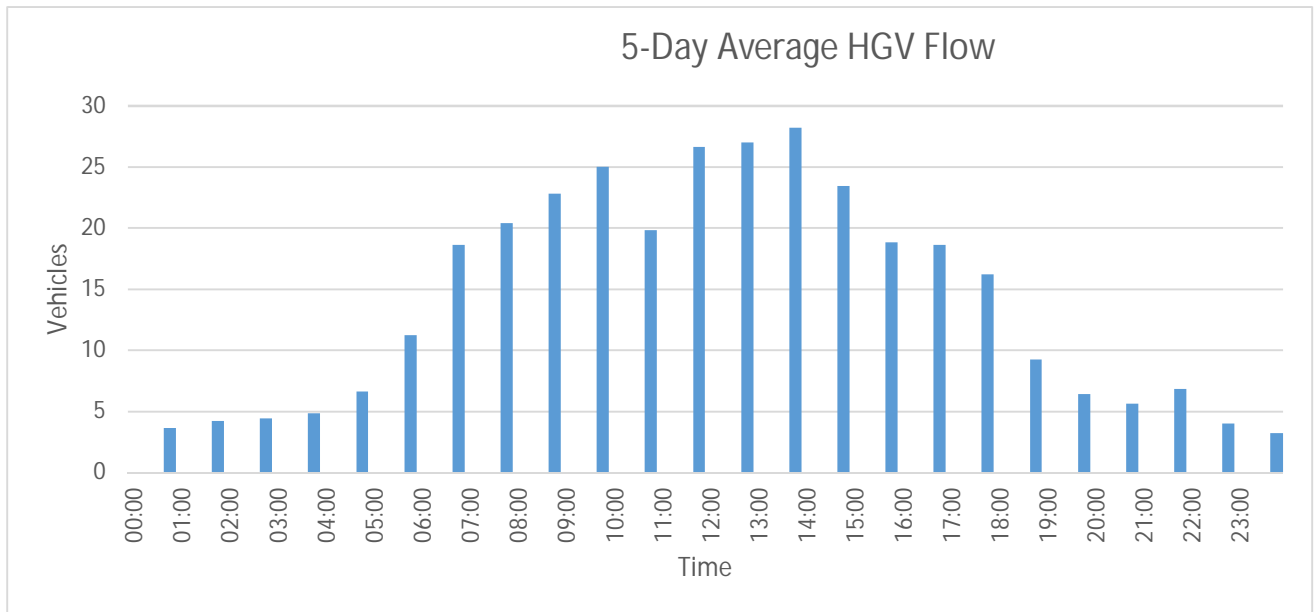
Figure 3-8 and Figure 3-9 present the 5-day average flow for the light vehicles and HGVs respectively. As it can be observed, the light vehicle flow increases notable between 06:00 and 08:00, reaching approximately 1,800 vehicles per hour. It falls then around 10:00, to increase again gradually between 12:00 and 17:00, when it reaches similar flows to that of the AM peak. From around 18:00 the traffic flow gradually diminishes.

Figure 3-8 – 5 Day Average Light Vehicles Flow



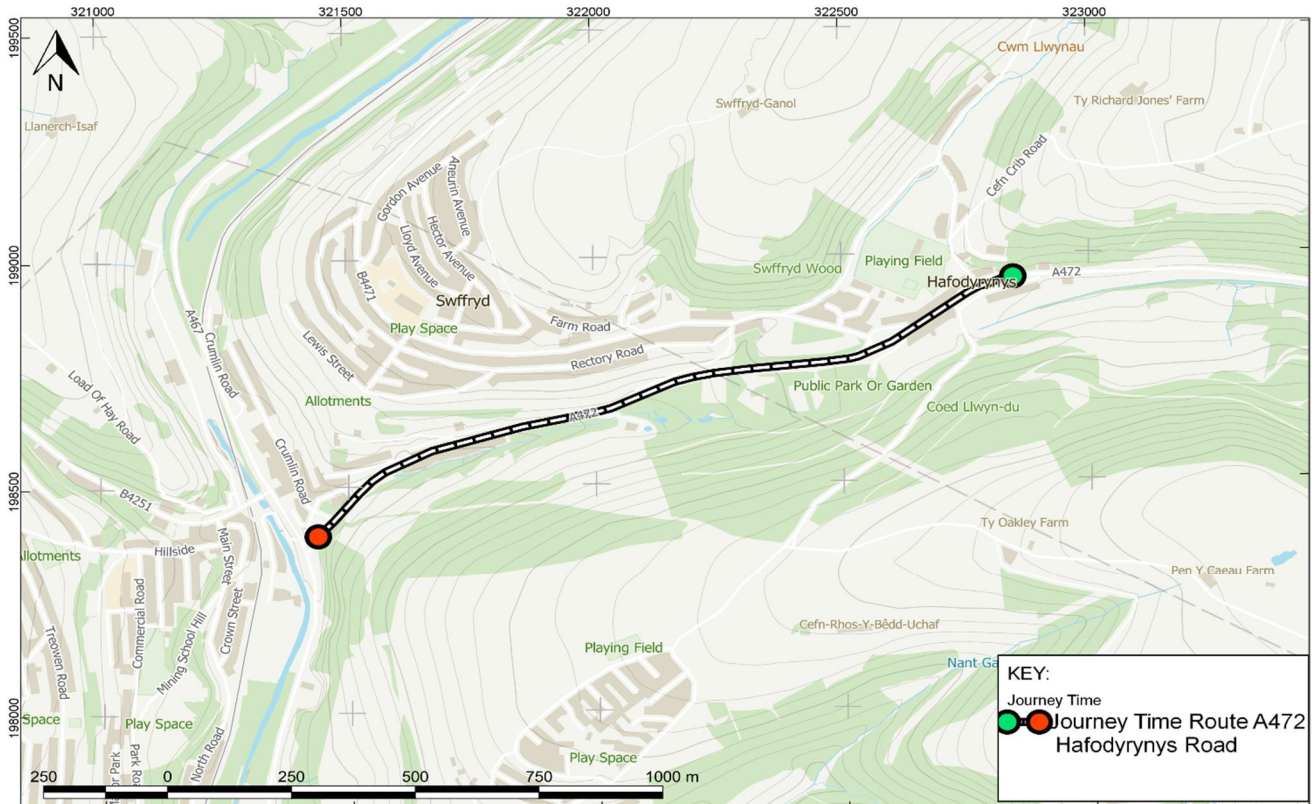
The HGV traffic flow presented in Figure 3-9, increases gradually from approximately 05:00 until 14:00 with only a small decrease at 11:00. After reaching its peak at 14:00 of just under 30 vehicles per hour, the HGV flow decreases then gradually until 20:00 and remains constant until the morning increase.

Figure 3-9 – 5-day Average HGVs Flow



The Bluetooth journey time surveys were carried out from 09-05-2018 to 05-06-2018 to assess the journey time during both the weekday peak hours and Saturday peak hour.

Figure 3-10 – Bluetooth Journey Time Survey

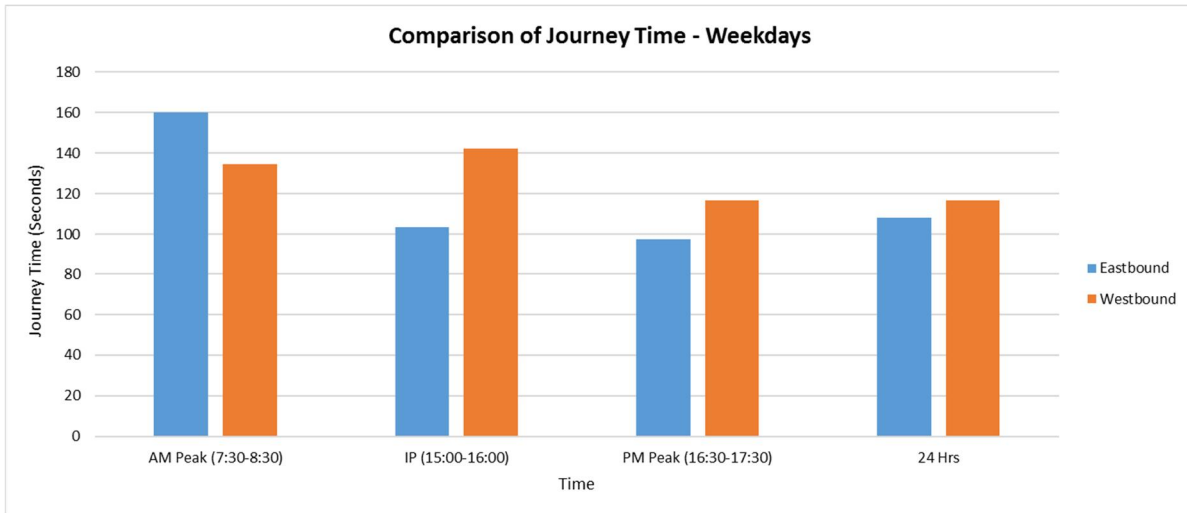


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Figure 3-10 – Bluetooth Journey Time Survey above shows the extent of the survey route where the Bluetooth journey time data has been collected. The total length of the study route is 1 mile.

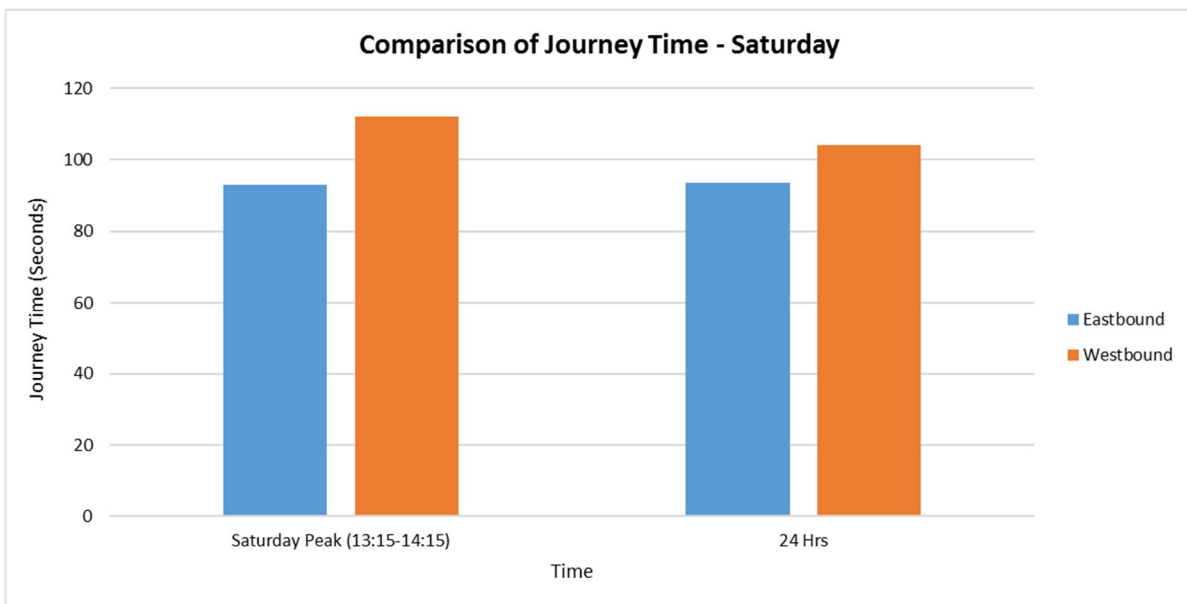
Figure 3-11 – Comparison of Bluetooth Journey Time - Weekdays demonstrates a clear increase in the journey time for eastbound flows during the morning AM Peak. This suggest that there could be localised congestion as the PM, Inter Peak, and 24hr peak journey times are less than the AM peak and the associated westbound journey times.

Figure 3-11 – Comparison of Bluetooth Journey Time - Weekdays



The Saturday journey times are shown in Figure 3-12 – Comparison of Bluetooth Journey Time - Saturday. It is clear from this figure that journey times are noticeably greater for westbound flows compared to eastbound.

Figure 3-12 – Comparison of Bluetooth Journey Time - Saturday



3.5 ACTIVE TRAVEL

Some of the proposed options are likely to impact on the active travel provision of Hafodyrnys. It is important to know the number of pedestrians using the pathways to also quantify the exposure to NO₂ and the impact on the pathways as a result of any of the proposed options. The largest impact is likely to be on walking on the two pathways adjacent to the Woodside Terrace.

Pedestrian count results are presented in Table 3-9 from a video survey undertaken on Monday 14th May 2018. On this date there was also a general waste collection service at around 14:15. The figures below show that the south side, directly in front of the Woodside Terrace, is more heavily utilised than the North Side. There are 38 pedestrians using the South Side and 14 pedestrians the North Side. In total there are 52 pedestrians using both sides of the pathways.

Table 3-9 – Pedestrian Count outside Woodside Terrace, Hafodyrnys

Time	Pedestrians			
	South Side		North Side	
	Uphill	Downhill	Uphill	Downhill
6:30-7:30	1	0	0	1
7:30-8:30	0	4	0	2
8:30-9:30	0	1	2	1
9:30-10:30	0	0	1	2
10:30-11:30	2	0	0	0
11:30-12:30	1	3	0	1
12:30-13:30	1	2	0	0
13:30-14:30	2	4	0	0
14:30-15:30	1	4	3	0
15:30-16:30	6	1	0	0
16:30-17:30	1	0	0	0
17:30-18:30	3	1	1	0
18:30-19:00	0	0	0	0
Total	18	20	7	7
	38		14	
	52			

Pedestrian surveys were carried out from 09-05-2018 to 22-05-2018 to assess the utilisation and demand of pedestrian crossings within the study area during the weekday peak hours and Saturday. The surveyed pedestrian crossing sites are presented in Figure 3-13 – Pedestrian Survey Site Number & Aerial Photography.

Figure 3-13 – Pedestrian Survey Site Number & Aerial Photography

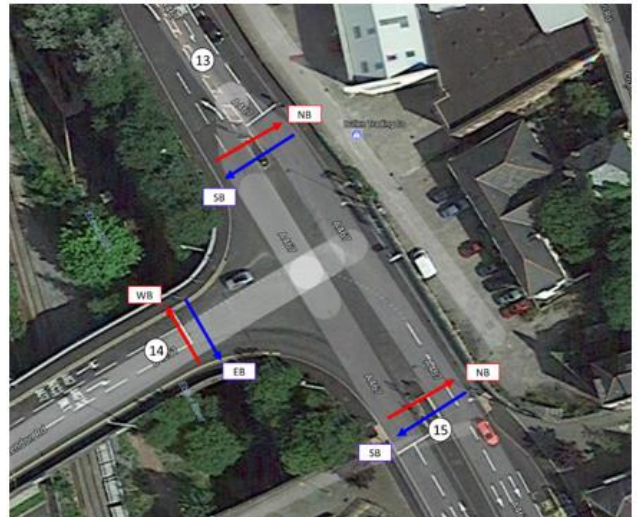
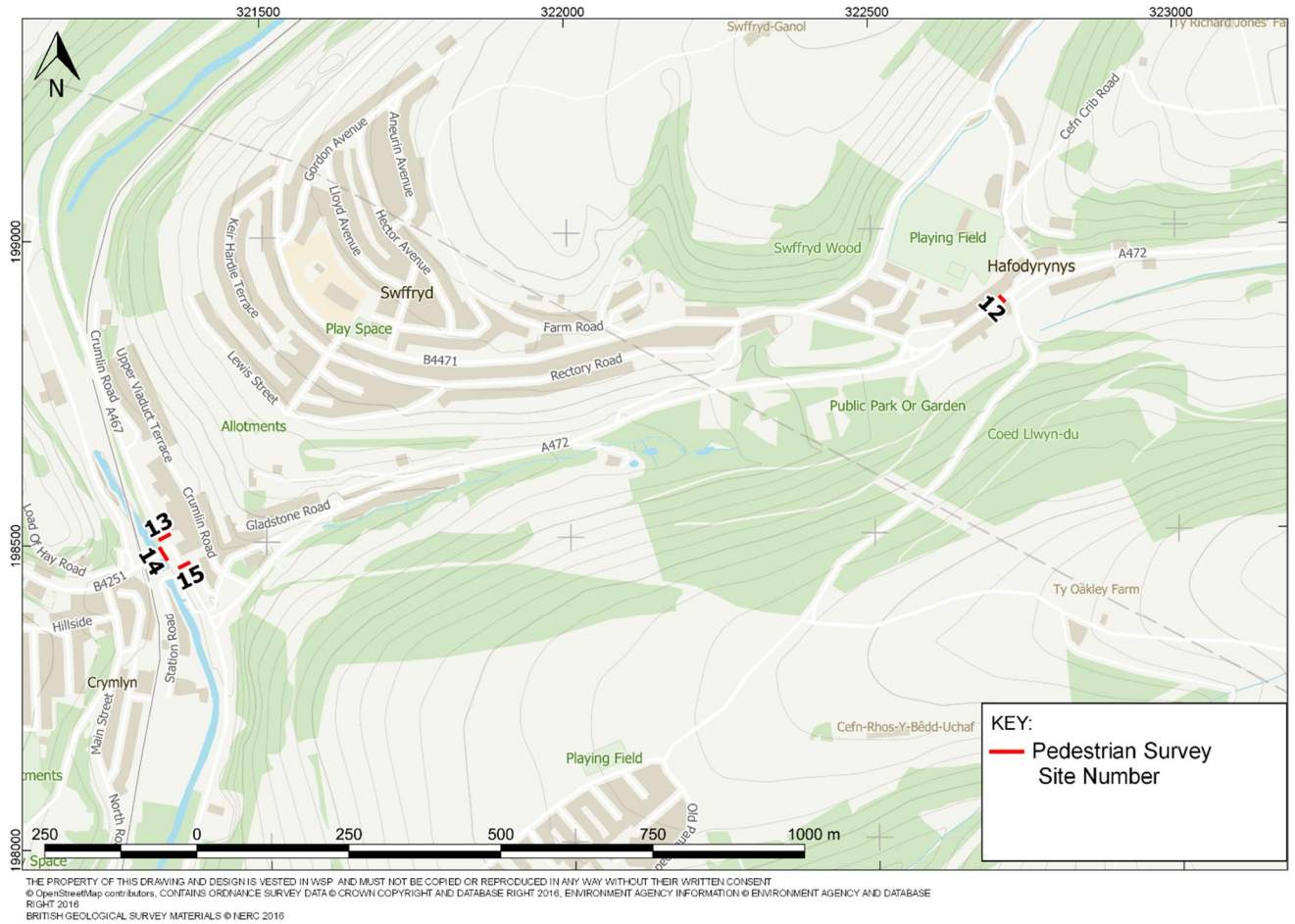


Table 3-10 shows the weekday pedestrian counts for the four sites. Site 12 is used by less than 5 pedestrians during all peaks and directions. There are 16 pedestrians travelling eastbound and 21 westbound over a 12-hour period. Site 13 and 14 have very low utilisation, with no pedestrians using them during all peaks and directions and only marginal usage in the off-peak visible in the 12-hour period column. Site 15 has a considerable high pedestrian demand compared to the other sites. The

majority of demand is for southbound movements during the AM and PM, while in the inter-peak the predominant movement is in the northbound direction.

Table 3-10 – Pedestrian Count - Weekday

Site	Direction	AM Peak (7:30-8:30)		IP (15:00-16:00)		PM Peak (16:30-17:30)		12 Hrs (7:00-19:00)	
		Pedestrian	Cyclists	Pedestrian	Cyclists	Pedestrian	Cyclists	Pedestrian	Cyclists
Site 12	Eastbound	0	0	1	0	2	0	16	3
	Westbound	2	0	2	1	3	1	21	3
Site 13	Northbound	0	0	0	0	0	0	2	0
	Southbound	0	0	0	0	0	0	0	0
Site 14	Eastbound	0	0	0	0	0	0	0	0
	Westbound	0	0	0	0	0	0	1	0
Site 15	Northbound	4	0	23	0	10	0	81	4
	Southbound	22	0	7	0	15	0	113	3

Table 3-11 – Pedestrian Count - Saturdays shows the Saturday pedestrian counts for the four sites. Site 12 has a considerable amount of flow in the 12-hour, with 24 pedestrians travelling eastbound and 30 travelling westbound. Site 13 and 14 have low utilisation, with three pedestrians in each direction at Site 13 and one pedestrian at Site 14. Site 15 has a high pedestrian demand for the 12-hour period, with 72 travelling northbound and 117 travelling southbound.

Table 3-11 – Pedestrian Count - Saturday

Site	Direction	Saturday Peak (13:15-14:15)		12 Hrs (7:00-19:00)	
		Pedestrian	Cyclists	Pedestrian	Cyclists
Site 12	Eastbound	5	1	24	1
	Westbound	4	0	30	3
Site 13	Northbound	0	0	3	0
	Southbound	0	0	3	1
Site 14	Eastbound	0	0	1	0
	Westbound	0	0	0	0
Site 15	Northbound	4	0	72	3
	Southbound	12	0	117	3

3.6 OTHER BASELINE DATA

More baseline data is going to be presented in the Impact Assessment Report (IAR).

Further baseline information is contained within the WeITAG Stage One report for the following areas:

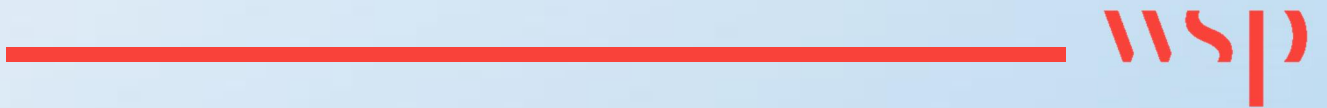
- Infrastructure and Local Facilities;
- Traffic Flows;
- Journey Time and Reliability;
- Personal Injury Collision Data;
- Public Transport;
- Origin and Destination Analysis;
- Economy;
- Demographics;
- Other Related Work; and
- Committed Developments

More baseline information is available also within the WeITAG Stage Two report for the following areas:

- Air Quality Baseline
- Sensitive Environmental Areas
- Water Environment
- Cultural Heritage and Historic Landscape Designations

4

TRANSPORT CASE



4 TRANSPORT CASE

4.1 OVERVIEW

The Transport Case ‘tells you what the expected impacts of the project are, how the project will contribute to the well-being goals and whether a project will provide value for public money. This is the equivalent of the ‘Economic Case’ in HM Treasury’s Green Book. This is achieved by considering the social, cultural, environmental and economic costs and benefits of each option.

Whilst WelTAG provides a fixed framework for appraisal, the guidance acknowledges that the level of detail provided in the WelTAG report should be proportionate to the impacts under consideration. Therefore, the transport case focuses on air quality and reflects the key considerations in relation to the EU Air Quality Directive and bringing forward compliance with limit values.

4.2 METHODOLOGY

The approach to the Stage Three level of appraisal is intended to examine in greater detail the physical ‘hard measures’, which have tangible benefits for tackling the problem under consideration. The ‘soft measures’ included within the complementary package have not been modelled as the direct benefits are expected to be intangible. The general approach to the modelling of measures is outlined in Table 4-1.

Table 4-1 – Modelling Approach to Measures

Reference	Measure	Traffic Modelling Requirement	Air Quality Modelling Requirement
S1	Change Signal Timings at Crumlin Junction	Yes, for AM peak hour only	Included
S2	Signalise the A472/B4471 Swyffryd Junction and introduce an eastbound queue detector	Yes, for all peak hours	Included
S3	Demolish Dwellings at Woodside Terrace and Re-align Road	No – this option utilises Do-Minimum traffic data.	Included
S4	Peak Period HGV Bans	Yes, for AM and PM peak hour.	Included

S5	Clean Air Zone / Low Emission Zone	Yes, for all Peak hour – Class D ⁸ (with JAQU Behavioural Response assumptions)	Included
S6	Traffic Management Option - Change Signal Timings at Crumlin Junction (Option 1) + Signalise the A472/B4471 Swyffryd Junction with 2 lanes on A472 EB (Option 2)	Yes, for all peak hours.	Included
S7	Do Max - Change Signal Timings at Crumlin Junction + Signalise the A472/B4471 Swyffryd Junction with 2 lanes on A472 EB + Clean Air Zone / Low Emission Zone	Yes, for all peak hours.	Included

4.2.1 ENVIRONMENTAL APPRAISAL

4.2.1.1 Transport Modelling

The emissions and dispersion modelling undertaken at Stage Two was based on the assumed impacts of measures on traffic speeds and volumes. At Stage Three a fully quantifiable approach to appraising the benefits of measures has been undertaken, and this required the ‘hard measures’ to be modelled with microsimulation traffic modelling. It was not necessary to undertake traffic modelling for all measures as some measures (e.g. Demolition of the Woodside) are not expected to result in a change in traffic flows. The static VISSIM micro-simulation model has two forecast years, 2021 and 2029.

A static VISSIM micro-simulation model was developed for the morning peak, inter-peak (IP), evening peak and Saturday peak for the A472 Hafodyrynys Road study corridor, utilising demand data from an extensive traffic data collection exercise which was undertaken in 2018. This included 10 automatic traffic counters (ATC) on the A472 Hafodyrynys Road, and the micro-simulation model was calibrated and validated utilising journey time and queue data. Results were output and averaged over several random seeds to ensure the ‘daily variability’ in traffic flow was accurately modelled. High resolution data was outputted from the model (across 350 data collection points) and included volume, classification and speed data. The ATC data was used to factor the morning, inter-peak evening peak hour flow data to AM, IP, PM, Saturday, and off-peak periods covering 24 hours in total.

⁸ Class A - Buses, coaches, taxis and private hire vehicles (PHVs); Class B - Buses, coaches, taxis, PHVs and heavy goods vehicles (HGVs); Class C - Buses, coaches, taxis, PHVs, HGVs and light goods vehicles (LGVs); Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards

Whilst the model was developed for the A472 Hafodyrynys Road corridor of the exceedance only, general consideration has been given to the wider impacts of displacing traffic in the instance of peak period HGV bans and Clean Air Zones. The full detail on the traffic modelling, including the base model calibration and validation statistics are included within the WelTAG Stage Three Impact Assessment Report (IAR).

The base year for the VISSIM model is 2018. Growth factors were derived from TEMPro 7.2 to growth the traffic data to 2021 and 2029. The TEMPro growth factors for Caerphilly are presented in Table 4-2.

4.2.1.2 Strategic modelling

As part of the Stage Three assessment work, the CAZ option has been modelled within the South-East Wales Transport Model (SEWTM) to assess the re-distribution of traffic.

Strategic models operate through repeated iterations of traffic assignment to the network, with costs calculated for the current run and fed forward into the next iteration for re-routing traffic until the model converges (when there is little change between one iteration and the next). The convergence of the model is controlled by looking at statistics for the model as a whole; this can mean that when running networks with slightly different properties or flow patterns (such as testing schemes that only affect a small part of the model, such as in this case), there is often a difference in the traffic flows that has nothing to do with the specific changes put in but is just because the model has converged with a slightly different answer, and these differences are referred to as 'noise' when comparing two models. Where changes are small because of a scheme it is therefore difficult to separate out the specific changes due to the scheme from any background noise.

Below is a summary of the SEWTM results for a CAZ Option Class D⁹ with JAQU Behavioural response¹⁰. The modelling results are based on a 2026 forecast assessment year. This year has been utilised as the model does not have either the 2021 or 2029 assessment years, whilst 2026 is available and served as a proxy year between 2021 and 2029.

- Morning Peak

There are approximately 90 vehicles westbound that reroute from along Hafodyrynys Road. Approximately half of these trips were coming from the north, with those trips previously following Swyffrd Road before coming down Hafodyrynys Road, while in the Do Something they route directly along the A467. The other half of these trips were routing along the A472 from the east; due to the background traffic in the model it's unclear where these trips may have re-routed to or from.

- Inter-peak

⁹ Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards

¹⁰ JAQU (Defra and Department for Transport Joint Air Quality Unit) provide guidance on the likely behavioural responses to a charging Clean Air Zone. Details are available in the Impact Assessment Report.

There are approximately 10 vehicles westbound and 25 vehicles eastbound that re-route from along the Hafodyrynys Road. The majority of these flow changes continue to the east along the A472, however similarly to the AM and therefore in combination with the small flows being talked about it's not clear whether there's a specific route that these vehicles re-route on to.

- Evening Peak

There are approximately 10 vehicles westbound and 10 vehicles eastbound that re-route from along the Hafodyrynys Road. Similarly, to the AM and IP time periods, the small flows being talked about and the background traffic in the model make it unclear where vehicles may be re-routing to.

These results have been used to inform the distributional analysis. However, the results should be treated with caution as the reassignment has been treated with caution due to limitations of the model. More detail on the SEWTM model outputs is contained within the IAR.

4.2.1.3 Traffic Modelling Assumptions

Table 4-2 – Local Growth Figures for A472 Crumlin (TEMPro)

	AM Peak Hour	Inter-Peak	PM Peak Hour	Saturday
2021	1.0492	1.0580	1.0477	1.0490
2029	1.1121	1.1320	1.1094	1.1153

Table 4-3 below shows the weekday conversion factors which have been calculated from a two-week average survey data. The Saturday conversion factors were also calculated from the same survey dataset but only looking at the average Saturday data.

Table 4-3 – Time Conversion Factors

	Weekday Factors
AM Peak Hour to AM 3hr Period	2.6
IP Average hour to IP 6hr Period	6
PM Peak Hour to PM 3hr Period	2.6
AM + PM + IP Peak Hours to OP Period	0.9

As part of the model calibration and validation it was identified that the morning peak hour for the eastbound and westbound direction does not coincide. As a result, the model period was extended to 2 hours to ensure that the complex interactions within the morning peak could be accurately modelled.

4.2.1.4 Air Quality

The air quality modelling can be broadly split into two components:

- Emission modelling

- Dispersion modelling

Emission modelling

The emission modelling for this study is essentially a translation of the results of the traffic microsimulation described in previous sections- with an emphasis on avoiding loss of temporal variance in the results of the traffic model. The emissions model also makes use of ambient vehicle emission measurements from two campaigns carried out in 2018.

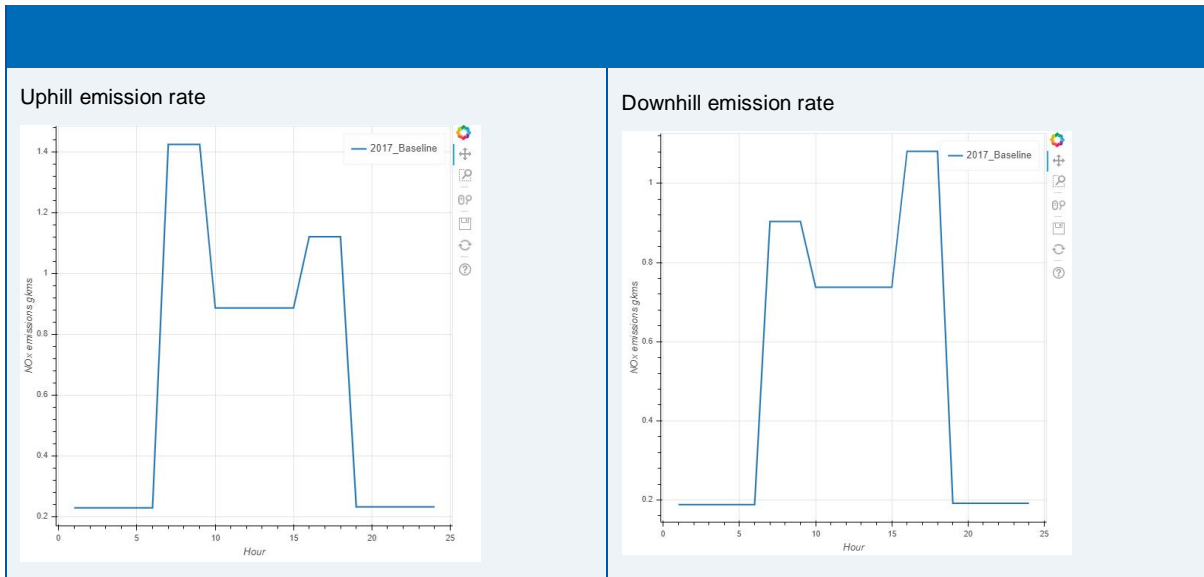
The modelled traffic conditions were passed through our emission model (which is based on COPERT but tuned with the measured vehicle emission data) using discrete values for each hour so that detailed temporal patterns could be captured, and therefore reflected in the annual mean pollutant values reported. This represents a significant enhancement over the Stage 2 work which used average speeds and flows across the day.

In addition to the activity-based traffic scenarios modelled technology changes implied by the CAZ scheme (based on Class D¹¹, with behavioural responses) have been incorporated into the model. This was done by modelling each link using independent flow, speed and fleet composition for each of the 24 hours in a typical day. The detailed temporal allocation of emissions also enabled the modelling of the HGV scheme impacts specific to the time of the day affected.

An example of the temporal allocation of emissions is provided in Table 4-4 where the effect of both the tidal traffic pattern and the uphill/downhill effect can be observed in the emission curves.

¹¹ Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards

Table 4-4 - Daily NOx emission profile through street canyon (note higher values uphill)



The emission modelling approach was written into a series of python programs to enable the modeller to vary the flow, speed, fleet mix and gradient for each link, for each hour of the day. This represents a significant enhancement over simple daily average-based methods.

Air quality modelling

The Hafodyrynys Road location presents a set of topographical factors which complicate air quality modelling at the location. These can be summarised thus:

- 1) The road transects an obvious street canyon which is asymmetrical- the north elevation is higher than the south
- 2) The street canyon lies within a valley. The wider topography of the area comprises many hills and valleys.
- 3) The street canyon has an upwards gradient running from West to East

In isolation each of these factors would present a challenge for dispersion models commonly used in the UK. The confluence of all of these factors has led us to select the GRAL modelling suite which is well suited to deal with these additional challenges.

The air quality modelling for the Woodside Terrace corridor was undertaken in the GRAL dispersion model, supported by meteorological modelling undertaken in the GRAMM processor. Much of the detail around this method remains unchanged from the Stage Two report so is not reproduced here (a full methodological report is provided in the Impact Assessment Report).

The GRAL/GRAMM modelling system (hereafter called 'GRAL') was developed by the Graz University of Technology, Institute for Internal Combustion Engines. GRAL is a sophisticated, non-steady state air quality model which has been used extensively in Europe.

For the purposes of this study we have followed the advice set out in the guidance note by the developers of GRAL which is circulated with the model code.

The air quality modelling was carried out using wind and cloud data from the Cardiff Airport station in 2017, which was used to provide boundary conditions to the regional domain represented in the GRAMM met model. Subsequently GRAMM provides the meteorological boundary conditions to the

GRAL dispersion model. The GRAMM domain covers an area of around 9km x 9km centred on the GRAL domain.

Each hour was modelled individually by averaging the meteorology across the year for the hour- e.g. all 1am hours are grouped and modelled as an average, all 2am hours are grouped and so on. This means that the temporally detailed emissions can be presented to the appropriate meteorology in each hour.

The GRAL domain covering the Woodside Terrace corridor is comprised of 378 x 177 x 12 cells in the x, y and z axes, set to a horizontal resolution of 1m (Figure 4-1).

Two further grids were also modelled (mainly to support the economic and health impact appraisals) using the Ricardo RapidAIR model. The RapidAIR domain shown below was also prepared at 1m resolution and a further larger domain was modelled for the distributional analysis at 3m resolution (see Table 4-2). RapidAIR is Ricardo Energy & Environment's propriety modelling system developed for urban air pollution assessments. The model is based on convolution of an emissions grid with dispersion kernels derived from the USEPA AERMOD¹² model. The physical model parameterisation (release height, initial plume depth) closely follow guidance provided by the USEPA in their statutory road transport dispersion modelling guidance¹³. AERMOD provides the algorithms which govern the dispersion of the emissions and is an internationally accepted model for traffic studies. Further details about the RapidAir model, including results of a validation study in London, has been published in a peer-reviewed academic journal¹⁴.

¹² https://www3.epa.gov/ttn/scram/dispersion_prefrec.htm#aermod

¹³ <https://www.epa.gov/state-and-local-transportation/project-level-conformity-and-hot-spot-analyses>

¹⁴ Masey, Nicola, Scott Hamilton, and Iain J. Beverland. "Development and evaluation of the RapidAir® dispersion model, including the use of geospatial surrogates to represent street canyon effects." *Environmental Modelling & Software* 108 (2018): 253-263.

Figure 4-1 Air quality simulation domain

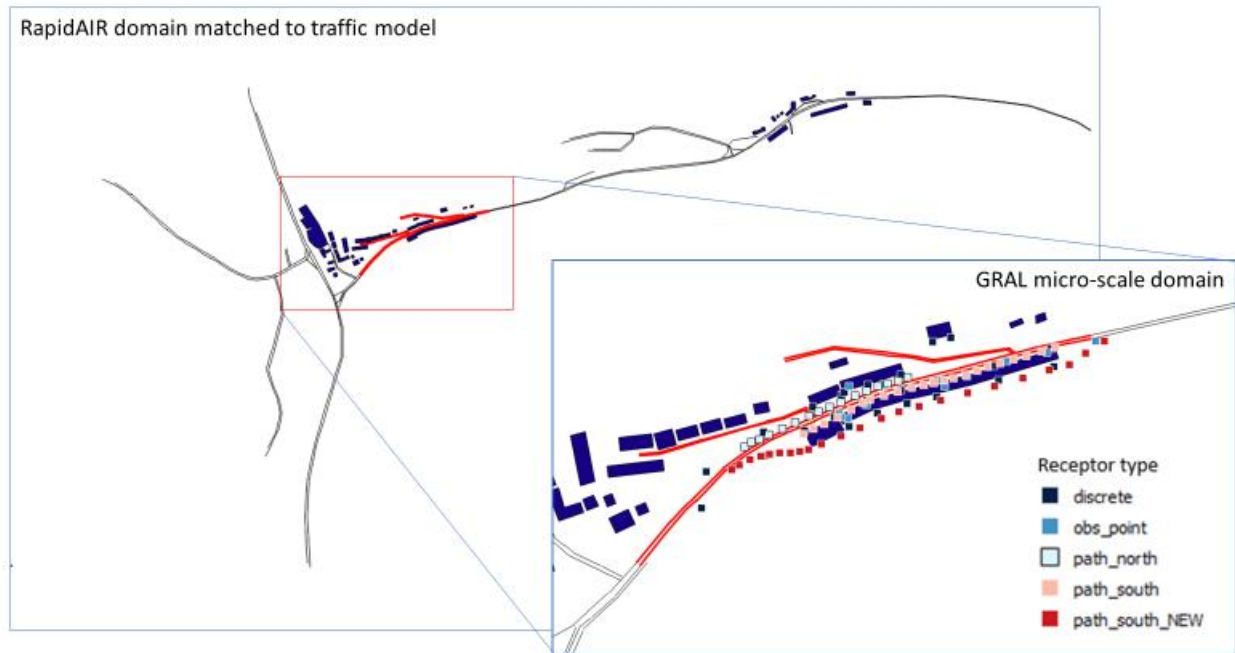
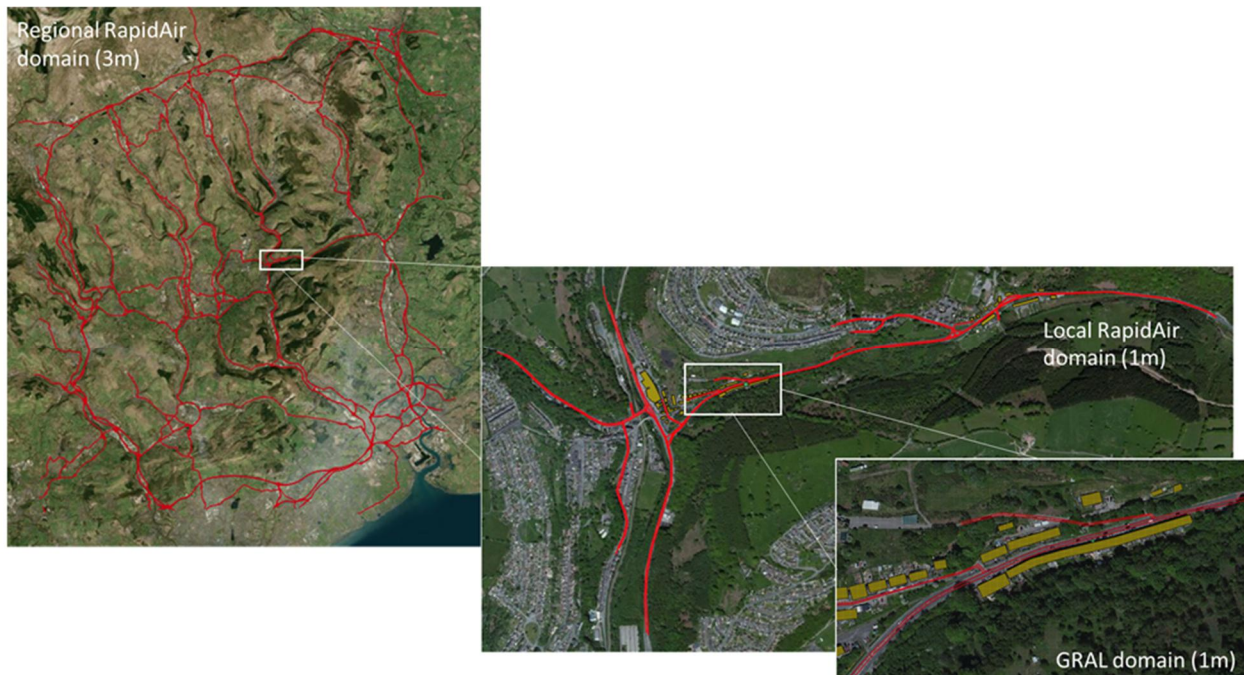


Figure 4-2 Regional simulation domain



Non-road background concentrations of NO_x for 2017 were obtained from the Defra UK-Air website. The component from road traffic was removed to avoid double counting. The background air pollution climate in Hafodyrynys is quite low, with an average value at the model domain of around 9 µg/m³. The low background value further reinforces the very dominant effect of local traffic on the NO₂ climate in the area.

The GRAL results require conversion with an empirically derived equation. A formula is provided by the model developers, but it is based on conditions in Europe, so a conversion function specific to the study was derived. The default values for f-NO₂ in the NO_x to NO₂ calculator were used (0.28 in 2017 for 'All UK Traffic').

The background value was input into the Defra NO_x to NO₂ calculator along with the diffusion tube results provided by CCBC to obtain a conversion curve to be applied to the modelled NO_x concentrations. A 3rd order polynomial expression was obtained which explains 99.999% of the variance in the relationship between total NO_x and total NO₂. The expression is provided in Equation 1 below.

Equation 1

$$NO_2 = 0.00000089x^3 - 0.00079666x^2 + 0.52084404x + 3.7371263$$

where x = total annual mean NO_x (sum of traffic NO_x and background)

In deeming when a measure could be deployed in the field, considering, *inter alia*, the required investigations and, consultation periods, commissioning and construction times, legislation to be enacted and existing statutory powers of the trunk road agents, the timescales in Table 4-5 – Assumed implementation timescales were assumed.

Table 4-5 – Assumed implementation timescales

Measure	Earliest Implementation Timescale
Change Signal Timings at Crumlin Junction	2020
Signalise the A472/B4471 Swyffryd Junction	2021
Demolish Dwellings at Woodside Terrace and Re-align Footpath	2023
Peak Period HGV Bans	2021
Clean Air Zone / Low Emission Zone	2026
Traffic Management Option (Changing Signal Timings at Crumlin Junction & Signalise the A472/B4471 Swyffryd Junction)	2021
Do Maximum Option (Changing Signal Timings at Crumlin Junction & Signalise the A472/B4471 Swyffryd Junction & Clean Air Zone / Low Emission Zone)	2026

4.3 AIR QUALITY APPRAISAL

The options appraised for their air quality effects are as follows:

Table 4-6 – Option Description

Reference	Measure Description
1	Change Signal Timings at Crumlin Junction
2	Signalise the A472/B4471 Swyffryd Junction
3	Demolish Dwellings at Woodside Terrace and Re-align Footpath
4	Peak Period HGV Bans
5	Clean Air Zone / Low Emission Zone
6	Traffic Management Option (Changing Signal Timings at Crumlin Junction & Signalise the A472/B4471 Swyffryd Junction)
7	Do Maximum Option (Changing Signal Timings at Crumlin Junction & Signalise the A472/B4471 Swyffryd Junction & Clean Air Zone / Low Emission Zone)

The section 4.3.1 Scenario Results below presents plots and numerical values for the following scenarios:

- 1) Baseline 2017
- 2) Do-minimum 2021
- 3) Scenario 3 - Do-minimum 2021 emissions with demolition and south path realignment
- 4) Scenario 4 - 2021- HGV ban in peak period
- 5) Scenario 5 - 2021 Class D¹⁵ CAZ with Behavioural Response

The three scenarios in the list above yielded material changes in concentrations whereas scenarios 1, 2 and 6 in Table 4-5 had no effect on concentrations. Scenario 7 yielded the same results as scenario 5.

In addition to modelling NO₂, results for PM_{2.5} are presented as required by the Health Impact Assessment.

¹⁵ Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards

Agreement between the modelled values and the observed values was very good. The relationship between observed road NO_x and modelled values was best explained by a 2nd order polynomial, which was subsequently used to adjust the road NO_x component. After applying the polynomial, the relationship is linear and there is a good match between observed vs modelled values. Following that the NO₂ expression above to convert total NO_x to annual mean NO₂ was applied, before calculating the RMSE- which in this case is 3.9 µg/m³. The modelled concentrations explain 84.4 % of the variance in the measured NO₂ values.

Table 4-7 – Model Validation Data for Annual Mean NO₂

Site	Site description	Measured NO ₂ (µg/m ³)	Modelled NO ₂ (µg/m ³)
CCBC48	1 Woodside Shops, Hafodyrynys	42.8	47.2
CCBC50	Past Woodside Terrace, Hafodyrynys	51.5	57.1
CCBC60	3 New Houses, Hafodyrynys	36.5	37.7
CCBC79	20 Woodside Terrace, Hafodyrynys	61.2	64.0
CCBC83	10 Woodside Terrace, Hafodyrynys	58.9	59.4
CCBC84	La Loma, Hafodyrynys	41.4	34.9
CCBC86	Telegraph pole outside 16 Woodside Tce	66.9	70.0
CCBC87	16 Woodside Tce, Hafodyrynys	66.5	70.0
CCBC88	13 Woodside Tce, Hafodyrynys	53.6	58.8
CCBC89	Hafodyrynys AQE 1	70.3	65.8
CCBC90	Hafodyrynys AQE 2	69.5	65.8
CCBC91	Hafodyrynys AQE 3	72.5	65.8
CCBC93	3 Woodside Tce, Hafodyrynys	58.0	63.4
CCBC94	Bus stop outside 1 Woodside Tce	59.4	60.6
CCBC95	1 Woodside Tce, Hafodyrynys	42.9	41.2
Auto_site	Automatic analyser site	70.0	64.0
Root mean square error = 3.9 µg/m ³			

4.3.1 SCENARIO RESULTS

4.3.1.1 Baseline 2017

Figure 4-3 shows the modelled NO₂ climate along Hafodyrynys Road in 2017. As we can see there are areas of significant exceedance of the NO₂ annual mean limit value along the road (the yellow line is the exceedance boundary). **The baseline in 2017 does not comply with the annual mean NO₂ limit value.**

Figure 4-3 Modelled concentrations of annual mean NO₂ for 2017 baseline



Figure 4-4 NO₂ exceedance / compliance plot for 2017 baseline (green dots ≤ 40 µg/m³, red dots > 40 µg/m³)

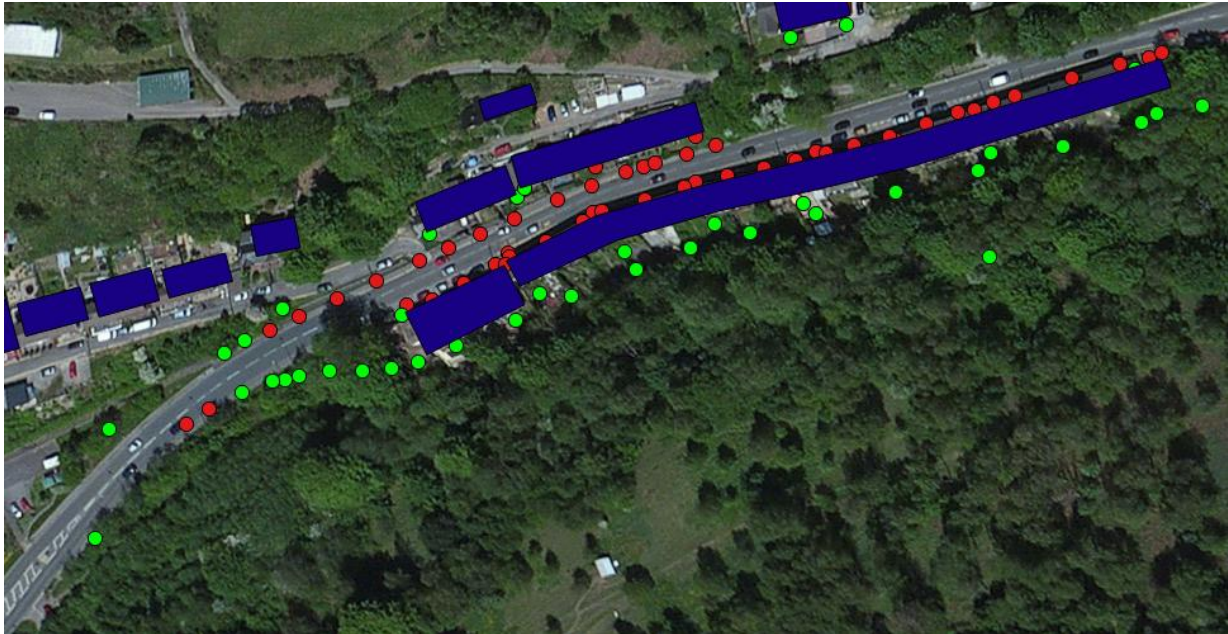
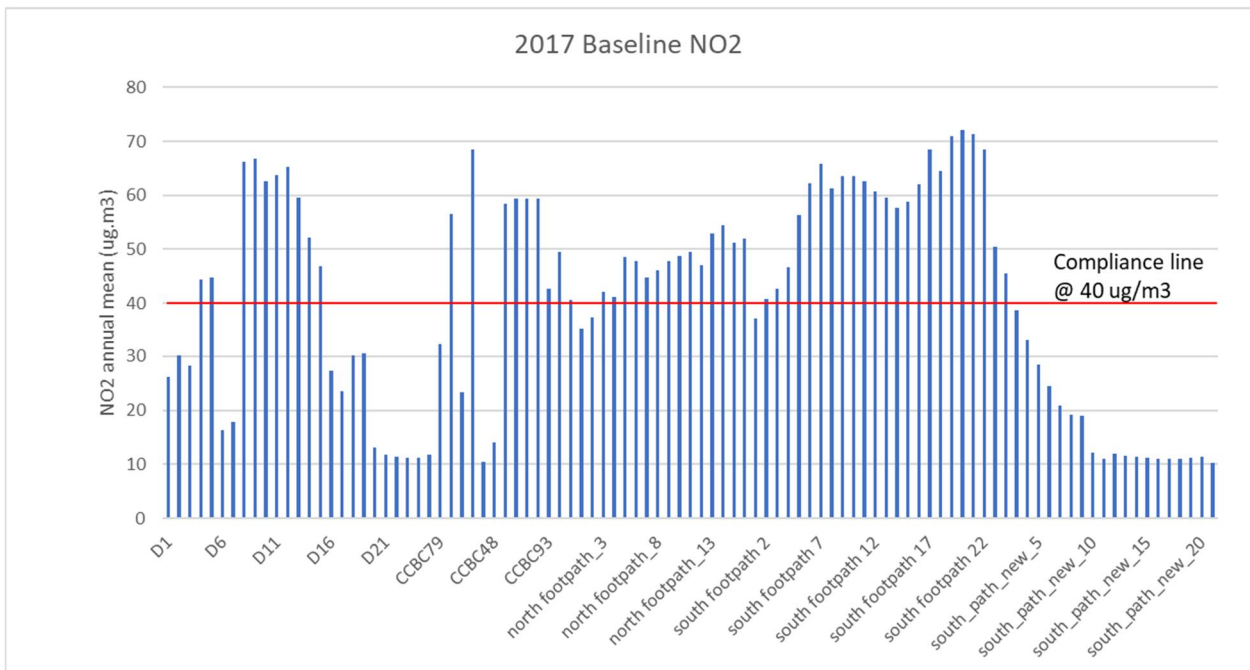


Figure 4-5 NO₂ at receptor locations for 2017 baseline



4.3.1.2 Baseline 2021

Figure 4-6 shows the modelled NO₂ climate along Hafodyrynys Road in 2021. As we can see there are areas of significant exceedance of the NO₂ annual mean limit value along the road (the yellow line is the exceedance boundary). **The baseline in 2021 does not comply with the annual mean NO₂ limit value.**

Any reference to compliance or non-compliance in 2021 is based on the results of the 2021 forecast modelling. For many of the options this is before the year of implementation. Where this is the case, the year of compliance should be taken as the year of implementation.

Figure 4-6 Modelled concentrations of annual mean NO₂ for 2021 do minimum

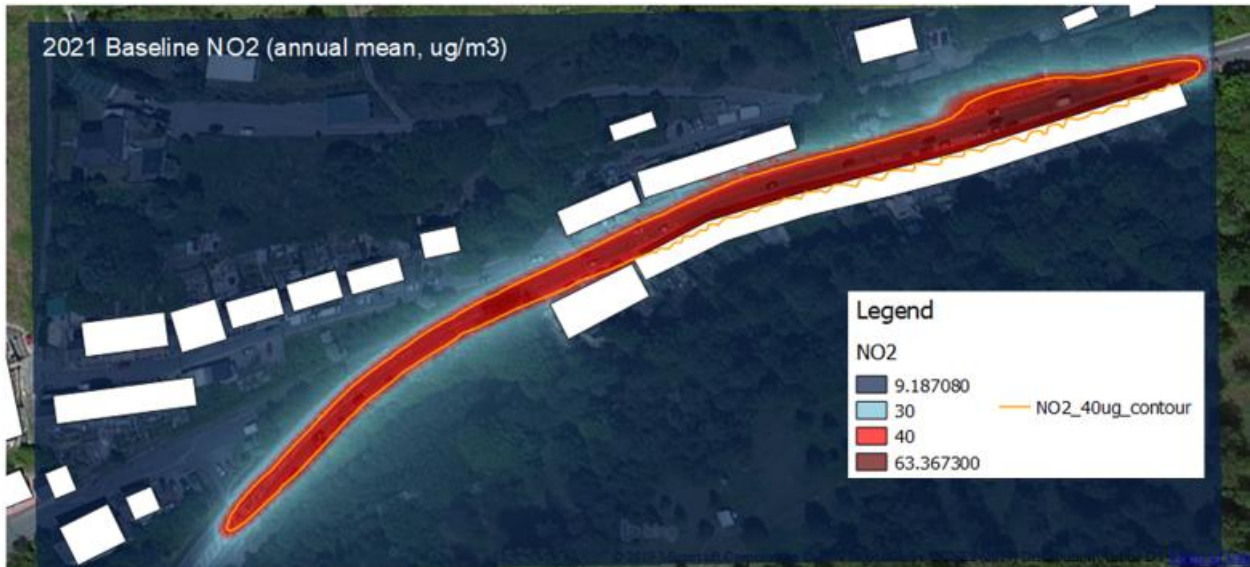


Figure 4-7 NO₂ exceedance / compliance plot for 2021 baseline (green dots $\leq 40 \mu\text{g}/\text{m}^3$, red dots $> 40 \mu\text{g}/\text{m}^3$)

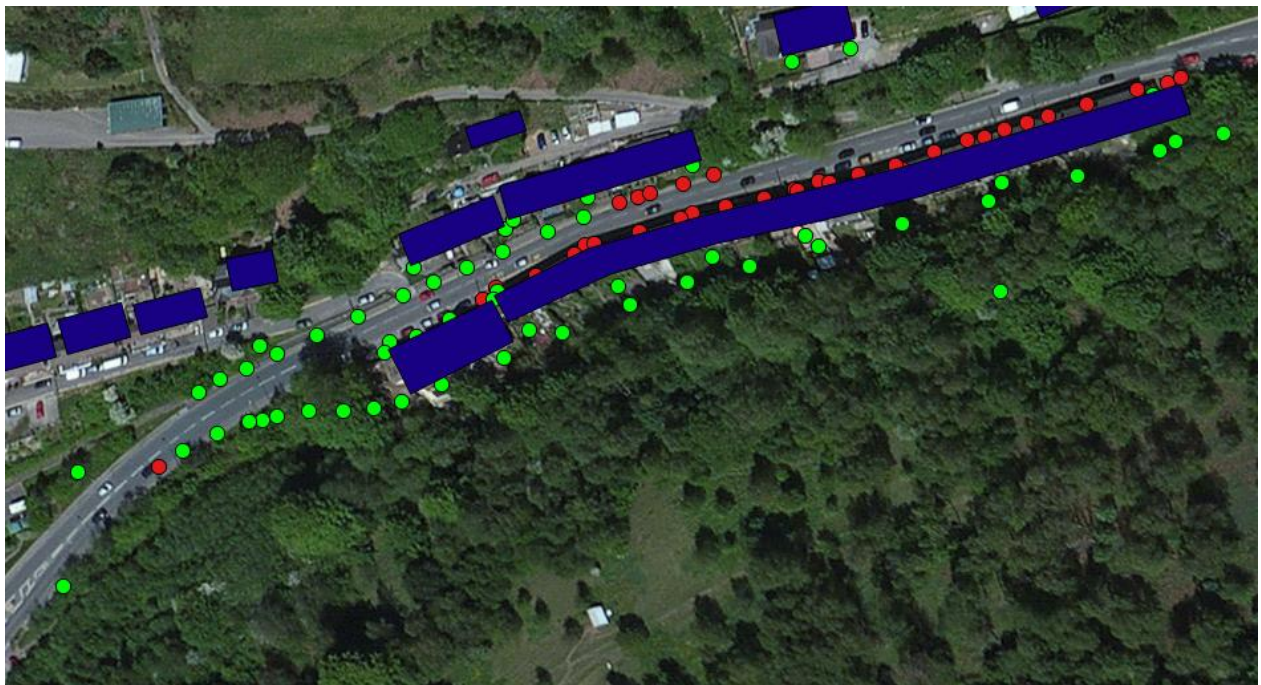
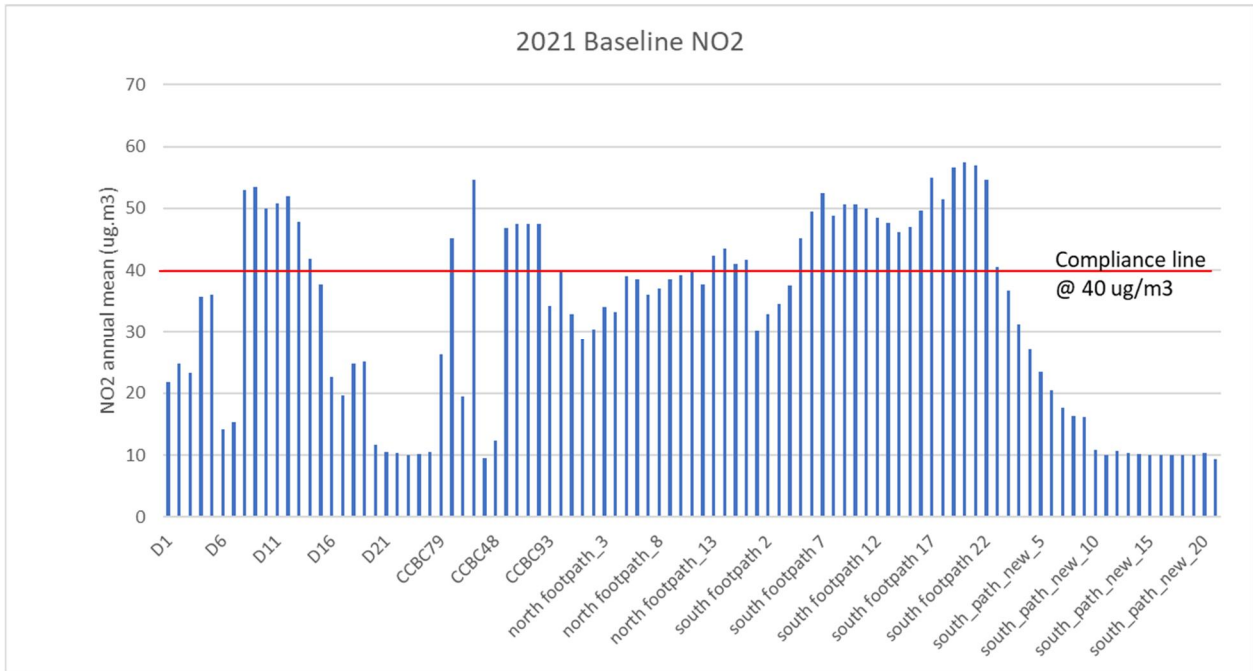


Figure 4-8 NO₂ at receptor locations for 2021 baseline



4.3.1.3 Scenario 3- Demolition and move south path to the south

This option involves removing the southern residential properties from the dispersion model, whilst leaving the emissions set to the 2021 Do-minimum values. The option also realigns the southern side footpath further south away from the existing road alignment. Hence the receptors representing the original south path are no longer relevant and are removed. - **The demolition option in 2021 does comply with the annual mean NO₂ limit value at relevant locations.**

Figure 4-9 Modelled concentrations of annual mean NO₂ for 2021 Scenario 3

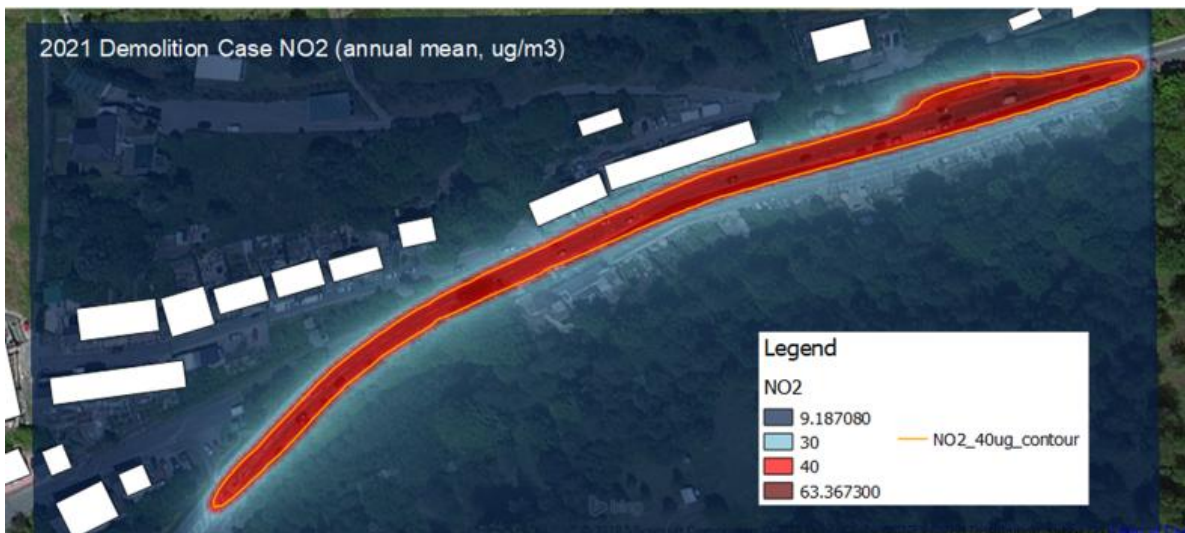


Figure 4-10 NO₂ exceedance / compliance plot for 2021 Scenario 3 (green dots $\leq 40 \mu\text{g}/\text{m}^3$, red dots $> 40 \mu\text{g}/\text{m}^3$)

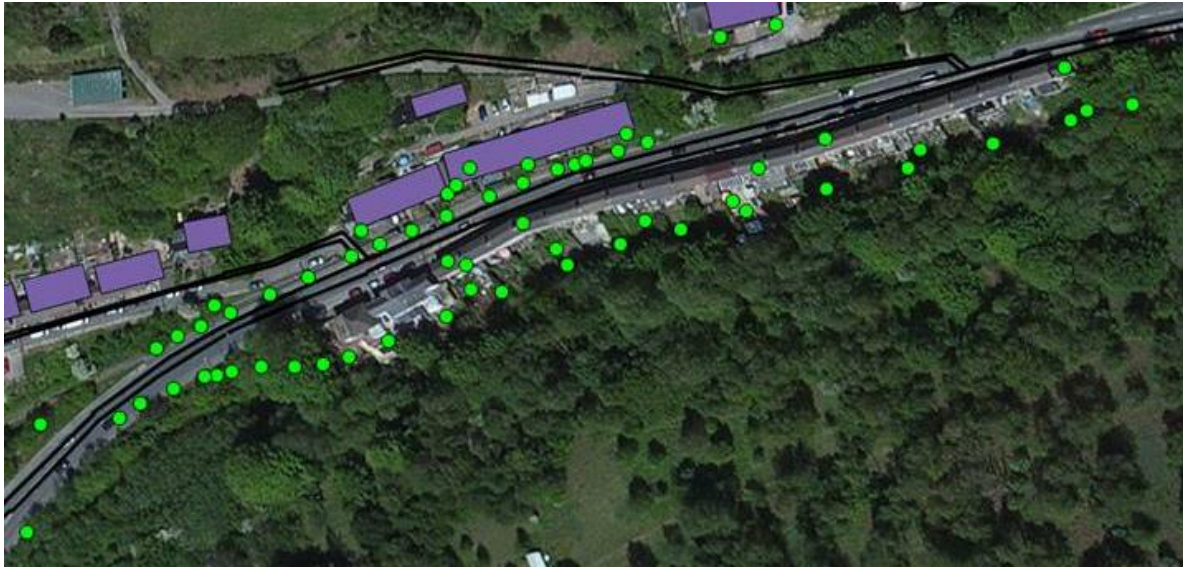
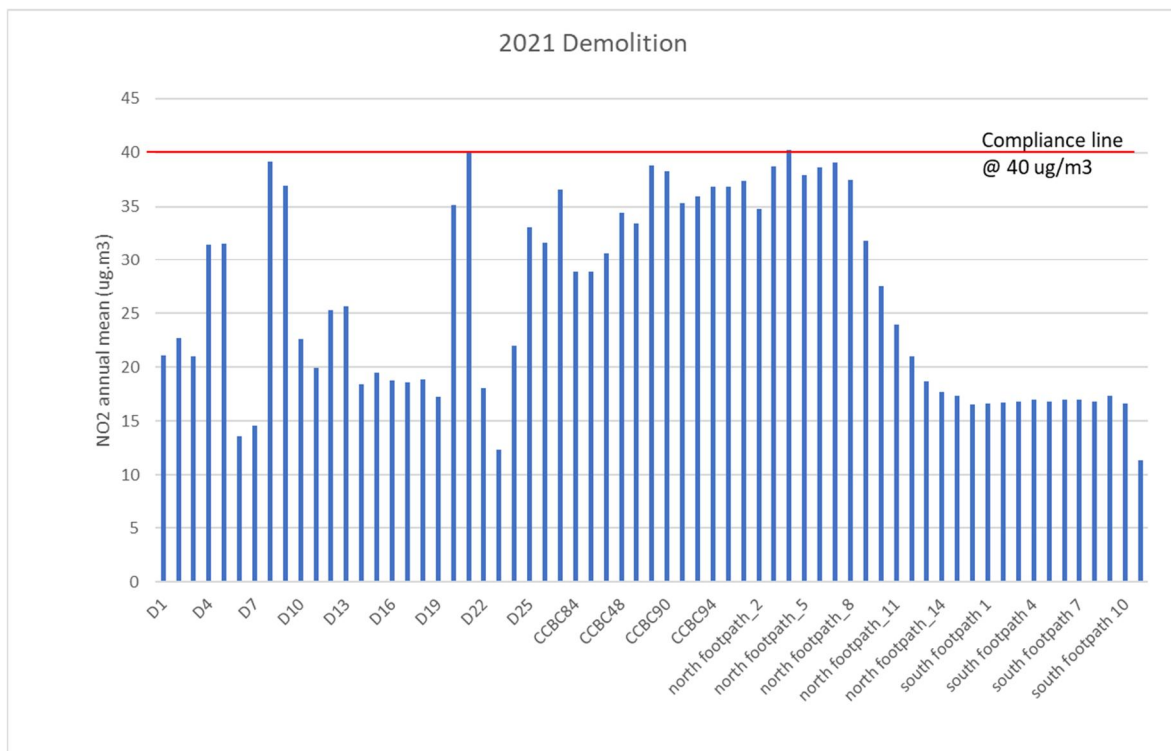


Figure 4-11 NO₂ at receptor locations for 2021 S3



To further underpin the analysis Figure 4-12 shows the difference between the 2021 baseline scenario and the demolition scenario. It can be clearly seen that demolition reduces concentrations in the canyon, most likely due to the reduction in recirculation of emissions.

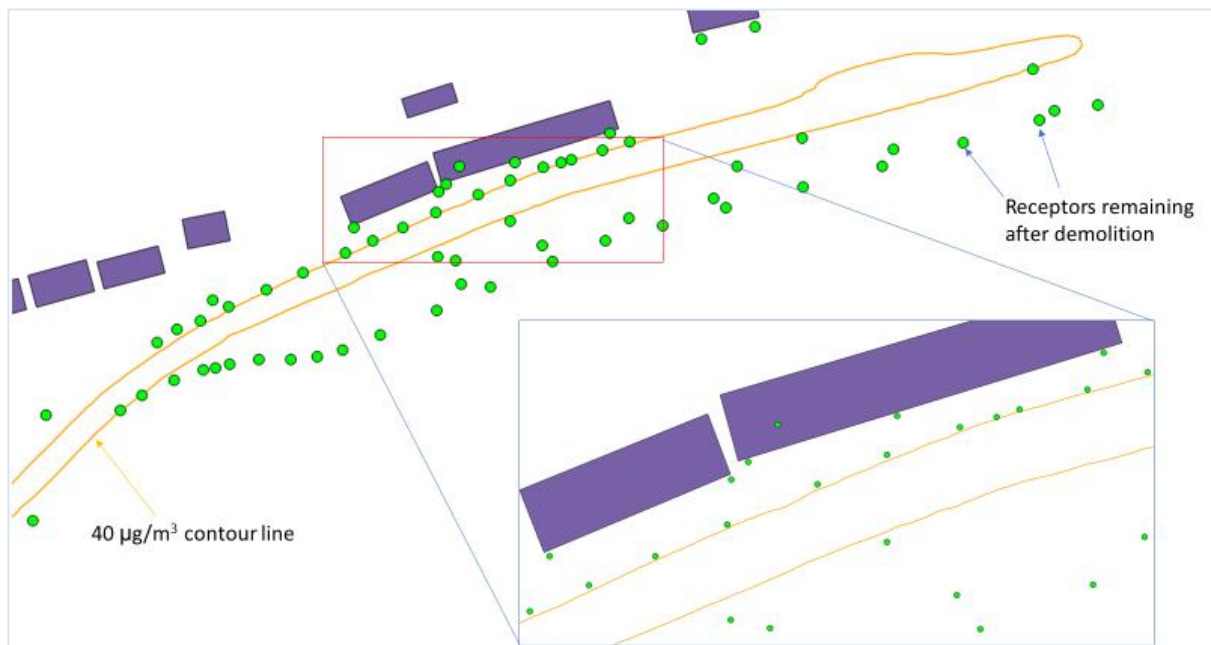
Figure 4-12 NO₂ difference plot for 2021 Scenario 3 (red areas = lower NO₂ concentrations, blue = higher)



Note: existing building footprints are retained deliberately to avoid artefacts in the plot

As the margin of compliance is slight, we have plotted the 40 µg/m³ contour line and shown its alignment with receptors remaining after the demolition would be completed (Figure 4-13 Close up of NO₂ exceedance line along north path receptors (scenario 3)).

Figure 4-13 Close up of NO₂ exceedance line along north path receptors (scenario 3)



4.3.1.4 Scenario 4 HGV ban in peak period

The HGV peak period ban reduces concentrations of NO₂ along the corridor by a few µg/m³. Significant exceedances still persist with the measure in place. **The HGV ban option in 2021 does not comply with the annual mean NO₂ limit value.**

Figure 4-14 Modelled concentrations of annual mean NO₂ for 2021 Scenario 4



Figure 4-15 NO₂ exceedance / compliance plot for 2021 Scenario 4 (green dots ≤ 40 µg/m³, red dots > 40 µg/m³)

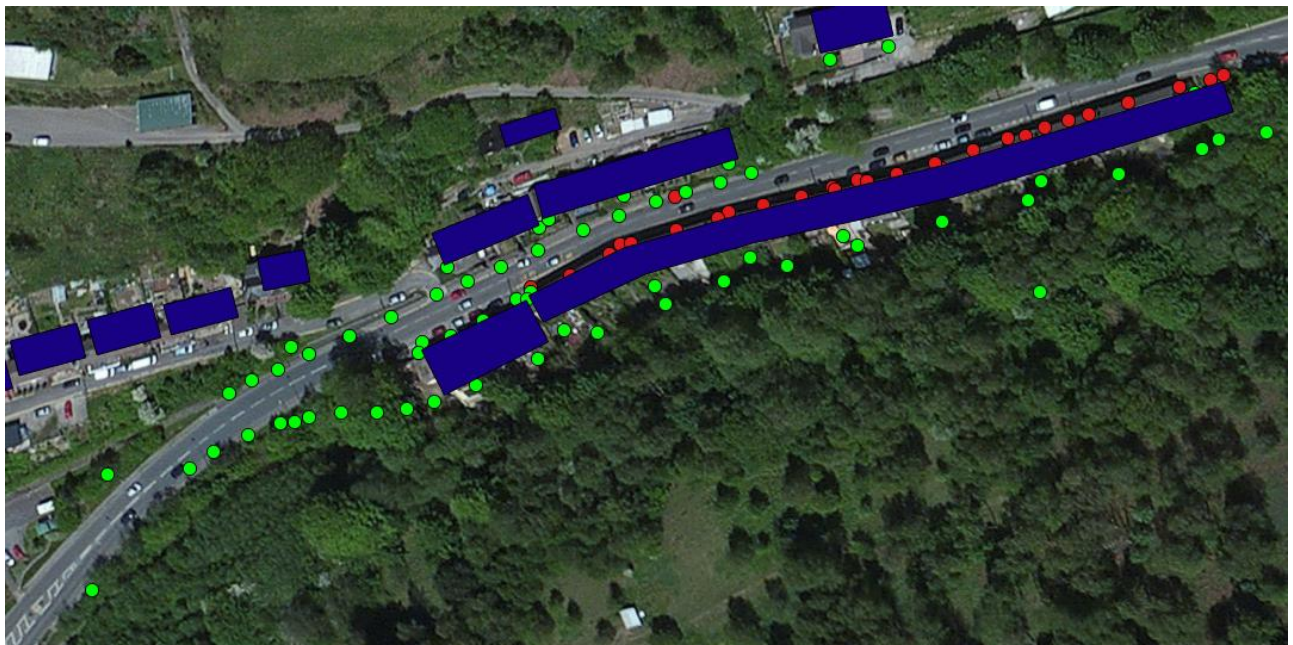
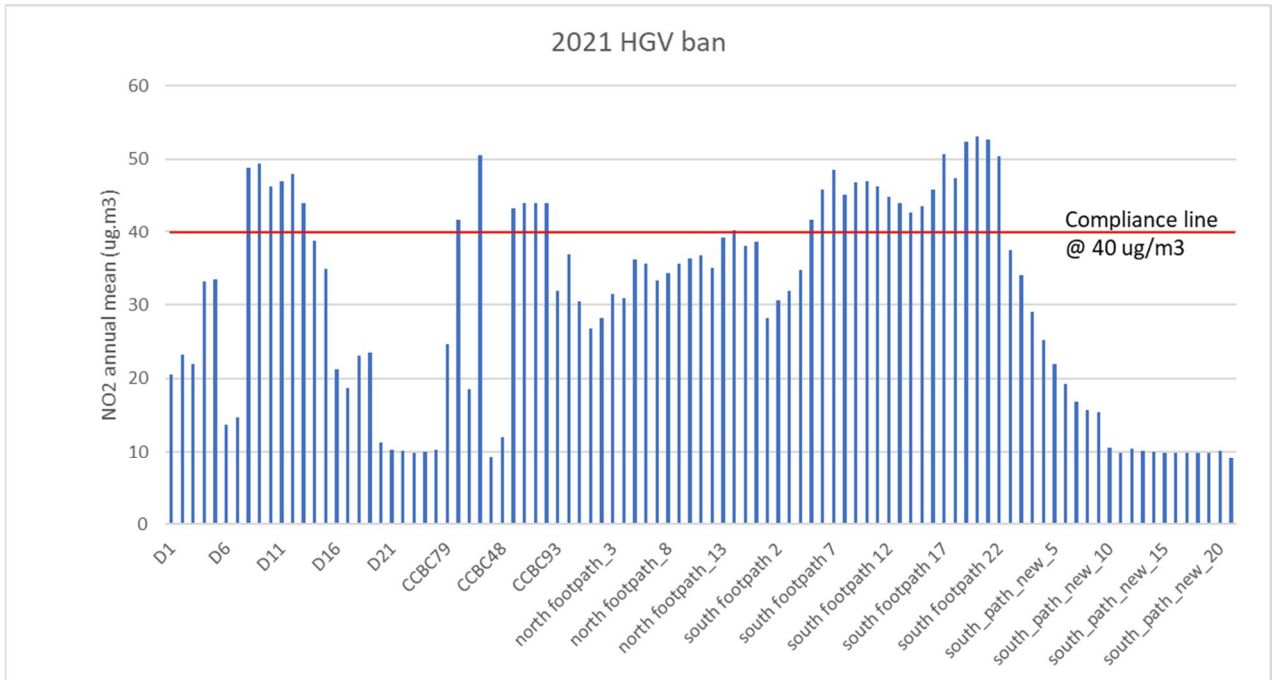


Figure 4-16 NO₂ at receptor locations for 2021 S4



4.3.1.5 Scenario 5 - 2021 Class D CAZ with Behavioural Response

The CAZ option has a large effect on NO₂ concentrations which reduce by 40-50% in the modelled corridor. This is primarily because of Euro 6/VI vehicles with lower emissions in the fleet. **The CAZ option in 2021 does comply with the annual mean NO₂ limit value**

Figure 4-17 Modelled concentrations of annual mean NO₂ for 2021 Scenario 5

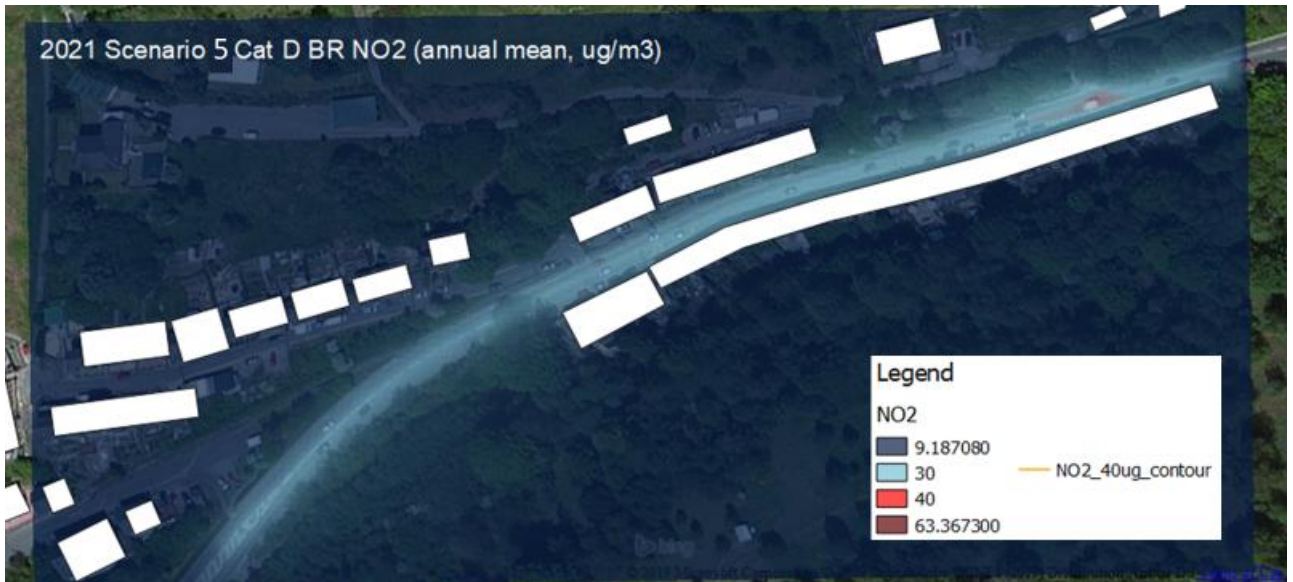


Figure 4-18 NO₂ exceedance / compliance plot for 2021 Scenario 5 (green dots ≤ 40 µg/m³, red dots > 40 µg/m³)

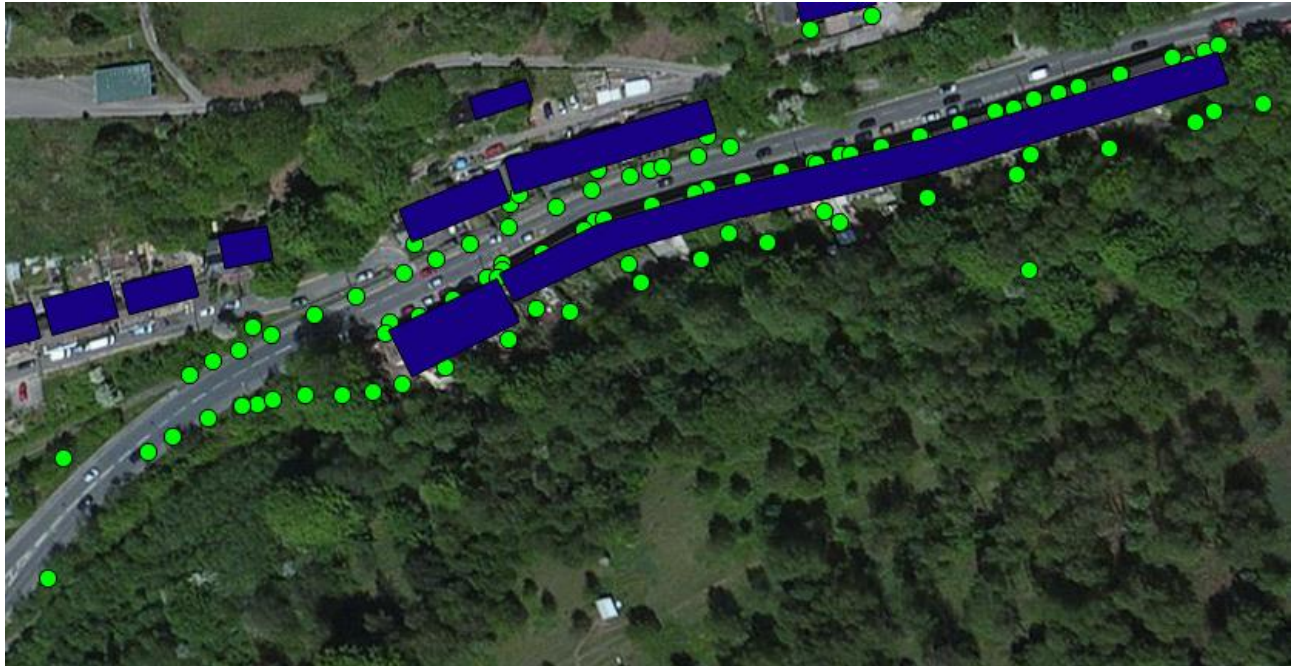
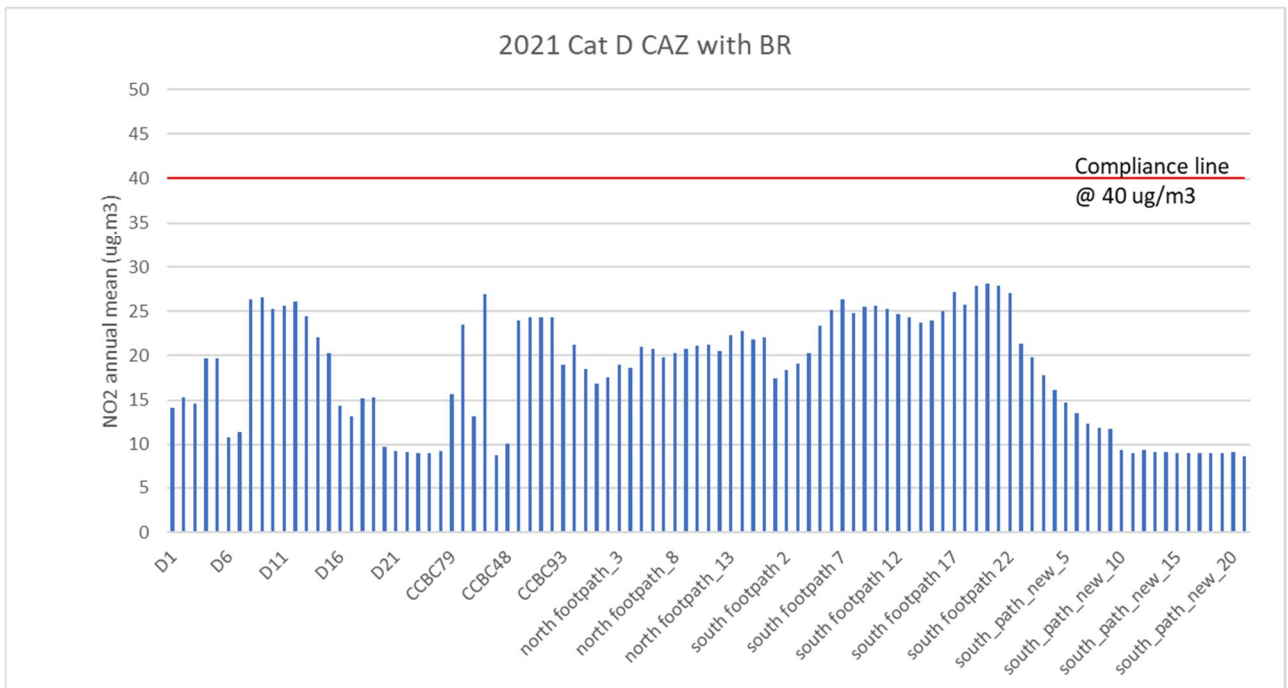


Figure 4-19 NO₂ at receptor locations for 2021 S5



4.3.1.6 Do minimum in future years

Fleet renewal in years to come will deliver air quality improvements without local intervention. Table below shows the total number of modelled receptors that comply with the NO₂ limit value for future modelled years (based on linear interpolation between 2021 and 2029). The modelling indicates that

the NO₂ limit value can be met in 2025 without local action- though this is contingent on later iterations of Euro standards delivering predicted NO_x emission reductions.

Table 4-8 – Do Minimum Compliance

Scenario	Total Number of Receptors	
	NO ₂ >40	NO ₂ <40
2017	56	41
2021	35	62
2022	31	66
2023	25	72
2024	10	87
2025	0	97
2026	0	97
2027	0	97
2028	0	97
2029	0	97

This table is the number of receptor points <40, or >40 µg/m³

Table 4-8 shows the total number of receptors' compliance against the 2017 data and the 2021 Baseline. It shows that by the 2021 forecast year, the CAZ (S5) and the Do Maximum Option which includes a CAZ, result in all 97 receptors below the 40 µg/m³ level. The demolition option (S3) also results in 97 compliant receptors below the 40µg/m³ level in 2021. The next ranked option with a compliant number of 67 receptors below the 40µg/m³ level is the peak hours HGV bans (S4).

Table 4-9 – Do Something Options Compliance

Scenario	Total Number of Receptors	
	NO ₂ >40	NO ₂ <40
2017	56	41
2021 Baseline	35	62
2021 Signal Timings S1	35	62
2021 Swyffryd Road S2	35	62
2021 Demolition S3	0	97
2021 HGV Ban S4	30	67
2021 CAZ S5	0	97
2021 Traffic Management S6	35	62
2021 Do Maximum S7	0	97

This table is the number of receptor points <40, or >40 µg/m³

Comparison of the compliance year for the do-minimum with the measures in 2021 shows that both the demolition and CAZ options have the potential to bring forward compliance from 2025. However, the CAZ option is not likely to bring forward compliance due to the timescales, needing both enactment of new legislation and the implementation time. A realistic expected implementation of the CAZ is 2026.

4.4 VALUE FOR MONEY ASSESSMENT

As part of the WelTAG Stage Three study, consideration has been given to the Value for Money (VfM) of the proposed schemes. Outputs from the micro-simulation traffic modelling have informed a TUBA (Transport User Benefit Appraisal) economic assessment for the measures under consideration.

The aim of TUBA is to carry out economic appraisal in accordance with the DfT's Transport Analysis Guidance as set out in Unit A1-1 'Cost-Benefit Analysis'¹⁶ and the associated WebTAG Data Book (v1.10) published in May 2018¹⁷.

¹⁶ <https://www.gov.uk/government/publications/webtag-tag-unit-a1-1-cost-benefit-analysisdecember-2017>

¹⁷ <https://www.gov.uk/government/publications/webtag-tag-data-book-may-2018>

The benefit to cost ratio (BCR), net present value (NPV), present value of benefits (PVB) and present value of costs (PVC) will be represented for each option. The detailed breakdown of the Value for Money assessment is presented within the IAR.

4.5 SENSITIVITY TESTING

4.5.1 UNCERTAINTY IN THE AIR QUALITY MODELLING

Air quality modelling carries uncertainty at all stages- from the input meteorological data to the emission estimates, through to the physical treatment of dispersion in the domain. All of these factors contribute to uncertainty. The main way to reduce the effect of these uncertainties is to validate the modelled concentrations against ambient measurements of the pollutants under consideration. Then the relationship between the two is used to derive model scaling factors and reduce error estimates.

We have used standard methods for this derived from Defra guidance. The model has a Root-Mean-Square-Error (RMSE) of 3.9 $\mu\text{g}/\text{m}^3$ which can be interpreted as an acceptable measure of overall uncertainty.

All air quality modelling presented in this Stage 3 report is based on core scenarios to underpin decision making. Sensitivity tests based on high and low traffic forecasts have been modelled for the impact on annual average NO_2 . Results are presented in the Impact Assessment Report.

4.5.2 UNCERTAINTY IN TRAFFIC GROWTH FORECASTS

As part of the sensitivity tests undertaken for this study, consideration has been given to the uncertainty in traffic growth forecasts. This has been done in line with WebTAG Unit M4 'Forecasting and Uncertainty'.

The high and low growth demand sets are developed due to uncertainty around annual forecasts from the National Transport Model (NTM), based on the macro-economic variables that influence the main drivers of travel demand.

The high / low growth scenario should consist of forecasts that are based on a proportion of base year demand added / subtracted to the demand from the core scenario. This is done on the basis of:

$$2.5\% \times \sqrt{(\text{number of years between base and forecast year})}$$

Whilst these uncertainty test have been undertaken, the core scenario is intended to be the best basis for decision-making given current evidence. As such, all sensitivity tests are wholly contained within the IAR.

4.5.3 BEHAVIOURAL RESPONSE TO THE CLEAN AIR ZONE

The impact of any measure in addressing air quality is dependent upon the extent to which it alters the mix or behaviour of transport within an area. This could be, for instance, by altering the number of journeys undertaken, encouraging more efficient journeys or by altering the mode or technology used for the journey.

As part of this specific sensitivity testing, different behaviour responses are expected by motorist users of the A472 corridor because of a charging CAZ. This is a continuation of the initial Stage Two assessment which assumed all non-compliant vehicles are removed from the corridor with motorists

either rerouting or cancelling their trip. The core scenario of the Clean Air Zone assessment assumes the following behavioural responses to a CAZ:

- Continue and pay charge
- Avoid the Clean Air Zone
- Cancel planned journeys
- Upgrade/ replace their vehicle
- Change transport mode

Table 4-10 – Behavioural Response to CAZ (Modelling)

Behavioural Response	How to model?
Replace vehicle	Vehicle still within model (not removed) though will increase the overall percentage of compliant vehicles.
Cancel trip	Remove vehicle from network completely.
Change mode	Remove vehicle from network completely
Avoid zone	Remove vehicle from A472 corridor as per the assignment assumptions done for the CAZ option to date.
Pay charge	Vehicles to remain within the CAZ despite being non-compliant.

The core assessment for the CAZ assumes a Class D¹⁸ charging zone based on the above assumptions. Sensitivity test have been undertaken assuming a Class C¹⁹ charging zone and total displacement of non-compliant vehicles. These results are presented within the IAR.

4.6 APPRAISAL AGAINST OBJECTIVES

At Stage Two, the options were re-appraised against the key criteria for the objective as further evidence emerged. This has been done again at Stage Three to ensure that the options are effective, can be delivered in meaningful timeframes and are deliverable.

The Stage Three appraisal procedure is a full independent quantitative approach. For the environmental appraisal everything except the net present value (NPV) has been populated.

¹⁸ Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards

¹⁹ Class C - Buses, coaches, taxis, PHVs, HGVs and light goods vehicles (LGVs)

4.6.1 KEY CRITERIA

The following key criteria for the appraisal were established in Stage One, updated in Stage Two, and has been re-evaluated in Stage Three:

Effectiveness – Is the measure likely to deliver reductions in roadside concentrations proportionate to the scale of the exceedance above the 40µg/m³ legal limit.

Timescales – Can the measure be implemented within timescales that are meaningful (short enough) to have an impact on bringing forward the projected compliance date.

Deliverability – Can the measure be delivered in the location involved with the powers available to the Local Authority.

4.6.2 SECONDARY CRITERIA

In addition to bringing forward compliance against the Limit Vales, the study contributes to the strategic priorities of the Welsh Government, including that of the Well-being of Future Generations (Wales) Act 2015. As such, the following were considered as secondary criteria in the appraisal process at Stage Three:

Will the measure deliver an overall reduction in NO₂ emissions to air?

This is a qualitative appraisal based on the likelihood of overall reduction to NO₂ resulting from the measure. This will enable the differentiation of measures which simply redistribute the impacts rather than seeking to reduce overall NO₂ emissions to air.

Will the measure result in unintended consequences or other environmental impacts?

This is a qualitative appraisal that considers whether there will be any other adverse environment impacts resulting from the measures. This will summarise the findings of the appraisal against the environmental aspects of well-being.

Will the measure contribute to well-being?

This is a qualitative appraisal which considers the seven goals of the Well-being of Future Generations (Wales) Act 2015, with the following criteria:

Will the measure impact equally across multiple vehicle classes and journey types?

Will the measure have a positive impact on wider public health and inequalities?

4.6.3 THE SEVEN WELL-BEING GOALS (FUTURE GENERATIONS FRAMEWORK)

This section aims to provide a summary to the well-being goals and has been used as part of a parallel appraisal process at Stage Three.

‘The well-being goals must be considered as an integrated set of seven, and the well-being objectives (considered above) should maximise contribution to all seven.’

Table 4-11 – The Seven Well-being Goals

Well-being Goal	Well-being Areas	Meeting goal at a Strategic Level	Designing our proposal
Prosperous	<p>Green growth, growing deprived business areas, social reasons for poor health, support to local communities and economy, environmental sustainability.</p> <p>Need for skills development, innovative economy and adapted to future change.</p> <p>Source materials locally and working with other public bodies in pursuit of shared goals.</p>	<p>Open opportunities for businesses and public goods production.</p> <p>Support the local supply chains and low-carbon sectors.</p> <p>Ways to address future needs.</p> <p>Push infrastructure provision in a sustainable innovative way.</p> <p>Have less resource intensive alternatives been looked at? Does the project propose a responsible solution in terms of ecological, financial and material resources?</p> <p>Consider the role of employment in reducing inequality.</p>	<p>How can negative impacts on the local economy be reduced?</p> <p>How can it support productivity?</p> <p>Can it be adapted to a changed Wales in the future.</p> <p>Thinking about the 'long-term' in the Ways of Working?</p> <p>What behaviours does this project encourage or discourage?</p> <p>How will this project help or impede people to live low-carbon lifestyles?</p> <p>How will the design of this project use resources efficiently and proportionately?</p> <p>Will this project create jobs in places with high levels of unemployment and underemployment?</p>
Resilient	Cohesive communities, need to adapt to environmental trends.	Enhance or reduce access to, and quality of, green and open spaces?	<p>How will this project protect and enhance ecosystems which support economic activity in Wales?</p> <p>How will this project directly impact ecosystems?</p>
Healthier	Unequal distribution of environmental problems.	Address the determinants of mental and physical health and well-being of people of all ages?	How will this project address the social, economic, environmental and cultural

	<p>Broader factors to physical and mental health; connectedness, good jobs, access to opportunities and services.</p> <p>Income inequalities, opportunities for active travel and exercise</p>		<p>determinants of health and well-being?</p> <p>Consider the Public Health Outcomes Framework.</p> <p>How will this project protect and improve local access to quality outdoor spaces for revival, restoration and exercise?</p>
More equal	<p>Creating vibrant culture; relationship between health and inequality; developing jobs and skills</p> <p>Need to involve local people meaningfully (refer to 'Involvement' under the Five Ways of Working)</p> <p>Improve education and tackling low pay.</p>	<p>Fairer society.</p> <p>Supporting disadvantaged groups in sustainable long-term ways.</p> <p>Ensure public resources and assets are not transferred to a small group of organisations or individuals</p>	<p>Where decisions are made and which groups have access to decision-makers?</p> <p>Is the area in priority need of investment?</p> <p>Will the scheme bring opportunity to deprived areas?</p> <p>Who benefits most from this? And who is negatively impacted. Can these impacts be avoided?</p> <p>Impacts on marginalised groups. Consult the Public-Sector Equality Duty</p> <p>Engagement with social enterprises, co-operatives and employee-owned businesses?</p>
Cohesive communities	<p>Attractive places to live, need for local jobs, opportunities to develop local arts, music and culture</p>	<p>How will this project support communities to be more cohesive, locally viable, well-connected, safe and attractive?</p>	<p>Impact on access to and availability of amenities?</p> <p>Long-term jobs creation.</p> <p>How will this project support local amenities and strengthen social relationships?</p>
Vibrant culture	<p>Employment provided by heritage sites, equal access to heritage.</p> <p>Building social ties to support activities for a lively public life.</p>	<p>How will this project contribute to a culturally vibrant Wales, recognising the potential direct and indirect impacts on Welsh</p>	<p>Opportunities are accessible to all, e.g. affordable, public transport accessible, have disability access.</p>

		communities and the Welsh language?	
Globally responsible	<p>Low-carbon economies and lifestyles. Proportionate uses of resources. Understanding the impact of our own lifestyle on the rest of the world.</p> <p>Reducing greenhouse gas emissions both in production and use.</p>	<p>Global leadership or innovation.</p> <p>Follow national or international innovative models?</p> <p>How can greenhouse gas emissions be brought down?</p> <p>Build on the best practice in sustainability.</p>	<p>What Wales is bringing in from the rest of the world?</p> <p>e.g. sustainable purchasing, Fairtrade, global supply chains.</p> <p>What Wales is putting out into the world based on our unique qualities?</p> <p>e.g. low-carbon technology, sustainable developing, positive example on infrastructure projects.</p>

<https://futuregenerations.wales/wp-content/uploads/2018/11/FGCW-Framework.pdf> p12-p25

4.6.4 OTHER ISSUES

Further potential issues with each measure have been explored and considered accordingly in the instance that they have not been covered under any of the other appraisal areas. These include:

Overall Acceptability

A qualitative appraisal has been undertaken in order to assess the receptivity of the public, local authorities and key stakeholders, both groups and individuals to the measure. The appraisal has been undertaken on a measure by measure basis.

Technical, Operational and Financial Feasibility

Where appropriate a qualitative appraisal has been undertaken to assess measures on the following criteria:

- Technical: The extent to which the measure is technically feasible within the specified budget and timeframe
- Operational: The extent to which the measure is operationally feasible within the specified budget and timeframe
- Financial: The extent to which the measure is financially feasible

Deliverability and Risk

At this stage issues regarding deliverability and risk have been taken into consideration. This has been included as part of the Appraisal Summary Tables at WeITAG Stage Three.

4.6.5 IMPACT DISTRIBUTIONAL ANALYSIS (IDA)

4.6.5.1 Air quality: Summary

Traffic management measures result in small changes to NO₂ concentrations relative to other measures. The impact of these measures across the wider population is therefore negligible. The impact of the demolition measure is very localised to the one road link under consideration. Therefore, the impact across the wider population is also negligible.

The CAZ Class D²⁰ and HGV peak period ban have wider spatial impacts on NO₂ concentrations and thus, the results of the distributional analysis are based on a larger, regional domain. A CAZ Class D would reduce average concentrations by almost 0.35 µg/m³ compared to baseline for 2021 across the entire regional domain, whereas a HGV Ban will only reduce it by 0.018 µg/m³. A HGV ban would cause potential winners and losers as some areas see an increase in air pollution due to re-routing of traffic, but this effect is not observed for the CAZ Class D which only sees reductions in concentrations across all LSOAs and therefore only winners.

For these scenarios (CAZ Class D and HGV Ban) a quintile analysis following WelTAG guidance was carried out in relation to household income and children population. Across both scenarios and against both vulnerable characteristics, this analysis suggests there will be no distributional pattern to the effects, either regressive or progressive. That said it is interesting to note that for the HGV Ban the least deprived quintile will not achieve a benefit in proportion to its population, as other quintiles do (hinting at a potential progressive effect). However, this WelTAG analysis only takes into account the numbers of winners and losers, and does not account for the relative size of the win or loss. When we assess average change in concentration by quintile, under both the HGV ban and CAZ option greater reductions in pollutants accrue to the least deprived areas (no trend is observed for children). This suggests in fact that both options may have a marginal regressive impact.

Table 4-12 – IDA for Air Quality

CAZ	Scenario	Direct distributional impacts
1	Change Signal Timings at Crumlin Junction	No distributional impact because the change in emissions is localised.
2	Signalise the A472/B4471 Swyffryd Junction and introduce an eastbound queue detector	No distributional impact because the change in emissions is localised.
3	Demolish Dwellings at Woodside Terrace	No distributional impact because the change in emissions is localised.
4	Peak Period HGV Bans AM & PM	Reduce average concentrations within the regional domain by 0.018 µg/m ³ compared to baseline for 2021 Potential winners and losers as concentrations increase in other areas due to re-routing

²⁰ CAZ Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards

		<p>No distributional impact is observed from the quintile analysis counting winners and losers</p> <p>Highest positive relative changes in reduction of NO₂ concentrations in areas with least deprived population</p> <p>Sensitive receptors within the CAZ domain will benefit from a decrease in NO₂ concentrations</p>
5	CAZ Class D with behavioural response	<p>Reduce average concentrations within the regional domain by almost 0.35 µg/m³ compared to baseline for 2021</p> <p>No distributional impact is observed from the quintile analysis counting winners and losers</p> <p>Highest positive relative changes in reduction of NO₂ concentrations in areas with least deprived population</p> <p>Sensitive receptors within the CAZ domain will benefit from a decrease in NO₂ concentrations.</p>
6	Traffic Management Option (Scenario 1,2)	No distributional impact because the change in emissions is localised.
7	Do Maximum (Scenario 1,2,5)	<p>No distributional impact is observed from the quintile analysis counting winners and losers</p> <p>Highest positive relative changes in reduction of NO₂ concentrations in areas with least deprived population</p> <p>Sensitive receptors within the CAZ domain will benefit from a decrease in NO₂ concentrations.</p>

Note: Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards

4.6.5.2 Affordability for businesses: Summary

The traffic management options will only have very marginal impacts on businesses. Short-term negative impacts due to roadblocks related to construction works would be followed by long-term direct positive impact on businesses due to the improvement in access to/from affected business locations. Option S3 is not likely to impact on affordability for businesses. Further indirect positive impact may arise due to cost decreases for deliveries and easier access for customers and employees.

The HGV Ban and CAZ would have much greater and negative impacts. The extent to which businesses will be affected by either a CAZ Class D²¹ or a HGV ban during peak hour will depend on the type of business, its location, size and price sensitivity. Most of the actions that businesses can take to respond to the policy option will incur costs, which will place an additional burden on the business. Where these burdens are significant, businesses could choose to scale down operations, re-locate or even close altogether with a consequent impact on local employment and economic activity. CAZ Class D will also impact:

- taxi drivers, who are among the lower income households in society

²¹ Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards

- buses, with a potential reduction or removal of services to marginal areas
- cars, and hence commuters and other businesses that use cars for their business travel.

Smaller firms and sole traders are usually more price sensitive and therefore are likely to be the most affected if these policy options are in place: smaller businesses tend to operate older vehicles and cannot redistribute their fleets. At the same time, LGVs (also affected under the CAZ) are predominantly used by small businesses such as self-employed tradesmen. Any additional cost in relation to owning and operating LGVs, would impose a strain on these businesses.

These results align with the outcomes from the consultation undertaken by CCBC during January 2019. Almost all businesses felt suppliers or customers would be affected by the proposed restrictive options. Most businesses felt restricting access to vehicles along the A472 would have a negative or very negative impact on their operations. The majority stated that the proposed pricing for vehicles entering the proposed CAZ Class D was too high. Most businesses would re-route their journeys, and a significant number of businesses stated they would relocate their business. Furthermore, across the 20 firms from the sample, about 300 employees would be affected in their commute. Most popular steps business had already taken to reduce air pollution included alternative transport/work arrangements and the purchase of ULEV vehicles. A summary of the main findings for the IDA on business is shown below in Table 4-13 – IDA for businesses and their direct/indirect impacts.

Table 4-13 – IDA for businesses and their direct/indirect impacts

CAZ	Scenario	Direct impacts	Indirect impacts	IDA
1	Change Signal Timings at Crumlin Junction	Improvement in access to/from affected business locations	Cost decreases for deliveries Easier access for customers, employees	+
2	Signalise the A472/B4471 Swyffryd Junction and introduce an eastbound queue detector	Improvement in access to/from affected business locations	Cost decreases for deliveries Easier access for customers, employees	+
3	Demolish Dwellings at Woodside Terrace	Roadblocks due to site work		-
4	Peak Period HGV Bans AM & PM	Displacement or delays of deliveries via HGVs to/from affected businesses during peak periods: requires businesses to shift movements outside peak times Reduced response options.	Increased congestion on alternate routes Costs incurred to change transport modes Increased costs of deliveries Negative competitiveness impacts and potential loss of customers Potential relocation of severely affected firms	--
5	CAZ Class D* with behavioural response	Costs incurred by some businesses to upgrade fleets to comply. - CAZ generally tends to affect smaller firms most as they operate older vehicles / cannot redistribute their fleets. Costs incurred by businesses/ customers/ employees for access to business and deliveries. CAZ impacts vehicle movements other than HGVs: Taxi drivers, public transport	Increased congestion on alternate routes Potential relocation of affected businesses Potential loss of competitiveness for some affected businesses. Within CAZ zone: reduction in demand as fewer individuals are able or willing to travel along the A472.	---

		<p>providers, commuters and car business trips. In particular:</p> <ul style="list-style-type: none"> - CAZ will impact LGVs, which are commonly used by smaller businesses / tradesmen hence larger impact on smaller businesses. - CAZ will impact on cars, and hence commuters and other businesses that use cars. - CAZ will impact on buses that could reduce or remove services to marginal areas. Costs incurred by operators will impact public transport fares. - CAZ will impact on taxi drivers, who are amongst lowest income households in society. 	Potential effect on supply chains.	
6	Traffic Management Option (Scenario 1,2)	See 1 and 2	See 1 and 2	+
7	Do Maximum (Scenario 1,2,5)	See 1, 2 and 5	See 1, 2 and 5	- - -

Note: Large beneficial (+++); Moderate beneficial (++); Slight beneficial (+); Neutral (0); Slight adverse (-); Moderate adverse (- -); and Large adverse (- - -)

*Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards

4.6.5.3 Affordability for households: summary

Traffic management options will have minor impacts on households as there is no direct impact on income or expenditure and the only impact is on traffic flow. This could lead to potentially beneficial indirect impacts on their fuel costs and travel times. A HGV ban may have an indirect impact on households due to the behavioural response of businesses and thus wider employment and supply chains supporting Caerphilly. Demolition would have very high impact on dwelling owners and households living in the dwellings as well as some indirect impact on the households living nearby due to the demolition works. Given the indirect nature of the effect of these options, it is difficult to isolate any distributional effect.

A CAZ Class D²² will have a direct, negative impact on households, in particular to those with non-compliant cars. WelTAG analysis suggests middle income households could suffer the most (as they make the most non-compliant trips to the CAZ) and high-income households the least (lowest number of non-compliant trips). Non-compliant vehicles are mostly located in the northern part of the IDA domain as well as the eastern areas. That said, it is important to note that this analysis does not capture that the same cost has a greater proportional impact on lower income households. So even though it appears there will be a lower cost burden on the most deprived quintiles, there could still be a greater impact proportionally relative to their disposable income.

²² Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards



Furthermore, there are sensitive receptors located within the CAZ area (nursery and nursing homes) which suggests there will be some impact on their vulnerable users and accessibility both for employees, suppliers and visitors.

Table 4-14 – IDA for households and their direct/indirect impacts

CAZ	Scenario	Direct impacts	Indirect impacts	IDA
1	Change Signal Timings at Crumlin Junction	No distributional impact as there is no financial impact on households	Change in location of queuing traffic Potential changes in fuel costs due to reduction of commuting times and traffic	+
2	Signalise the A472/B4471 Swyffryd Junction and introduce an eastbound queue detector	No distributional impact as there is no financial impact on households	Change in location of queuing traffic Potential changes in fuel costs due to reduction of commuting times and traffic	+
3	Demolish Dwellings at Woodside Terrace	Direct impact on households living in affected dwellings: - There is a financial compensation from the house demolished - Households relocated will encounter cost of new house and cost of moving Larger impact on households living / owning the affected dwellings	Indirect impact on households living nearby during demolition works.	-
4	Peak Period HGV Bans AM & PM	Indirect impact on households from rerouting of business supply chain, re-location, etc.	Potential impact on employment and household earnings	-
5	CAZ Class D* with behavioural response	Negative direct impact on households using non-compliant cars to work or generally travel to the CAZ area Potential larger impacts on the poorest population as they in majority own non-compliant cars. Also lower costs could still represent a higher proportional cost to more deprived households	Indirect negative impact through taxis/ coaches/ buses potentially passing on costs Potential impact on older population or those with disabilities most likely to use taxis as well as younger and poorer residents using buses/coaches to travel	- -
6	Traffic Management Option (Scenario 1,2)	No distributional impact as there is no financial impact on households	Change in location of queuing traffic Potential changes in fuel costs due to reduction of commuting times and traffic	+
7	Do Maximum (Scenario 1,2,5)	Negative direct impact on households using non-compliant cars to work or generally travel to the CAZ area Potential larger impacts on the poorest population as they in majority own non-compliant cars. Also lower costs could still represent a higher proportional cost to more deprived households	Indirect negative impact through taxis/ coaches/ buses potentially passing on costs Potential impact on older population or those with disabilities most likely to use taxis as well as younger and poorer residents using buses/coaches to travel	- -

Note: Large beneficial (+++); Moderate beneficial (++); Slight beneficial (+); Neutral (0); Slight adverse (-); Moderate adverse (- -); and Large adverse (- - -).

*Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards

4.6.6 HEALTH IMPACT ASSESSMENT SUMMARY

A comprehensive Health Impact Assessment (HIA) was undertaken to assess the potential impact of proposed policy scenarios on Caerphilly residents. Impacts were tested through five pathways: prevalence of physical conditions such as respiratory and cardiovascular conditions associated with air pollutant exposure, active travel uptake, road accidents, noise pollution and mental wellbeing. For context, Hafodyrynys is located within the scope of the Caerphilly East GP Cluster, which is home to an increasingly aging population. In addition, a high proportion of individuals in this Cluster live in areas which fall into the most (lowest quintile), or second most (second lowest quintile), deprived areas in Wales. In these areas, the prevalence of depression is some of the highest in the county of Gwent (8.7%)²³. Therefore, the population is particularly vulnerable to the adverse impacts of worsening air quality.

Considering the overall air quality impact across the modelled domain, the HGV ban, Class D²⁴ CAZ and 'do maximum' scenarios appear to deliver the largest reductions in NO₂ concentrations in the area immediately around the specific link²⁵. Hence, these options are likely to deliver the greatest improvement in health through reductions in air pollution for local residents. The traffic signals options do not achieve such significant reductions in air pollutant concentrations and hence the associated health impacts are also less significant for local residents. While the demolition option does not reduce emissions of NO_x, dispersion is improved and hence concentrations on the road and footpaths decrease. This will bring a health benefit to motorists and pedestrians. In addition, there will also be potential benefits for displaced households who have reduced exposure from their move away from this area of high pollution, although the net impact will depend on the levels of air pollution in the areas to which displaced residents move.

Although there will be improvements in health associated with reduced air pollution along the link in question, some options will also have impacts outside this area: where vehicles upgrade in response to the CAZ, this could deliver air pollution benefits outside the CAZ. However, where vehicles re-route in response to the charging zone and the HGV ban option, this will result in worsening air quality elsewhere, and therefore, exacerbate health impacts in surrounding locations.

²³ Note: the impacts on air quality presented here are different in nature to those presented in the rest of this document (in particular comparing the performance of options to limit values). To assess compliance, impacts on air quality are judged at individual receptor locations on the specific link against the legal limit. Health impacts are associated with the more general change in air pollution – hence to inform this analysis, we look at a more aggregate change in air pollution (averaging across a number of receptor points and the whole air quality modelling domain) and consider the overall absolute change, rather than the shift relative to a given benchmark.

²⁴ Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards

²⁵ Note: the impacts on air quality presented here are different in nature to those presented in the rest of this document (in particular comparing the performance of options to limit values). To assess compliance, impacts on air quality are judged at individual receptor locations on the specific link against the legal limit. Health impacts are associated with the more general change in air pollution – hence to inform this analysis, we look at a more aggregate change in air pollution (averaging across a number of receptor points and the whole air quality modelling domain) and consider the overall absolute change, rather than the shift relative to a given benchmark.

In regard to noise pollution, assessment by WSP suggests that all of the policy scenarios will engender minimal impact on noise pollution. The demolishing of houses and the alteration of signals at Crumlin Junction will have a neutral impact (although demolition could reduce exposure for displaced residents to noise from the link, the net impact depends on noise levels at the area they move to). The remaining scenarios will result in slight adverse or positive impacts, yet the magnitude of impacts remains negligible. Hence, there will be no significant impacts on health through changes in noise.

It is also important to consider the impact of policy scenarios on mental health. The HGV ban and CAZ scenarios could have a significant impact on mental wellbeing, through placing a cost on businesses. In response, businesses may alter/cancel journeys or potentially relocate their businesses, which could have negative knock on effects to employment in the local area, and associated wellbeing effects. In addition, a Class D²⁶ CAZ will result in costs to households, as private vehicles are incorporated within the charging scheme. This results in an additional strain on households, in particular poorer households who tend to own older cars and for whom additional costs may comprise a greater proportion of their disposable income.

In regard to changes in accident levels, there is greater disparity between policy scenarios. For the policy scenarios relating to the alteration of signals, the assumed zero impact on traffic flow translates to negligible impact on accident levels. However, the HGV ban and CAZ scenarios could have a greater influence on accident risk due to traffic re-routing to avoid the link. These options are expected to cause a positive impact on local accident levels, due to the reduction in the volume of vehicles on the A472 (some re-routing is observed in response to these options in the transport model). However, the re-routing of journeys around the zone could result in an increase in accident risk in surrounding areas – the net effect will depend on the areas to which traffic re-routes and whether these are residential areas (no clear pattern of where traffic re-routes to could be drawn from the transport model). That said, overall there is little change in flow observed in the transport model, suggesting that any change or shifting of accident risk could be negligible.

The CAZ scenarios could engender a modal shift, through encouraging individuals to take-up cycling and walking in replacement of vehicles, to avoid the costs associated with upgrading vehicles, paying to enter the zone or cancelling journeys. This presents both an additional benefit, through the impacts of exercise on health, but also an additional risk (as cyclists are at greater risk than those travelling via car). However, the level of impact will depend on the level of uptake, which is uncertain and will depend on the feasibility of vehicle owners switching to active travel, which in turn will depend on a range of factors (e.g. overall journey length and time, individual fitness, etc). Given that the route would not meet the Wales Active Travel Design Guide, it is not included on Caerphilly's Integrated Network Map and given topography, it is unlikely that these impacts will be significant. The remaining scenarios are expected to have negligible impact on active travel uptake, and therefore, minimal impact on the associated benefits to physical health from increasing exercise levels.

²⁶ Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards

In conclusion, the demolition option is expected to result in the greatest impacts on health and with moving to a low pollution area will bring positive health benefits in terms of reduced exposure to air pollution, noise and accident risk. Traffic management options will have marginal positive impacts on health through improved air quality. A CAZ and HGV ban is likely to have a net negative impact on health, as detrimental mental health impacts through the potential impacts on business and employment could outweigh any net improvements in air quality and accident risk. Table 4-15 provides a summary of the health impacts assessed.

Table 4-15 – Summary of health impacts

Option ID	Short ref.	Air quality	Noise	Accidents	Active travel	Mental health
1	Crumlin Junction Signals	✓	-	-	-	-
2	Signalise Swyffryd Junction	✓	-	-	-	-
3	Demolish Dwellings	✓	-	-	-	✘
4	HGV Ban	✓/✘	-	✓/✘	-	✘✘
5	CAZ Class D*	✓✓/✘	-	✓/✘	-	✘✘
6	Traffic Management Option	✓	-	-	-	-
7	Do Max	✓✓/✘	-	✓/✘	-	✘✘

Key: ✓✓ = strong positive impact, ✓ = positive impact, '-' = no significant impact, '✓/✘' = positive and negative impacts, ✘ = negative impacts, ✘✘ = strong negative impacts

*Class D - Buses, coaches, taxis, PHVs, HGVs LGVs and cars where all petrol vehicles should comply with at least Euro 4 and all diesel vehicles Euro 6 emission standards

4.7 STAGE THREE APPRAISAL

For Stage Three of the study, the appraisal outcomes have been summarised as follows:

- Air Quality Impacts
 - The modelling indicates that the NO₂ limit value can be met in 2025 without local action- though this is contingent on later iterations of Euro standards delivering predicted NO_x emission reductions.
 - The baseline in 2021 does not comply with the annual mean NO₂ limit value.
 - The demolition option with footpath realignment in 2021 does comply with the annual mean NO₂ limit value at relevant locations.
 - It can be clearly seen that demolition reduces concentrations in the canyon, most likely due to the reduction in recirculation of emissions.
 - The HGV ban option in 2021 does not comply with the annual mean NO₂ limit value.
 - The CAZ option has a large effect on NO₂ concentrations which reduce by 40-50% in the modelled corridor. This is primarily due to the effect of Euro 6/VI type vehicle with lower emissions in the fleet. The CAZ option in the modelled 2021 future year is predicted to comply with the annual mean NO₂ standard. However, it is not possible to be fully implemented until 2026.

- For all other options including changing signal timings at Crumlin junction and signalise the A472/B4471 Swyffryd Junction reductions in annual average NO₂ was negligible. Results are presented in the Impact Assessment Report.
 - Greatest health benefits are likely from the demolition option as physical health including respiratory and cardiovascular impacts from high pollution are likely to decline from residents moving to a lower pollution area. The CAZ and HGV ban are likely to have negative economic impacts on local businesses and households which could have a negative impact on mental health. Both CAZ and HGV options are likely to cause re-routing resulting in an overall increase of emissions, and with the potential to result on exceedances with the limit value elsewhere. The HIA and Distributional Analysis has identified unacceptable adverse impacts resulting from this option given the lack of alternate route choice on this part of the local highway.
- Overall Impacts
 - Appraisal against Future Generations Well-being objectives
 - Appraisal Summary Tables (ASTs)

4.7.1 APPRAISAL FUTURE GENERATIONS WELL-BEING OBJECTIVES

The options have been considered against the Well-being of Future Generations Act. These are presented in the ASTs.

4.8 APPRAISAL SUMMARY TABLES

The appraisal outcomes have been summarised within Appraisal Summary Tables (AST). The ASTs provide a breakdown of the impact of each measure on each of the appraisal areas. The scoring has been undertaken using the WelTAG 7-point scale where applicable.

Name of scheme:	Change Signal Timings at Crumlin Junction
Location:	Crumlin Junction
Effectiveness:	Ineffective
Timescale:	2020
Feasibility:	Yes. Road network is managed by CCBC Highways Operations Department.

Objective		Summary of key impacts	Assessment
			Qualitative
Environment	Air Quality	For this option the reductions in annual average NO2 are negligible. This option scores as neutral for the air quality.	Neutral (0)
	Noise	<p>Receptor The closest sensitive receptors are at Woodside Terrace, situated in NAPPA 619 mid-way up Hafodyrynys Road (A472). A number of elevated receptors on Gladstone Road also overlook the A472 and a housing estate is situated approximately 100m to the north of the A472.</p> <p>Absolute Noise Levels With the implementation of infrastructure changes, noise levels at Woodside Terrace are still predicted to exceed 68dB LA10,18h. Noise levels were measured in 2014 and found to be 76dB LA10,18h at 10m distance from the road.</p> <p>Noise Impact At Woodside Terrace short term impacts are predicted to be negligible at source, long term impacts are seen to be negligible, but with a slight decrease in noise levels of less than a 1dB; this trend is seen across the network.</p>	Neutral (0)
	Landscape	Alterations to signal timings at Crumlin Junction would manipulate the flow of traffic approaching from the A472, but this would have a negligible effect on the wider impacts imposed by the busy transit corridor.	Neutral (0)
	Historic Environment	There will be no appreciable impacts, either positive or negative, on any Grade II* and Grade II Listed Buildings or their context. The option will not result in severance or loss of integrity, context or understanding of the Listed Buildings within the historic landscape. There will be no appreciable impacts, either positive or negative, on non-designated heritage assets or the historic landscape.	Neutral (0)
	Biodiversity	This option is unlikely to lead to any significant effects on biodiversity due to the lack of landtake, and produce no impact on ecology due to the lack of vegetation clearance and works confined within the hard estate.	Neutral (0)
	Water Environment	No predicted adverse effects to the water environment. Slight increase in AADT traffic flows predicted for this option but far below typical threshold value of 20% to cause notable increase of pollution risk to receiving watercourses.	Neutral (0)
Economy	Journey Time Changes	This option sees an immediate increase in travel time of vehicles in 2021, especially as result of travel delay on the A467 due to the signal timings. Furthermore, the option sees a reduction in the travel time for 2029. Overall there is a negative impact on journey time with an increase of 13.5 hours of travel time (in total during the AM peak) for the vehicles operating on the network. However, due to the small change in travel time per vehicle, and the fact that only the morning peak is impacted, it is expected to have a neutral impact on the overall journey time.	Neutral (0)
	Journey Time Reliability Changes	This option sees a slight benefit to the journey time reliability as it may reduce the EB queuing vehicles on the A472 Hafodyrynys Road in the AM peak especially, through changes to the signal timings.	Slight Beneficial (+)
	Transport Costs	Monetary costs paid by those travelling e.g. vehicle operating costs and tolls. Vehicle operating costs include fuel and non-fuel operating costs. Given the small scale of change on the network, these impacts are minimal. The TUBA estimates the impact as £47,000 of benefit over the 60 year appraisal period.	Neutral (0)
	Accidents	Accident savings are neutral across this option because of the little to no impact which it will have on the layout of the road network.	Neutral (0)
	Changes in Productivity	This option is not expected to impact upon productivity.	Neutral (0)
	Local Economy	This option is not expected to impact upon the local economy.	Neutral (0)
	Land	It is anticipated that this option can be accommodated within the verge of current road system. This is not anticipated to have any requirements for additional land.	Neutral (0)
	Capital Costs	The costs for this option have been calculated and include a 44% Optimism Bias	£ 7,200.00
	Revenue Costs	None	Neutral (0)
Physical Activity	Journey Quality	Changing signal timings is not envisaged to have an impact on the journey quality and, therefore, the journey quality is considered to be neutral.	Neutral (0)
	Physical Activity	Signal timing modifications are unlikely to impact on physical activity along the study route. Therefore, it is considered that the impact will be neutral.	Neutral (0)

S&C	Security	This scheme is unlikely to have an impact on the security of carriageway users at this location	Neutral (0)
	Access to Employment	Changes to signal timing are not expected to impact on access to employment along the study route. Therefore, it is considered that the impact will be neutral.	Neutral (0)
	Access to Services	Changes to signal timing are not expected to impact on access to services along the study route. Therefore, it is considered that the impact will be neutral.	Neutral (0)
	Affordability	This option is unlikely to lead to a local change in user class or impact on costs of transport.	Neutral (0)
	Severance	This option will not have an impact on severance	Neutral (0)
VfM	Value for Money	10 Years - PVB = -£707,000 PVC = £7,000 NPV = -£714,000 60 Years - PVB = £1,108,000 PVC = £7,000 NPV = £1,101,000	BCR 10 years -101.0 60 years 158.3
Other Issues	Acceptability	Given the nature of the proposals, this measure is unlikely to be opposed by any groups or individuals.	
	Technical, Operational & Financial Feasibility	None identified at this stage.	
	Deliverability & Risk	This option will have minimal cost as the option is an existing signalised junction with only timings being changed.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	It is considered that this measure should have minimal impact on overall reduction in NO2	
	Will the intervention result in unintended consequences or other environmental impacts	No. There are no adverse consequences to other environmental impacts.	
	Will the intervention impact equally across multiple vehicle classes and journey types	Yes. This scheme should have an equal impact on all vehicle classes and journey types.	
	Will the intervention have a positive impact on wider public health and inequalities	Yes. It is considered that this measure should marginally improve the wider public health.	
Future Generations 7 Well-being goals	Prosperous	This option is likely to have a neutral impact to business activity and slightly influence business movements.	0
	Resilient	This option requires minimal amount of resources for implementation. However, the measures directly impact on the ecosystem is not measurable and scores as neutral for this option	0
	Healthier	This option is likely to have a neutral impact to the health of the local communities.	0
	More Equal	This option is unlikely to have an impact on anything associated with "more equal" objective.	0
	Cohesive Communities	This option is unlikely to influence areas that make cohesive communities and scores as neutral for this goal.	0
	Vibrant Culture	This option is not likely to influence areas that make a vibrant culture and scores as neutral for this goal.	0
	Globally Responsible	This option scores as neutral for as it does not directly impact on areas such as sustainable purchasing, global supply chains or low-carbon technologies.	0

Appraisal Summary Table

Option No. / Theme

2

Name of scheme:	Signalise the A472/B4471 Swyffryd Junction and introduce an eastbound queue detector
Location:	A472 Hafodyrynys Road / B4471 Swyffryd Junction
Effectiveness:	Ineffective
Timescale:	2021
Feasibility:	Yes. Road network is managed by CCBC Highways Operations Department.

	Objective	Summary of key impacts	Assessment
			Qualitative
Environment	Air Quality	For this option the reductions in annual average NO2 are negligible. This option scores as neutral for air quality.	Neutral (0)
	Noise	<p>Receptors The closest sensitive receptors are at Woodside Terrace, situated in NAPPA 619 mid-way up Hafodyrynys Road (A472). A number of elevated receptors on Gladstone Road also overlook the A472 and a housing estate is situated approximately 100m to the north of the A472.</p> <p>Absolute Noise Levels With the implementation of infrastructure changes, noise levels at Woodside Terrace are still predicted to exceed 68dB LA10,18h. Noise levels were measured in 2014 and found to be 76dB LA10,18h at 10m distance from the road.</p> <p>Noise Impact At Woodside Terrace short term impacts are predicted to be negligible at source, long term impacts are also seen to be negligible, but with a slight increase in noise levels of less than a 1dB; this trend is seen across the network.</p> <p>The design drawings indicate a new lane at the A472/B4471 Swyffryd Junction, causing the road to be brought approximately 3.5m closer to pond villa; this could result in a slight increase in noise levels as vehicles accelerate away from the junction.</p>	Neutral (0)
	Landscape	Introducing traffic signals at the A472/B4471 Junction would manipulate the flow of traffic along the A472, resulting in some standing traffic where not previously experienced. These impacts would have a negligible effect on the wider/existing impacts imposed by the busy transit corridor.	Neutral (0)
	Historic Environment	There will be no appreciable impacts, either positive or negative, on any Grade II* and Grade II Listed Buildings or their context. The option will not result in severance or loss of integrity, context or understanding of the Listed Buildings within the historic landscape. There will be no appreciable impacts, either positive or negative, on non-designated heritage assets or the historic landscape.	Neutral (0)
	Biodiversity	This option is unlikely to lead to any significant effects on biodiversity due to the minimal landtake and construction footprint, largely confined to existing areas of hardstanding.	Neutral (0)
	Water Environment	No predicted adverse effects to the water environment. Slight increase in AADT traffic flows predicted for this option but far below typical threshold value of 20% to cause notable increase of pollution risk to receiving watercourses.	Neutral (0)
	Economy	Journey Time Changes	This option sees an immediate decrease in travel time in 2021, with a higher reduction for 2029. Overall this option results in 180 hours of time savings in total across all modelled peaks, with a moderate benefit associated to the journey time change.
Journey Time Reliability Changes		This option sees a slight benefit to the journey time reliability as it improves traffic flow through the A472 Hafodyrynys Road and Swyffryd Junction, through signalisation of this junction.	Slight Beneficial (+)
Transport Costs		Monetary costs paid by those travelling e.g. vehicle operating costs and tolls. Vehicle operating costs include fuel and non-fuel operating costs. Given the small scale of change on the network, these impacts are minimal. The TUBA estimates the impact as £2,228,000 of benefit over the 60 year appraisal period.	Moderate Beneficial (++)
Accidents		For Option 2, an accident appraisal was carried out using accident data over a four-and-a-half-year period from the 1st January 2014 to the 30th June 2018 (https://gov.wales/statistics-and-research/police-recorded-road-casualties/?tab=data&lang=en). A total of 22 accidents occurred on the road network over these five years, 6 serious and 16 slight. These accidents were then filtered down to the area which will be affected by the implementation of the signal junction. Over the four-and-a-half-year period, one serious accident has occurred in the vicinity of the junction. As the traffic around the junction will have a reduced speed, it is assumed that this accident would be downgraded to a rear-end collision/shunt with the possibility that it is removed completely from the recorded accidents on the network. This is a saving of 0.2 serious accidents per year, costed at £243,645 (https://www.gov.uk/government/statistical-data-sets/ras60-average-value-of-preventing-road-accidents) per serious accident which is a monetary saving of £54,141 per year.	Moderate Beneficial (++)
Changes in Productivity		This option is not expected to impact upon productivity.	Neutral (0)
Local Economy		This option is not expected to impact upon the local economy.	Neutral (0)
Land		It is anticipated that this option can be accommodated within the verge of current road system. This is not anticipated to have any requirements for additional land.	Neutral (0)

	Capital Costs	The costs for this option have been calculated and include a 44% Optimism Bias	£ 487,243.57
	Revenue Costs	None	Neutral (0)
S&C	Journey Quality	Installing a new signalling scheme at the A472/B4471 junction is not envisaged to have an impact on the journey quality and, therefore, the impact is considered to be neutral.	Neutral (0)
	Physical Activity	Installing the new signalling at the A472/B4471 junction is unlikely to impact on physical activity along the study route. Therefore, it is considered that the impact will be neutral.	Neutral (0)
	Security	As the signals are not within a site of concern (associated with crime), the security impact is considered to be neutral	Neutral (0)
	Access to Employment	Signalising the A472/B4471 junction is expected to slightly benefit the access to employment along the study route by improving the flow of traffic. Therefore, it is considered that the impact will be slightly beneficial.	Slight Beneficial (+)
	Access to Services	Signalising the A472/B4471 junction is expected to slightly benefit the access to services along the study route by improving the flow of traffic. Therefore, it is considered that the impact will be slightly beneficial.	Slight Beneficial (+)
	Affordability	This option is unlikely to lead to a local change in user class or impact on costs of transport.	Neutral (0)
	Severance	This option will not have an impact on severance	Neutral (0)
VfM	Value for Money	10 Years - PVB = £7,214,000 PVC = £475,000 NPV = £6,739,000 60 Years - PVB = £46,359,000 PVC = £490,000 NPV = £45,869,000	BCR 10 years 15.2 60 years 94.6
Other Issues	Acceptability	Given the nature of the proposals, this measure is unlikely to be opposed by any groups or individuals.	
	Technical, Operational & Financial Feasibility	None identified at this stage.	
	Deliverability & Risk	This option will need to be properly signed as a new junction layout to avoid traffic accidents.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	It is considered that this measure should have minimal impact on overall reduction in NO2	
	Will the intervention result in unintended consequences or other environmental impacts	No. There are no adverse consequences to other environmental impacts.	
	Will the intervention impact equally across multiple vehicle classes and journey types	Yes. This scheme should have an equal impact on all vehicle classes and journey types.	
	Will the intervention have a positive impact on wider public health and inequalities	Yes. It is considered that this measure should marginally improve the wider public health.	
Future Generations 7 Well-being goals	Prosperous	This option is likely to have a neutral impact to business activity and slightly influence business movements.	0
	Resilient	This option requires a minimal amount of resources for implementation. The measure is likely to assist in a more consistent flow in traffic, in comparison to the existing queues.	+1
	Healthier	This option is likely to have a neutral impact to the health of the local communities.	0
	More Equal	This option is unlikely to have an impact on anything associated with "more equal" objective.	0
	Cohesive Communities	This option is unlikely to influence areas that make cohesive communities and scores as neutral for this goal.	0
	Vibrant Culture	This option is not likely to influence areas that make a vibrant culture and scores as neutral for this goal.	0
	Globally Responsible	This measure complies with the 'globally responsible' objective by reducing green house gas emissions, and providing a positive example of how infrastructure projects can integrate and promote wider well-being.	+1

Appraisal Summary Table

Option No. / Theme

3

Name of scheme:	Demolish Dwellings at Woodside Terrace
Location:	A472 Hafodyrnys Road
Effectiveness:	High
Timescale:	2023 (Implementation will be moved forward if CPO is not contested)
Feasibility:	Yes. Subject to the CCBC's ability to enforce the Compulsory Purchase Order. A topological survey needs to be undertaken and is required for this option.

Objective		Summary of key impacts	Assessment
			Qualitative
Environment	Air Quality	The demolition option with footpath realignment in 2021 does comply with the annual mean NO2 standard at relevant locations. It should be noted that the compliance status is extremely marginal and in many cases is smaller than the error in the model. It can be clearly seen that demolition reduces concentrations in the canyon, most likely due to the reduction in recirculation of emissions.	Large Beneficial (+++)
	Noise	<p>Receptors The closest sensitive receptors are now the elevated receptors on Gladstone Road overlooking the A472 and a housing estate is situated approximately 100m to the north of the A472.</p> <p>Absolute Noise Levels With dwellings at Woodside Terrace demolished, the total dwellings within the NAPPA would decrease, however noise levels would still exceed 68dB LA10,18h at remaining dwellings to the north. The A472 is anticipated to remain in the same alignment. Noise levels were measured in 2014 and found to be 76dB LA10,18h at 10m distance from the road.</p> <p>Noise Impact If all the dwellings within the NAPPA are removed it would remove the need for this NAPPA; however, demolishing dwellings to the south would result in the NAPPA remaining, but with less dwellings than before.</p>	Neutral (0)
	Landscape	The demolition of dwellings at Woodside Terrace and re-alignment of footpath would expose the study area to a moderate value and locally designated landscapes in the south, and this would result in a slight adverse effect.	Slight adverse (-)
	Historic Environment	There will be no appreciable impacts, either positive or negative, on any Grade II* and Grade II Listed Buildings or their context. The option will not result in severance or loss of integrity, context or understanding of the Listed Buildings within the historic landscape. There will be no appreciable impacts, either positive or negative, on non-designated heritage assets or the historic landscape.	Neutral (0)
	Biodiversity	This could generate slight adverse impacts to the local ecology due to the need for vegetation clearance and landscaping near a river and the requirement to demolish buildings with high suitability to support roosting bats. The appropriate surveys will be carried out.	Slight adverse (-)
	Water Environment	No predicted adverse effects to the water environment. No increase to the AADT flows are expected for this option. Demolition works could cause short term impact in ordinary watercourse but of insufficient magnitude to affect its integrity and with no long term effects expected.	Neutral (0)
Economy	Journey Time Changes	The journey time changes for this option are neutral because of the little to no impact which it will have on the layout of the road network. It is expected to have a neutral impact on the overall journey time.	Neutral (0)
	Journey Time Reliability Changes	This option sees a neutral benefit to the journey time reliability as the option does not include any changes to the road infrastructure.	Neutral (0)
	Transport Costs	Monetary costs paid by those travelling e.g. vehicle operating costs and tolls. Vehicle operating costs include fuel and non-fuel operating costs. This scenario assumes no change in traffic from the Do Minimum, therefore the benefits are zero.	Neutral (0)
	Accidents	Accident savings are neutral across this option because of the little to no impact which it will have on the layout of the road network.	Neutral (0)
	Changes in Productivity	This option is not expected to impact upon productivity.	Neutral (0)
	Local Economy	This option is not expected to impact upon the local economy.	Neutral (0)
	Land	It is anticipated that demolishing the dwellings may result in a changes to the existing land & public footpath system.	Slight Adverse (-)
	Capital Costs	The costs for this option have been calculated and include a 44% Optimism Bias. No topographical or geotechnical surveys have been undertaken and are not included in this price. Currently the schme is at the design stage.	£ 4,310,939.66
Revenue Costs	None	Neutral (0)	

S&C	Journey Quality	Demolishing the dwellings along the south side of the Woodside Terrace is not envisaged to have an impact on the journey quality and, therefore, the impact is considered to be neutral.	Neutral (0)
	Physical Activity	Demolishing the dwellings is unlikely to impact on physical activity along the study route. Therefore, it is considered that the impact will be neutral.	Neutral (0)
	Security	The footpath on the southern side of the carriageway will be set back by approximately 6m.	Neutral (0)
	Access to Employment	This option does not impact on the access to employment, with a small number of residents being affected. No employment centres are likely to be impacted. Furthermore, it cannot be determined where these residents will relocate. However, it is likely residents will find access to employment after relocation. Therefore, the impact is considered as neutral.	Neutral (0)
	Access to Services	This option does not impact on the access to services, with a small number of residents being affected. No service centres are likely to be impacted. Furthermore, it cannot be determined where these residents will relocate. However, it is likely residents will find access to services after relocation. Therefore, the impact is considered as neutral.	Neutral (0)
	Affordability	This option is unlikely to lead to a local change in user class or impact on costs of transport.	Neutral (0)
	Severance	The number of residents being effected is considered as minimal. Furthermore, it cannot be determined where these residents will be re-allocated in regards to housing. Therefore the impact is considered as neutral.	Neutral (0)
VfM	Value for Money	10 Years - PVB = £15,492 PVC = £3,915,000 NPV = -£3,915,000 60 Years - PVB = £28,566 PVC = £3,915,000 NPV = -£3,915,000 The Present Value Benefits (PVB) for this option derives from the monetised impacts of the air quality for the residents.	BCR 10 years 0.004 60 years 0.007
Other Issues	Acceptability	Given the nature of the proposals, this measure is anticipated to be opposed by the Woodside Terrace's residents.	
	Technical, Operational & Financial Feasibility	Financial feasibility to residents.	
	Deliverability & Risk	This option will be high risk, with geotechnical and topographical surveys being required. There are also legal challenges and the residents need to come to a joint decision to relocate.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	Yes. However, this measure will not reduce the emissions from the vehicles. It will decrease the concentrations in the local area due to the removal of the canyon. Dispersion is improved and hence concentrations on the road and footpaths decrease. Furthermore, the southern footpath is going to be compliant through re-alignment. Similarly, the northern footpath is likely to be compliant in the option implementation year.	
	Will the intervention result in unintended consequences or other environmental impacts	Yes. There are slight adverse consequences to the landscape and biodiversity.	
	Will the intervention impact equally across multiple vehicle classes and journey types	Yes. This scheme should have an equal impact on all vehicle classes and journey types.	
	Will the intervention have a positive impact on wider public health and inequalities	Yes. The residents will no longer be exposed to the high NO2 concentration. However, some social inequalities are envisaged due to the displacing the residents. This is further impacted as the figures show that Caerphilly has a slightly higher economic inactivity of 24.7% compared to the Welsh average of 23.8%. The majority (33.6%) are made up of long-term sick residents.	
Future Generations 7 Well-being goals	Prosperous	This option will lead to a relocation of the current residents at Woodside Terrace to other areas, however it is likely to have a neutral impact on local trade/economy and services due to over 85,500 economically active people in Caerphilly and the small number of people relocating from Woodside Terrace.	0
	Resilient	This option requires a high amount of resources for implementation, both financial costs and physical resources. The measure is likely to result in a small adverse impact on local biodiversity and ecosystems. However, it is likely to score as neutral for this well-being goal.	0
	Healthier	This option addresses the problem of poor air quality and removes the residents from the problem. However, residents will be subject to stress and anxiety over significant change. It is likely to have a positive impact on the current residents of the Woodside Terrace overall.	+2
	More Equal	The current resident group will be reimbursed and compensated for the disruption caused and in line with this goal, involvement of local people is of vital importance. There is a clear link between the inequality and health in this option, as less advantaged groups are being offered an economic support to find new housing. However, although a small group of residents are being affected from a population of over 180,800 in Caerphilly (2017), this option has the potential to leave the residents in a financial deficit overall. Especially those who have no mortgage and are now faced with having to take out a new mortgage and those coming to the end of their mortgage having to extend. This option scores as slight adverse for the 'more equal' goal.	-1
	Cohesive Communities	This option is likely to negatively impact on strengthening local community social relationships and damage the links currently made. However, it is unlikely to make Hafodyrnyrs or the wider area, a less attractive place to live and work, therefore scores as neutral for the cohesive communities goal.	0
	Vibrant Culture	Likely to be diverging the social ties with the current residents and could cause some cultural problems between the council and the public. This scores as negative for the vibrant culture goal.	-1
	Globally Responsible	This option completely removes the health problems caused to the Woodside Terrace residents from NO2. On a localised level, the carbon footprint of demolition needs to ensure to dispose of materials in sustainable manner in order to comply with this goal. This option is seen as sustainable as it puts residents' health first by removing them from the problem.	+1

Appraisal Summary Table

Option No. / Theme

4

Name of scheme:	Peak Period HGV Bans
Location:	A472 Hafodyrnys Road
Effectiveness:	Low
Timescale:	2021
Feasibility:	Possibly. CCBC can introduce and put forward the traffic order. Road network is managed by CCBC Highways Operations Department and would need to be enforced by the police for this option to be feasible.

Objective		Summary of key impacts	Assessment
			Qualitative
Environment	Air Quality	The HGV ban reduces concentrations of NO2 along the corridor by an average of -2 ug/m3. However, the HGV ban option in 2021 does not achieve compliance with the NO2 limit value. This option scores as slight beneficial to the air quality.	Slight Beneficial (+)
	Noise	<p>Receptors The closest sensitive receptors are at Woodside Terrace, situated in NAPPA 619 mid-way up Hafodyrnys Road (A472). A number of elevated receptors on Gladstone Road also overlook the A472 and a housing estate is situated approximately 100m to the north of the A472.</p> <p>Absolute Noise Levels With the implementation of peak hour HGV bans, noise levels at Woodside Terrace are still predicted to exceed 68dB LA10,18h. Noise levels were measured in 2014 and found to be 76dB LA10,18h at 10m distance from the road.</p> <p>Noise Impact Short term and long term impacts are predicted to be negligible at source in NAPPA 619, but with a slight decrease in noise level of less than 1dB.</p>	Neutral (0)
	Landscape	The introduction of peak hour HGV bans would manipulate the flow and nature of traffic using the A472, but this would have a negligible effect on the wider impacts imposed by the busy transit corridor.	Neutral (0)
	Historic Environment	There will be no appreciable impacts, either positive or negative, on any Grade II* and Grade II Listed Buildings or their context. The option will not result in severance or loss of integrity, context or understanding of the Listed Buildings within the historic landscape. There will be no appreciable impacts, either positive or negative, on non-designated heritage assets or the historic landscape.	Neutral (0)
	Biodiversity	This option is unlikely to produce any impacts on ecology due to the lack of vegetation clearance and works would be confined within the hard estate.	Neutral (0)
	Water Environment	No predicted adverse effects to the water environment. Slight increase in AADT traffic flows predicted for this option but far below typical threshold value of 20% to cause notable increase of pollution risk to receiving watercourses	Neutral (0)
	Economy	Journey Time Changes	This option sees an immediate decrease in travel time in 2021, with a higher reduction for 2029. Overall this option results in 194 hours of savings for all vehicle types except HGVs who operate the A472 corridor in the morning and evening peak periods. However, as result of HGVs displacement on the wider network, it is expected to have a slight adverse impact on the journey time overall.
Journey Time Reliability Changes		This option sees a neutral benefit to the journey time reliability due to unknown impacts on the corridor and displacement of HGVs elsewhere on the network. This option might result in a journey reliability improvement in 2021 on the A472 Hafodyrnys Road corridor in the AM peak especially. There is an expected adverse impact on the journey time reliability for 2029 due to a higher number of other vehicle types entering the corridor, slowly reducing the slight improvements from 2021.	Slight Adverse (-)
Transport Costs		Monetary costs paid by those travelling e.g. vehicle operating costs and tolls. Vehicle operating costs include fuel and non-fuel operating costs. The TUBA estimates £2,292,000 of benefit. However, this benefit is a function of improved traffic flow due to the removal of HGVs from the corridor. Due to the limitations of the model extents, the TUBA does not calculate disbenefits associated with the rerouting of HGVs. Because of this, the anticipated impacts are Slight Adverse.	Slight Adverse (-)
Accidents		Accident savings are neutral across this option because of the little to no impact which it will have on the layout of the road network.	Neutral (0)
Changes in Productivity		This option is not expected to impact upon productivity.	Neutral (0)
Local Economy		A questionnaire for businesses local to Hafodyrnys and A472 has been undertaken. The respondents admit that the deliveries that taking place during either a morning or afternoon peak constitute for up to 50% of deliveries within their companies. This is likely to have a moderate adverse impact on the local economy.	Moderate Adverse (--)
Land		It is anticipated that this option can be accommodated within the verge of current road system. This is not anticipated to have any requirements for additional land.	Neutral (0)
Capital Costs		The costs for this option have been calculated and include a 44% Optimism Bias	£ 507,821.16
Revenue Costs		None	Neutral (0)
Journey Quality	A HGV ban is not envisaged to have an impact on the journey quality and, therefore, the impact is considered to be neutral.	Neutral (0)	

S&C	Physical Activity	Peak hour HGV bans are unlikely to impact on physical activity along the study route. Therefore, it is considered that the impact will be neutral.	Neutral (0)
	Security	This scheme is unlikely to have an impact of the security of carriageway users at this location	Neutral (0)
	Access to Employment	Banning HGVs during morning and evening peak periods is likely to negatively impact on their trips associated with employment. This, in turn, will affect these places operational ability. The impact is considered to be moderately adverse.	Moderate Adverse (-)
	Access to Services	Banning HGVs during peak morning and evening periods is likely to negatively impact on their trips associated with services. The impact is considered to be moderately adverse.	Moderate Adverse (-)
	Affordability	This option is unlikely to lead to a local change in user class or impact on costs of transport.	Neutral (0)
	Severance	This option will not have an impact on severance	Neutral (0)
VfM	Value for Money	10 Years - PVB = £6,571,562 PVC = £511,000 NPV = £6,030,000 60 Years - PVB = £40,275,943 PVC = £511,000 NPV = £39,719,000	BCR 10 years 12.9 60 years 78.8
Other Issues	Acceptability	Given the nature of the proposals, this measure is anticipated to be opposed by the local businesses and service providers.	
	Technical, Operational & Financial Feasibility	Police enforcement.	
	Deliverability & Risk	The diversion for the HGVs is significant, if not policed properly HGVs will continue to use the route and ignore the new diversion. Need to ensure sufficient signage is used. May lead to longer travel routes for HGVs and increases in NO2 on other routes by moving the problem from one area to another.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	It is considered that this measure should have a positive impact on overall reduction in NO2. In the local area. However, diversion routes are significant, will take longer to travel and could increase the overall levels of NO2.	
	Will the intervention result in unintended consequences or other environmental impacts	Yes possibly, rerouting of vehicles could increase NO2 elsewhere.	
	Will the intervention impact equally across multiple vehicle classes and journey types	No. HGVs will be targeted	
	Will the intervention have a positive impact on wider public health and inequalities	Yes. It is considered that this measure should marginally improve the wider public health in the local area but may increase NO2 overall in other regions.	
Future Generations 7 Well-being goals	Prosperous	This option is likely to see a negative impact on business growth and business opportunities, whilst damaging local supply chains. The measure will however favour low-carbon sectors and push the infrastructure to be more sustainable by understanding the impact of older polluting HGVs on NO2. Its impact on the economic growth may result in Caerphilly receiving less business investment, overall having an adverse impact on a Prosperous Wales.	-1
	Resilient	This measure requires minimal resources for implementation and can be enforced using ANPR. It uses resources efficiently and can positively impact on the ecosystem by removing queueing HGVs from the A472 Hafodyrnys Road local area. The option needs to ensure that by banning peak period HGVs on this route, it does not create a problem somewhere else.	+2
	Healthier	This option is likely to see a reduction in HGVs, which is likely to have a slight benefit to air quality and health. The measure is likely to make for safer active travel conditions.	+1
	More Equal	This option is anticipated to score negatively for impacting local businesses utilising HGVs. The measure could also be damaging to freight operators in the region utilising the strategic route.	-2
	Cohesive Communities	This measure is likely to negatively impact on local businesses that rely on the route for their freight transport.	-2
	Vibrant Culture	This option is not likely to influence areas that make a vibrant culture and scores as neutral for this goal.	0
	Globally Responsible	This measure complies with the 'globally responsible' objective by reducing greenhouse gas emissions, removing a considerable NO2 pollutant source from an Air Quality Management Area (AQMA) and providing a positive example of how infrastructure projects can integrate and promote wider well-being. Future assessments may be necessary to ensure negative impacts because of longer diversions are mitigated.	+1

Appraisal Summary Table

Option No. / Theme

5

Name of scheme:	Clean Air Zone / Low Emission Zone
Location:	A472 Hafodyrnys Road
Effectiveness:	High
Timescale:	2026 (Assuming legislation is enacted by 2021)
Feasibility:	Yes. Road network is managed by CCBC Highways Operations Department.

	Objective	Summary of key impacts	Assessment
			Qualitative
Environment	Air Quality	The CAZ reduces concentrations of NO2 along the corridor by an average of -14 ug/m3. The CAZ option has a transformative effect on NO2 concentrations which reduce by 40-50% in the modelled corridor. This is primarily due to the effect of Euro 6/VI in the fleet. The CAZ option in 2021 does comply with the annual mean NO2 standard.	Large Beneficial (+++)
	Noise	<p>Receptors</p> <p>The closest sensitive receptors are at Woodside Terrace, situated in NAPPA 619 mid-way up Hafodyrnys Road (A472). A number of elevated receptors on Gladstone Road also overlook the A472 and a housing estate is situated approximately 100m to the north of the A472.</p> <p>Absolute Noise Levels</p> <p>With the implementation of a clean air zone, noise levels at Woodside Terrace are still predicted to exceed 68dB LA10,18h. Noise levels were measured in 2014 and found to be 76dB LA10,18h at 10m distance from the road.</p> <p>Noise Impact</p> <p>Short term impacts across the network are predicted to be negligible at source, but with a slight decrease in noise levels of less than 1dB. In the long term, impacts are generally predicted to be negligible overall. The only exception is Crumlin Road which is anticipated to experience a minor beneficial impact at source, although this is thought to be due to its low flow, meaning other roads are likely to be the dominant noise source and receptors on Crumlin Road are unlikely to face a significant benefit.</p>	Neutral (0)
	Landscape	The introduction of a Clean Air Zone/Low Emission Zone would see a displacement of HGV and other traffic to alternative routes, but this would have a negligible effect on the wider impacts imposed by the busy transit corridor.	Neutral (0)
	Historic Environment	There will be no appreciable impacts, either positive or negative, on any Grade II* and Grade II Listed Buildings or their context. The option will not result in severance or loss of integrity, context or understanding of the Listed Buildings within the historic landscape. There will be no appreciable impacts, either positive or negative, on non-designated heritage assets or the historic landscape.	Neutral (0)
	Biodiversity	This option is unlikely to produce any impacts on ecology due to the lack of vegetation clearance and works confined within the hard estate.	Neutral (0)
	Water Environment	No predicted adverse effects to the water environment. Increase in AADT traffic flows predicted at Junction B4471/A472 but not considered sufficient to cause notable increase of pollution risk to receiving watercourses that receive discharge from wider catchment.	Neutral (0)
Economy	Journey Time Changes	This option sees a larger change to the journey time in 2021 compared to 2029, with an overall benefit change of 214 hours for A472 Hafodyrnys Road users. However, this option is likely to include large vehicle displacement on the wider network such as the M4, A4042, A467 and the A465. The increase in journey time for the users on the previously mentioned strategic routes is anticipated to outweigh the benefit for the A472 Hafodyrnys Road. This option therefore is likely to have a large adverse impact on the journey time.	Large Adverse (---)
	Journey Time Reliability Changes	This option sees a moderate adverse impact on the journey time reliability as result of the different diversion routes, increased distance and problems on the network elsewhere will result in more travel delay, especially for vehicles travelling eastbound on the A472 Hafodyrnys Road in the morning peak.	Moderate Adverse (-)
	Transport Costs	Monetary costs paid by those travelling e.g. vehicle operating costs and tolls. Vehicle operating costs include fuel and non-fuel operating costs. The TUBA estimates £972,000 of benefit. However, this benefit is a function of improved traffic flow due to the removal of traffic from the corridor as a result of the Clean Air Zone. Due to the limitations of the model extents, the TUBA does not calculate disbenefits associated with the rerouting of traffic away from the Clean Air Zone. Similarly, the TUBA costs do not include the charge paid by non-compliant vehicles within the Clean Air Zone. Due to this, the impacts are expected to be Large Adverse.	Large Adverse (---)
	Accidents	This option is likely to displace traffic from the strategic corridor onto potentially unsuitable routes. This could result in increased traffic volumes in residential areas etc. making accidents more likely to happen.	Slight Adverse (-)
	Changes in Productivity	This option is likely to affect the availability of labour markets within the area. The charging Clean Air Zone will act as a barrier to commuters between Caerphilly and Torfaen.	Moderate Adverse (-)
	Local Economy	A questionnaire for businesses, local to Hafodyrnys and A472 has been undertaken. Only three respondents considered proposed charges for the CAZ as 'about right'. Some respondents suggest also that such changes might result in the area to be unattractive from a business point of view. This is likely to have a large adverse impact on the local economy.	Large Adverse (---)
	Land	It is anticipated that this option can be accommodated within the verge of current road system. This is not anticipated to have any requirements for additional land. This option will include the construction of signs on the nearby infrastructure.	Neutral (0)
	Capital Costs	The costs for this option have been calculated and include a 44% Optimism Bias	£ 20,000,000.00
Revenue Costs	None	Neutral (0)	

S&C	Journey Quality	A clean air/low emission zone is envisaged to have an impact on the journey quality through less exposure to NO2 levels for drivers, passengers, pedestrians and cyclists. This is likely to have a slight beneficial impact.	Slight Beneficial (+)
	Physical Activity	Introducing the Clean Air Zone/Low Emission Zone is unlikely to impact on physical activity along the study route. Therefore, it is considered that the impact will be neutral.	Neutral (0)
	Security	This scheme is unlikely to have an impact of the security of carriageway users at this location	Neutral (0)
	Access to Employment	Introducing a Clean Air Zone/Low Emission Zone is likely to reduce the residents' access to local employment as well as companies main transport routes being effected. The impact is considered to be large adverse.	Large Adverse (---)
	Access to Services	Introducing a Clean Air Zone/Low Emission Zone is likely to reduce the residents' access to the local services. Reduced number of trips associated with business & delivery will also see a reduction in the access to services. The impact is considered to be large adverse.	Large Adverse (---)
	Affordability	The clean air zone may result in an increase in the time necessary to save money to upgrade vehicles as a result of paying for the CAZ charge or having to extend their general daily trips.	Slight Adverse (-)
	Severance	This option will not have an impact on severance	Neutral (0)
VfM	Value for Money	10 Years - PVB = £3,180,914 PVC = £16,943,000 NPV = -£13,879,000 60 Years - PVB = £11,846,662 PVC = £17,203,000 NPV = -£5,473,252	BCR 10 years 0.2 60 years 0.7
Other Issues	Acceptability	Given the nature of the proposals, this measure is anticipated to be opposed by the local businesses and general public. The road users are likely to be financially penalised either by the introduced charges or the requirement to buy a newer vehicle.	
	Technical, Operational & Financial Feasibility	No legislation currently in place to allow a clean air zone to be implemented in Wales. This is likely to take up to 2021 for legislation to be in place, with the JAQU guidance suggesting a further 5 years implementation period following legislation being in place.	
	Deliverability & Risk	The diversion for vehicles is significant, if not policed properly vehicles will continue to use the route and ignore the new diversion. Need to ensure sufficient signage is used.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	Yes. There may potentially be an overall reduction to NO2, although it is likely that there may be localised increases in NO2 elsewhere, due to the Clean Air Zone/Low Emission Zone avoidance.	
	Will the intervention result in unintended consequences or other environmental impacts	Yes, potentially to the areas where the traffic re-routes.	
	Will the intervention impact equally across multiple vehicle classes and journey types	No. Older vehicles will be targeted.	
	Will the intervention have a positive impact on wider public health and inequalities	There may be a positive impact on the residents' health, however significant social inequalities are envisaged due to the vehicles' emissions restriction. CAZ displacement of older vehicles on the corridor and can impact on the air quality in other areas.	
Future Generations 7 Well-being goals	Prosperous	This option may lead to a local economy which is adapted to future change and thinks more about the air quality problem. The same can be said about working together with other public bodies' goals. This measure could however negatively impact local economy and provision of local services by discouraging trips through the zone.	-2
	Resilient	This measure requires notable resource for implementation. However, the measure can positively impact on the ecosystem by removing poor quality vehicles that negatively impact on local air quality readings. The option needs to ensure that by charging certain vehicles, it does not create a problem somewhere else. This option would be further benefited by a government scrappage scheme or incentives to renew older vehicles.	+1
	Healthier	This option is likely to see a reduction in poor quality vehicles, which is likely to have a slight benefit to air quality and subsequently to the health of the local residents.	+2
	More Equal	The CAZ charge can be classified as a proportional charge system which does not take into consideration someone's income. The more deprived groups are likely to be impacted more than those that are more financially secure. A measure to tackle this problem can be the introduction of interest-free loans for a limited time to purchase compliant vehicles. This idea was put forward by the secretary of the Yorkshire Professional Driver's Association in response to the Leeds CAZ. This option would be further benefited by a government scrappage scheme or incentives to renew older vehicles.	-2
	Cohesive Communities	This measure is likely to negatively impact on local businesses that rely on the route for their commuting and freight transport.	-2
	Vibrant Culture	This option is not likely to influence areas that make a vibrant culture and scores as neutral for this goal.	0
	Globally Responsible	This measure complies with the 'globally responsible' objective by reducing green house gas emissions, emphasising a need for developing sustainable low-carbon technologies, and providing a positive example of how infrastructure projects can integrate and promote wider well-being	+2

Appraisal Summary Table

Option No. / Theme

6

Name of scheme:	Traffic Management Option - Change Signal Timings at Crumlin Junction (Option 1) + Signalise the A472/B4471 Swyffryd Junction with 2 lanes on A472 EB (Option 2)
Location:	Crumlin Junction, A472 Hafodyrynys Road / B4471 Swyffryd Junction
Effectiveness:	Ineffective
Timescale:	2021
Feasibility:	Yes. Road network is managed by CCBC Highways Operations Department.

Objective		Summary of key impacts	Assessment
			Qualitative
Environment	Air Quality	For this option the reductions in annual average NO2 are negligible. This option scores as neutral for the air quality.	Neutral (0)
	Noise	<p>Receptors The closest sensitive receptors are at Woodside Terrace, situated in NAPPA 619 mid-way up Hafodyrynys (A472). A number of elevated receptors on Gladstone Road also overlook the A472 and a housing estate is situated approximately 100m to the north of the A472.</p> <p>Absolute Noise Levels With the implementation of infrastructure changes, noise levels at Woodside Terrace are still predicted to exceed 68dB LA10,18h. Noise levels were measured in 2014 and found to be 76dB LA10,18h at 10m distance from the road.</p> <p>Noise Impact Overall receptors are subject to negligible changes in the short and long term. The negligible beneficial and adverse impacts from option 2 and option 3 respectively effectively counteract each other.</p> <p>The design drawings indicate a new lane at the A472/B44721 Swyffryd Junction, causing the road to be brought approximately 3.5m closer to pond villa; this could result in a slight increase in noise levels as vehicles accelerate away from the junction.</p>	Neutral (0)
	Landscape	Alterations to signal timings at Crumlin Junction and introduction of traffic signals at the A472/B4471 junction would manipulate the flow of traffic approaching from the A472 and result in some standing traffic where not previously experienced. These alterations would have a negligible effect on the wider/existing impacts imposed by the busy transit corridor.	Neutral (0)
	Historic Environment	There will be no appreciable impacts, either positive or negative, on any Grade II* and Grade II Listed Buildings or their context. The option will not result in severance or loss of integrity, context or understanding of the Listed Buildings within the historic landscape. There will be no appreciable impacts, either positive or negative, on non-designated heritage assets or the historic landscape.	Neutral (0)
	Biodiversity	This option is unlikely to lead to any significant effects on biodiversity due to the minimal landtake and construction footprint, largely confined to existing areas of hardstanding.	Neutral (0)
	Water Environment	No predicted adverse effects to the water environment. Slight increase in AADT traffic flows predicted for this option but far below typical threshold value of 20% to cause notable increase of pollution risk to receiving watercourses.	Neutral (0)
	Economy	Journey Time Changes	This option sees a minor increase in travel time of vehicles in 2021, however this is outweighed by a positive change to the journey time in 2029 for an overall positive journey time change of 60 hours. The majority of the increase to journey time is associated with the signal timings in 2021. It is anticipated that the traffic management option will have a slight benefit on the journey time change.
Journey Time Reliability Changes		This option sees a moderate benefit to the journey time reliability, especially to traffic travelling eastbound in the AM peak.	Moderate Beneficial (++)
Transport Costs		Monetary costs paid by those travelling e.g. vehicle operating costs and tolls. Vehicle operating costs include fuel and non-fuel operating costs. Given the small scale of change on the network, these impacts are minimal. The TUBA estimates the impact as £959,000 of benefit over the 60 year appraisal period.	Slight Beneficial (+)
Accidents		An accident appraisal was carried out using accident data over a four-and-a-half-year period from the 1st January 2014 to the 30th June 2018 (https://gov.wales/statistics-and-research/police-recorded-road-casualties/?tab=data&lang=en). A total of 22 accidents occurred on the road network over these five years, 6 serious and 16 slight. These accidents were then filtered down to the area which will be affected by the implementation of the signal junction. As the traffic around the junction will have a reduced speed, it is assumed that this accident would be downgraded to a rear-end collision/shunt with the possibility that it is removed completely from the recorded accidents on the network. This is a saving of 0.2 serious accidents per year, costed at £243,645 (https://www.gov.uk/government/statistical-data-sets/ras60-average-value-of-preventing-road-accidents) per serious accident which is a monetary saving of £54,141 per year.	Moderate Beneficial (++)
Changes in Productivity		This option is not expected to impact upon productivity.	Neutral (0)
Local Economy		This option is not expected to impact upon the local economy.	Neutral (0)
Land		It is anticipated that this option can be accommodated within the verge of current road system. This is not anticipated to have any requirements for additional land.	Neutral (0)
Capital Costs	The costs for this option have been calculated and include a 44% Optimism Bias	£ 494,443.57	

	Revenue Costs	None	Neutral (0)
S&C	Journey Quality	A traffic management option is not envisaged to have an impact on the journey quality and, therefore, the impact is considered to be neutral.	Neutral (0)
	Physical Activity	A traffic management option is unlikely to impact on physical activity along the study route. Therefore, it is considered that the impact will be neutral.	Neutral (0)
	Security	As the signals are not within a site of concern (associated with crime), the security impact is considered to be neutral	Neutral (0)
	Access to Employment	Traffic management could improve the vehicle flow through the corridor and therefore create a more attractive route for drivers. This could potentially attract additional users and therefore slightly improve access to employment.	Slight Beneficial (+)
	Access to Services	Traffic management could improve the vehicle flow through the corridor and therefore create a more attractive route for drivers. This could potentially attract additional users and therefore slightly improve access to services.	Slight Beneficial (+)
	Affordability	This option is unlikely to lead to a local change in user class or impact on costs of transport.	Neutral (0)
	Severance	This option will not have an impact on severance	Neutral (0)
VfM	Value for Money	10 Years - PVB = £2,433,000 PVC = £482,000 NPV = £1,951,000 60 Years - PVB = 19,995,000 PVC =£497,000 NPV =19,498,000	BCR 10 years 5.0 60 years 40.2
Other Issues	Acceptability	Given the nature of the proposals, this measure is unlikely to be opposed by any groups or individuals.	
	Technical, Operational & Financial Feasibility	None identified at this stage.	
	Deliverability & Risk	Signal timing will have minimal cost as the option is an existing signalised junction with only timings being changed. An eastbound queue detector will need to be properly signed as a new junction layout to avoid traffic accidents.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	It is considered that this measure should have minimal impact on overall reduction in NO2	
	Will the intervention result in unintended consequences or other environmental impacts	No. There are no adverse consequences to other environmental impacts.	
	Will the intervention impact equally across multiple vehicle classes and journey types	Yes. This scheme should have an equal impact on all vehicle classes and journey types.	
	Will the intervention have a positive impact on wider public health and inequalities	Yes. It is considered that this measure should marginally improve the wider public health.	
Future Generations 7 Well-being goals	Prosperous	This option is likely to have a neutral impact to business activity and slightly influence business movements.	0
	Resilient	Signalising Swyffryd Junction & eastbound queue detector requires a minimal amount of resources for implementation. The measure is likely to assist in a more consistent flow in traffic, in comparison to the existing queues.	+1
	Healthier	This option is likely to have a neutral impact to the health of the local communities.	0
	More Equal	This option is unlikely to have an impact on anything associated with "more equal" objective.	0
	Cohesive Communities	This option is not likely to influence areas that make cohesive communities and scores as neutral for this goal.	0
	Vibrant Culture	This option is not likely to influence areas that make a vibrant culture and scores as neutral for this goal.	0
	Globally Responsible	This measure complies with the 'globally responsible' objective by reducing green house gas emissions, and providing a positive example of how infrastructure projects can integrate and promote wider well-being	+1

Appraisal Summary Table

Option No. / Theme

7

Name of scheme:	Do Max - Change Signal Timings at Crumlin Junction + Signalise the A472/B4471 Swyffryd Junction with 2 lanes on A472 EB + Clean Air Zone / Low Emission Zone
Location:	Crumlin Junction, A472 Hafodyrnys Road / B4471 Swyffryd Junction
Effectiveness:	High
Timescale:	2026 (Assuming CAZ legislation is enacted by 2021)
Feasibility:	Yes. Road network is managed by CCBC Highways Operations Department.

Objective		Summary of key impacts	Assessment
			Qualitative
Environment	Air Quality	The CAZ option has a transformative effect on NO2 concentrations which reduce by 40-50% in the modelled corridor. This is primarily due to the effect of Euro 6/VI in the fleet. The CAZ option in 2021 does comply with the annual mean NO2 standard.	Large Beneficial (+++)
	Noise	<p>Receptors The closest sensitive receptors are at Woodside Terrace, situated in NAPPA 619 mid-way up Hafodyrnys Road (A472). A number of elevated receptors on Gladstone Road also overlook the A472 and a housing estate is situated approximately 100m to the north of the A472.</p> <p>Absolute Noise Levels With the implementation of a clean air zone, noise levels at Woodside Terrace are still predicted to exceed 68dB LA10,18h. Noise levels were measured in 2014 and found to be 76dB LA10,18h at 10m distance from the road.</p> <p>Noise Impact Similarly to option 6, short term impacts are predicted to be negligible at source, but with a slight decrease in noise levels of less than 1dB across the network. In the long term, impacts are generally predicted to be negligible overall. The minor beneficial impact on Crumlin road is marginally less than option 6 and receptors are unlikely to face a significant benefit.</p> <p>The design drawings indicate a new lane at the A472/B44721 Swyffryd Junction, causing the road to be brought approximately 3.5m closer to pond villa; this could result in a slight increase in noise levels .</p>	Neutral (0)
	Landscape	The introduction of a Clean Air Zone/Low Emission Zone, alterations to signal timings at Crumlin Junction and introducing traffic signals at the A472/B4471 Junction would see a displacement of HGV and other traffic to alternative routes and manipulation of vehicle flows using the transit corridor. The alterations would have neutral effect on the immediate landscape setting and wider area.	Neutral (0)
	Historic Environment	There will be no appreciable impacts, either positive or negative, on any Grade II* and Grade II Listed Buildings or their context. The option will not result in severance or loss of integrity, context or understanding of the Listed Buildings within the historic landscape. There will be no appreciable impacts, either positive or negative, on non-designated heritage assets or the historic landscape.	Neutral (0)
	Biodiversity	This option is unlikely to lead to any significant effects on biodiversity due to the minimal landtake and construction footprint, largely confined to existing areas of hardstanding.	Neutral (0)
	Water Environment	No predicted adverse effects to the water environment. Increase in AADT traffic flows are predicted at Swyffryd Junction B4471/A472 but not considered sufficient to cause notable increase of pollution risk to receiving watercourses that receive discharge from wider catchment.	Neutral (0)
Economy	Journey Time Changes	This option similarly to the Clean Air Zone (CAZ) option, sees an immediate decrease in travel time in 2021, with a higher reduction for 2029, with an overall positive journey time change of 269 hours. However overall, this option is likely to include large vehicle displacement on the wider network such as the M4, A4042, A467 and the A465. The traffic management options (timings and junction improvement to Swyffryd Road) are likely to see more benefit to the journey time overall compared to the CAZ. Therefore the do maximum option is anticipated to have a moderate adverse impact on journey time changes.	Moderate Adverse (--)
	Journey Time Reliability Changes	This option sees a neutral benefit to the journey time reliability as the slight benefit from Option 1 (Change of signal timings) and Option 2 (Signalisation of Swyffryd Junction) are counterbalanced by the moderate adverse impacts of the CAZ.	Slight Adverse (-)
	Transport Costs	Monetary costs paid by those travelling e.g. vehicle operating costs and tolls. Vehicle operating costs include fuel and non-fuel operating costs. The TUBA estimates £1,714,000 of benefit. However, this benefit is a function of improved traffic flow due to the removal of traffic from the corridor as a result of the Clean Air Zone. Due to the limitations of the model extents, the TUBA does not calculate disbenefits associated with the rerouting of traffic away from the Clean Air Zone. Similarly, the TUBA costs do not include the charge paid by non compliant vehicles within the Clean Air Zone. Due to this, the impacts are expected to be Large Adverse.	Large Adverse (---)
	Accidents	An accident appraisal was carried out using accident data over a four-and-a-half-year period from the 1st January 2014 to the 30th June 2018 (https://gov.wales/statistics-and-research/police-recorded-road-casualties/?tab=data&lang=en). A total of 22 accidents occurred on the road network over these five years, 6 serious and 16 slight. These accidents were then filtered down to the area which will be affected by the implementation of the signal junction. As the traffic around the junction will have a reduced speed, it is assumed that this accident would be downgraded to a rear-end collision/shunt with the possibility that it is removed completely from the recorded accidents on the network. This is a saving of 0.2 serious accidents per year, costed at £243,645 (https://www.gov.uk/government/statistical-data-sets/ras60-average-value-of-preventing-road-accidents) per serious accident which is a monetary saving of £54,141 per year.	Moderate Beneficial (++)
	Changes in Productivity	This option is likely to affect the availability of labour markets within the area. The charging Clean Air Zone will act as a barrier to commuters between Caerphilly and Torfaen.	Moderate Adverse (--)

	Local Economy	A questionnaire for businesses, local to Hafodyrnyrs and A472 has been undertaken. Only three respondents considered proposed charges for the CAZ as 'about right'. Some respondents suggest also that such changes might result in the area to be unattractive from a business point of view. This is likely to have a large adverse impact on the local economy.	Large Adverse (---)
	Land	It is anticipated that this option can be accommodated within the verge of current road system. This is not anticipated to have any requirements for additional land.	Neutral (0)
	Capital Costs	The costs for this option have been calculated and include a 44% Optimism Bias	£ 20,494,443.57
	Revenue Costs	None	Neutral (0)
S&C	Journey Quality	A do maximum option which includes a clean air zone is envisaged to have an impact on the journey quality through less exposure to NO2 levels for drivers, passengers, pedestrians and cyclists. This is likely to have a slight beneficial impact.	Slight Beneficial (+)
	Physical Activity	A do maximum option is unlikely to impact on physical activity along the study route. Therefore, it is considered that the impact will be neutral.	Neutral (0)
	Security	As the signals are not within a site of concern (associated with crime), the security impact is considered to be neutral	Neutral (0)
	Access to Employment	Introducing a Clean Air Zone/Low Emission Zone is likely to reduce the residents' access to local employment as well as companies main transport routes being effected. The impact is considered to be large adverse.	Large Adverse (---)
	Access to Services	Introducing a Clean Air Zone/Low Emission Zone is likely to reduce the residents' access to the local services. Reduced number of trips associated with business & delivery will also see a reduction in the access	Large Adverse (---)
	Affordability	The clean air zone may result in an increase in the time necessary to save money to upgrade vehicles as a result of paying for the CAZ charge or having to extend their general daily trips.	Slight Adverse (-)
	Severance	This option will not have an impact on severance	Neutral (0)
VfM	Value for Money	10 Years - PVB = £4,941,171 PVC = £16,979,000 NPV = -£12,155,000 60 Years - PVB = £26,529,919 PVC = £17,499,000 NPV = £8,913,748	BCR 10 years 0.3 60 years 1.5
Other Issues	Acceptability	Given the nature of the proposals, this measure is likely to be opposed by current residents/businesses.	
	Technical, Operational & Financial Feasibility	No legislation currently in place to allow a clean air zone to be implemented in Wales. This is likely to take up to 2021 for legislation to be in place, with the JAQU guidance suggests a further 5 years implementation period considering legislation is in place.	
	Deliverability & Risk	Changes to the signal timings will have a minimal cost as the option is already a signalised junction. The diversion for vehicles away from the clean air zone is significant, if not policed properly vehicles will continue to use the route and ignore the new diversion. Need to ensure sufficient signage is used.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	It is considered that signal timings should have minimal impact on overall reduction in NO2. However, with the introduction of a CAZ there may potentially be an overall reduction to NO2, although it is likely that there may be localised increases in NO2 elsewhere, due to the Clean Air Zone/Low Emission Zone avoidance.	
	Will the intervention result in unintended consequences or other environmental impacts	Yes, potentially to the areas where the traffic re-routes.	
	Will the intervention impact equally across multiple vehicle classes and journey types	Signal timing changes should have an equal impact on all vehicle classes and journey types. However, older vehicles will be targeted as part of the CAZ measure, so the intervention will not impact equally across vehicle classes.	
	Will the intervention have a positive impact on wider public health and inequalities	It is considered that signal timings should marginally improve the wider public health. Although there may be a positive impact on the residents' health from a CAZ, significant social inequalities are envisaged due to a charge on older vehicles generally owned by people with less disposable income.	
Future Generations 7 Well-being goals	Prosperous	This option may impact on the local economy of Caerphilly and local residents.	-2
	Resilient	A clean air zone requires notable resource for implementation. However, the measure can positively impact on the ecosystem by removing poor quality vehicles that negatively impact on local air quality readings. The option needs to ensure that by changing certain vehicles, it does not create a problem somewhere else. This option would be further benefited by a government scrappage scheme or incentives to renew older vehicles. For the traffic management options, an eastbound queue detector requires a minimal amount of resources for implementation. The measure is likely to assist in a more consistent flow in traffic for the Swyfydd Road junction, in comparison to the existing queues.	+1
	Healthier	Signal timings and an eastbound queue detector is likely to have a neutral impact to the health of the local communities. A clean air zone is likely to see a reduction in poor quality vehicles, which is likely to have a moderate benefit to air quality and subsequently to the health of the local residents.	+2
	More Equal	The CAZ charge can be classified as a proportional charge system which does not take in consideration someone's income. The more deprived groups are likely to be impacted more than those that are more financially secure. A measure to tackle this problem can be the introduction of interest-free loans for a limited time to purchase compliant vehicles. This idea was put forward by the secretary of the Yorkshire Professional Driver's Association in response to the Leeds CAZ. This option would be further benefited by a government scrappage scheme or incentives to renew older vehicles.	-2
	Cohesive Communities	This measure is likely to negatively impact on local businesses that rely on the route for their commuting and freight transport.	-2
	Vibrant Culture	This option is not likely to influence areas that make a vibrant culture and scores as neutral for this goal.	0
	Globally Responsible	This measure complies with the 'globally responsible' objective by reducing green house gas emissions, and providing a positive example of how infrastructure projects can integrate and promote wider well-being. A clean air zone complies with the 'globally responsible' objective by reducing green house gas emissions, developing sustainable low-carbon technologies, and providing a positive example of how infrastructure projects can integrate and promote wider well-being	+2

4.9 SUMMARY TO THE TRANSPORT CASE

Air quality modelling results have shown that for scenario 3 (Demolish Dwellings at Woodside Terrace) the compliance status is extremely marginal, although it does bring forward compliance. The study has stated compliance will be achieved by 2023. This allows sufficient time for a public inquiry should there be option from local residents. Demolition could achieve compliance sooner if CCBC are able to dispel concerns and get everyone to agree to the option. Furthermore, scenario 4 (Peak Period HGV bans), reduces concentrations of NO₂ along the corridor by a few µg/m³. However, scenario 4 in 2021 does not comply with the annual mean NO₂ standard and is therefore an ineffective option as it does not meet the study's objectives. The scenario 5 (CAZ) has a transformative effect on NO₂ concentrations which reduce by 40-50% in the modelled corridor. However, the implementation for the CAZ is likely to be 2026 due to the framework being in review and the new legislation necessary to implement this option. The scenario 3, demolition, is preferred as it moves compliance forward, all the other options have little to no effect or cannot be achieved before the compliance year of 2025 without any local intervention.

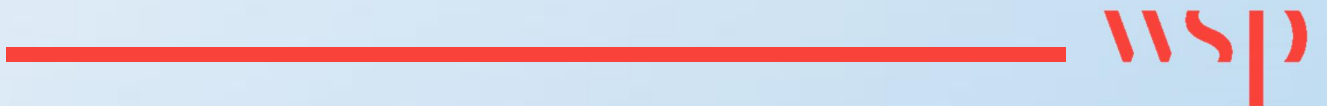
The environment section of the Appraisal Summary Tables (AST) has found that from all other sub-sections (noise, landscape, historic environment, biodiversity and water environment), the biggest influence is on air quality. The demolition option, CAZ and the do maximum options have scored the highest for air quality. The HGV ban option has a slight benefit as it does reduce NO₂ concentrations, but not enough to meet legal compliance. Furthermore, this option has significant adverse impacts on the local economy. The remaining options have scored neutral for all environment AS sections. The only adverse impacts being associated with the demolition option for its impact on landscape and biodiversity.

The economy section of the AST has found scenario 2 (signalisation of Swyfydd Road Junction) to have the highest BCR over the 10 years appraisal at 15.2 and the second highest for the 60 years appraisal at 94.6. Scenario 2 also scored positively for the journey time changes, journey time reliability, transport costs and accident reduction benefits. Scenario 3 (Demolish Dwellings at Woodside Terrace) scored neutral across all economic aspects except land, due to the anticipated transgression to the existing land, road or pathway systems. The air quality modelling has quantified some monetised impacts as part of a Cost Benefit Analysis (CBA) output which have been calculated in the BCR. The impact on the local economy has been appraised using the business questionnaire (Appendix B). It found a large adverse impact of scenario 5 (CAZ) and scenario 7 (do maximum) which also incorporates the CAZ. The scenario 4 (Peak Period HGV bans) is also found to have a moderate adverse impact as of the surveyed businesses' deliveries, up to 50% are taking place during the affected morning or evening peak.

The social & cultural section of the AST has found the options influence the access to employment, access to services and affordability sub-sections. For the other sub-sections (journey quality, physical activity, security and severance), the score has been neutral. Scenario 2 (signalisation of Swyfydd Road Junction) and subsequently scenario 6 (traffic management) scored positively for access to employment and access to services. Scenario 4 (Peak Period HGV bans) and 5 (CAZ) have scored negatively on their impact to access to employment and services, whilst the CAZ also influences affordability, as the usual users who have high emission vehicles are likely to have to pay the charge or extend general daily trips.

5

FINANCIAL CASE



5 FINANCIAL CASE

5.1 OVERVIEW

The financial case 'tells you whether an option is affordable in the first place and the long term financial viability of a scheme. It covers both capital and revenue requirements over the life time of the project and the implications of these for the balance sheet, income and expenditure accounts for public sector organisations'.

At Stage Two, it was considered that any of the measures identified in the Low (up to £500k) and Medium (£500k – £2m) are affordable within the information available to inform the study, though the measures identified with High costs will need the affordability re-evaluated when detailed designs are available at Stage Three.

5.2 FINANCIAL MODEL

The WelTAG appraisal guidance states that the lifetime costs of the project to include occurrence, price, source of funding, maintenance liabilities, risk allowances, environmental, social and cultural impacts and externalities.

5.2.1 METHODOLOGY RELATING TO THE COMPILATION OF THE ESTIMATES.

The quantities have been taken off the drawings provided by the design team. These are General Arrangement drawings with no details relating to the specific Highways Method of Measurement Series.

Therefore, due to absence of data relating to the existing ground conditions, an estimated assessment of the various series has been included, with regards to the items and quantities.

The estimate has been compiled using the items and rates taken from the South East and Mid Wales Highways Framework 1st January 2019 – 31st December 2022, Schedule of Rates, Lot 8. In general, the higher band rates have been used. Rogue items have been inserted for items that are not included within the Schedule of Rates, using rates taken from Spon's Civil Engineering and Highway Price Book 2018 or historic rates deemed to be appropriate for the size and nature of the scheme.

The following comments and exclusions should be noted:

- No allowance has been made for the treatment and removal of contaminated material
- Land take and associated costs have not been assessed, unless stated within the individual option.
- Any costs associated with Statutory Undertakers diversions and fees are excluded
- VAT is excluded
- Preparation and Supervision Costs are excluded

5.3 SCHEME COSTS

At Stage Three more detailed construction costing activities have been undertaken by WSP. More detailed scheme costs can be found in the IAR.

The costs have been based on the designs which are presented in Appendix C.

Table 5-1 – Scheme Costs

Option Number	Scheme Option Description	Total Capital Costs	Total Costs with an applied 44% Optimism Bias
		No Risk Allowance	Optimism Bias Stage 1
1	Change Signal Timings at Crumlin Junction	£ 5,000	£ 7,200
2	Signalise the A472/B4471 Swyffryd Junction and introduce an eastbound queue detector	£ 338,364	£ 487,244
3	Demolish Dwellings at Woodside Terrace	£ 2,993,708	£ 4,310,940
4	Peak Period HGV Bans	£ 352,654	£ 507,821
5	Clean Air Zone / Low Emission Zone	£ 20,000,000	£ 20,000,000 (Initial Estimate Cost Includes Risk)
6	Traffic Management Option - Change Signal Timings at Crumlin Junction (Option 1) + Signalise the A472/B4471 Swyffryd Junction with 2 lanes on A472 EB (Option 2)	£ 343,364	£ 494,444
7	Do Max - Change Signal Timings at Crumlin Junction + Signalise the A472/B4471 Swyffryd Junction with 2 lanes on A472 EB + Clean Air Zone / Low Emission Zone	£ 20,343,364	£ 20,494,444

5.4 RISKS

Using the TAG Unit 1.2 Scheme Costs²⁷, an optimism bias of 44% has been applied to the capital costs of the scheme. The optimism bias applies to the roads category. Risks for all options in Table 5-1 have been highlighted below:

S1 – No risks on deliverability, timescale and implementation costs are expected.

S2 – There are medium risks associated with the signalisation of the A472/B4471 Swyffryd Junction option. Predominantly due to the option designs created using 2D Ordnance Survey data. This option will need a topographical survey completed. A geotechnical survey is not likely to be necessary for this option at the current stage.

S3 – There are high risks associated with the demolition option. Predominantly due to the option designs created using 2D Ordnance Survey data. This option will need a topographical survey completed and additionally, a geotechnical survey might be necessary before the works can begin. In addition, the proposed compliance year of 2023 allows for a period where residents may oppose this measure and a public inquiry may be necessary. If resident's concerns can be dispelled the compliance can be achieved sooner.

S4 – Limited risks are associated with this option. No detailed surveys are expected to be required for this option.

S5 – Significant high risk, policy still not confirmed and time for legislation to be enacted will impact on the implementation timeframe.

S6 - There are medium risks associated with this option.

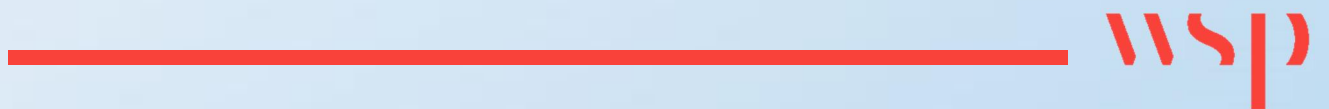
S7 - This do maximum option will need a topographical survey completed and additionally, a geotechnical survey might be necessary before the works can begin. For the CAZ it is expected to have a significant high risk, policy still not confirmed and time for legislation to be enacted will impact on the implementation timeframe.

²⁷TAG Unit A1.2 Scheme Costs Available from:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/625380/TAG_unit_a_1.2_cost_estimation_jul17.pdf

6

COMMERCIAL CASE



6 COMMERCIAL CASE

6.1 OVERVIEW

The commercial case 'tells you if a scheme will be commercially viable, whether it is going to be possible to procure the scheme and then to continue it in to the future'. It includes the commercial and contractual means by which the proposals could be delivered.

The areas that have been included:

- Output based Specification
- Procurement strategy
- Payment mechanisms (related to funding and associated issues to developing and implementing the measures)
- Risk Allocation & Transfer (related to the measures)

6.1.1 OUTPUT BASED SPECIFICATION

The Transport Case outlines a number of potential measures which could be implemented at Hafodyrynys to accelerate compliance with the Ambient Air Quality Directive and achieve the study objectives. These will be assessed through the study to identify any interdependencies and efficiencies which can be achieved by grouping options together in packages. A preferred measure / basket of measures for delivery will be identified at the Full Business Case stage.

6.1.2 PROCUREMENT STRATEGY

Any procurement strategy developed will follow and comply with Caerphilly County Borough Council's (CCBC) agreed procurement processes, the Council's Standing Orders for Contracts Guidance and any national or European legislation relevant at the time of tendering.

CCBC has a team within the Engineering Projects Group who are frequent engineering and construction clients, with experience in delivering major projects, primarily via partnering arrangements and within existing framework agreements.

Adopting a collaborative approach to procurement and building on existing relationships, the strategy will be used to engage early with Framework Contractors where appropriate to use their expertise in relation to engineering solutions and their intelligence in relation to the local supply chain. Consideration will also be given as to how we can embed the requirements of the Well Being of Future Generations Act, with a focus on the development of the local supply chain, creating and sustaining employment and training opportunities throughout the delivery of the proposal.

The options appraisal looked at seven measures within the Stage 3 report (already discussed within the document), some as individual and some as a package of measures. The options appraisal have concluded that demolition of the properties on the south side of Hafodyrynys Road (namely 1-20 Woodside Terrace, 1 & 2 Woodside Shops and Yr Adfa) is the measure that can achieve compliance in the 'shortest possible time'.

The delivery of the proposed demolition works along Hafodyrynys Road will require evaluation and management of risk, finance and performance. By utilising Framework Contractors, there is an

opportunity to build on lessons learned from previous projects and benefit from a process of continuous improvement.

There are essentially two procurement routes available for consideration and Caerphilly Council will consider, where appropriate the use of technical advisors to assist in the scheme specification, tendering and management.

These two main procurement routes are;

- Full tender process under Band C of the Council's Standing Orders for Contracts
- Utilising the South East & Mid Wales Highways Framework

The South East & Mid Wales Highways Framework has already been through a tender process and the framework is split in to lots, which has allocated contractors assigned to each of those lots.

The Authority chooses the lot which best fits the description and price of the proposed scheme, the Authority then has to run a mini competition with the contractors assigned to that lot. There is guidance given on how this should be done and timescales to allow for responses etc. Tendering through the framework document would be a far quicker process than the Council's Standing Orders for Contracts.

The Authority would utilise its consultants (WSP), to help write the specification for the required works prior to the mini competition process.

6.1.3 PAYMENT MECHANISMS

Funding for the proposals at Hafodyrynys is being supplied by Welsh Government via a Clean Air Fund. Details as to how Caerphilly and Welsh Government intend to make payments with respect to proposed products and services will be developed on completion of the final design.

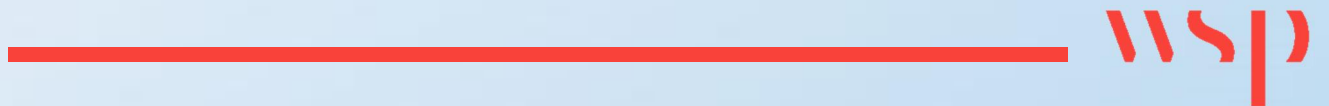
6.1.4 RISK ALLOCATION & TRANSFER

It is not considered possible at this stage to determine how the risks of the proposal might be apportioned between Caerphilly and any Contractor. However, it is expected the general principle will be to ensure that risks should be passed to the party best able to manage them, subject to Value for money (VfM).

Under the terms of the South East & Mid Wales Highways Framework it is recommended that a scheme specific register is prepared and priced for each contract at pre-tender preparation stage. The pre-tender estimate and the risk allowance should be used to determine both the Contracting Authority's budget for the scheme and to determine the appropriate lot. In the case of Hafodyrynys, the approximate costs (with contingency) equates to £4.3M to demolish the properties make safe the road and landscape the area.

7

MANAGEMENT CASE



7 MANAGEMENT CASE

7.1 SUMMARY OF MANAGEMENT CASE FROM STAGE ONE AND TWO

The management case tells you if an option is achievable. This case 'covers the delivery arrangements for the project and then its management during its life time. It covers the arrangements for the procurement, construction and on-going operation of the intervention, details of the monitoring arrangements and the undertaking of the evaluation plan. The management case should embed the five ways of working.

The WeITAG Stage One and Two reports outlined:

- Project Planning – Governance, organisational Structure
- Key Project Parties & Roles
- Identified the Review Group
- Communications & Stakeholder Management Plan

Stage Two highlighted that the following assessments had to be included in the WeITAG Stage Three:

- Preliminary scheme drawings
- Preliminary cost estimates
- Assessment of Technical, Operational and Financial Feasibility, and Deliverability and Risk
- Qualitative Value for Money assessment
- Detailed modelling of impacts – both traffic modelling and emissions/dispersion modelling.

7.2 DELIVERABILITY

Key milestones and delivery dates. Some consideration has been given to medium and short-term measures but with no exact timelines at Stage One and Two of the WeITAG.

7.3 KEY PROJECT PARTIES & ROLES

- Caerphilly County Borough Council (CCBC)
Ultimate client commissioning the study and overseeing delivery.
- Welsh Government (WG)
Directing CCBC in the delivery of this study.
- RICARDO / WSP
Project Consultants, delivering the study.
- Air Quality Independent Review Panel
Appointed by Welsh Government

7.4 REVIEW GROUP

A Review Group has been set up to guide the WeITAG process and have met regularly to discuss the project.

This group will take on the role of the Review Group and its members are as follows:

- Caerphilly County Borough Council
- Welsh Government

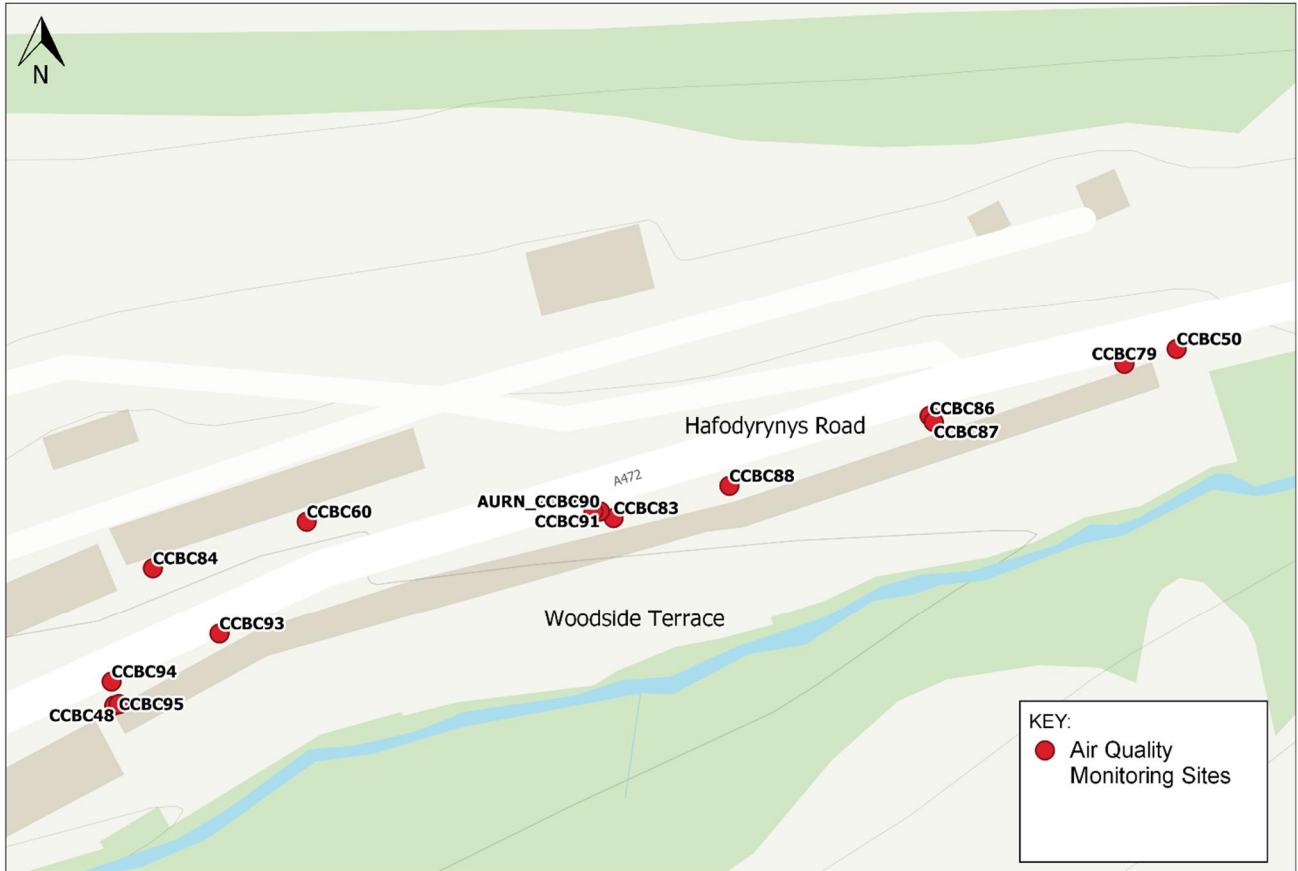
- Third party consultants (Ricardo / WSP at Stage One, Two and Three)

7.5 MONITORING AND EVALUATION PLAN

As per the five stages of WeITAG, it will be critical to monitor the impacts of the measures during and post implementation. The monitoring of outcomes during implementation in Stage Four will allow for adjustments to be made, if required, to realise the benefits of the intervention and mitigate any unforeseen adverse impacts. The longer-term evaluation provided in Stage Five covers both the process of delivering the scheme and the outcomes achieved. This makes WeITAG a learning process and future WeITAG appraisals will benefit from the sharing of experience gained elsewhere.

It is recognised that there is uncertainty in the modelling which has been undertaken. As such, should compliance on the A472 be delayed beyond current projections, the other measures mentioned in this report might be required to keep the time of exceedance of the limit values as short as possible.

Figure 7-1 – Existing NO₂ monitor locations on the A472 Woodside Terrace



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7.5.1 AIR QUALITY MONITORING

Air quality monitoring along the A472 Woodside Terrace comprise a combination of reference and indicative methods.

The reference method for the measurement of nitrogen dioxide and oxides of nitrogen is that described in EN 14211:2005 ‘Ambient air quality — Standard method for the measurement of the concentration of nitrogen dioxide and nitrogen monoxide by chemiluminescence.’

Reference method monitoring will be undertaken at a minimum of one location within the study corridor, with the recommended location being shown in Figure 7-1. This location has been selected because it meets the criteria in Annex III of the Directive, which specifically notes that:

Sampling should be directed at locations where the highest concentrations occur to which the population is likely to be directly or indirectly exposed for a period which is significant in relation to the averaging period of the limit value (Para B.1a)

For all pollutants, traffic-orientated sampling probes shall be at least 25 m from the edge of major junctions and no more than 10 m from the kerbside (Para C)

The final choice for the reference monitoring location will need to take account of Health and Safety and provision of infrastructure.

In addition to the reference monitoring, it is recommended that indicative diffusion tube monitoring is continued. The existing monitoring locations are provided in Figure 7-1.

7.5.2 TRAFFIC MONITORING

This study has highlighted the intrinsic link between air quality and traffic volumes, speeds and fleet mix. As such, it is recommended that the air quality monitoring is supplemented with either long term or regular short-term traffic monitoring to better understand any observed change in air quality. The following surveys should be considered:

Classified Link (Volume) Counts

This would require at least 1 full week (24 hours a day) of data for a DMRB neutral period. This data would be used to infer changes in Annual Average Daily Traffic (AADT) over time. Long term permanent count site data would be preferable so that the data would not need to be corrected for seasonality and the impacts of any incidents on the network could be fully understood.

Speed Data

Traffic speeds should be monitored post implementation to identify the real impacts of a change in speed limit and the speed data should be used to inform any decision on the requirement for and nature of enforcement. INRIX traffic data could be used to monitor speeds post implementation of measures though where possible should be backed up with survey data. Whilst undertaking surveys would potentially provide more robust data (larger sample size), it will be important to consider whether the survey is likely to impact upon typical driver behaviour and could underestimate real speeds on the corridors.

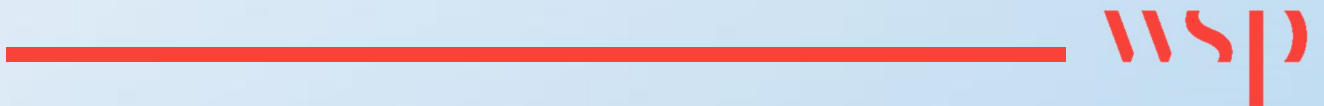
Automatic Number Plate Recognition

In addition to the classified link count data, there would be significant benefit in undertaking ANPR surveys. This data can be linked back to the DVLA database to determine not only vehicle classification, but also emission standards of vehicles. The data could be used to identify the rate of change of the fleet towards cleaner, newer, low emissions vehicles and could be used to evidence the need for additional measures to accelerate the rate of change, e.g. a scrappage scheme.

The monitoring locations will remain post implementation of the preferred demolition scheme (S3). However, the location of the continuous monitor will need reviewing because the area of exposure will change on completion of the scheme. Any newly proposed location(s) for the monitor will be agreed with Welsh Government (WG).

8

SUMMARY AND NEXT STEPS



8 SUMMARY AND NEXT STEPS

8.1 OVERVIEW

This WelTAG Stage Three report has considered the ‘preferred options’ brought forward from Stage Two in greater detail. Detailed traffic modelling has been undertaken for the options under consideration. The outputs of the traffic model have been used to inform robust air quality modelling to identify the potential reductions in NO₂ resulting from each option. In addition to this, the wider impacts of each option have been appraised against the WelTAG aspects of well-being. Value for Money assessments have also been undertaken, though this has not influenced the identification of measures taken forward for implementation.

8.2 AIR QUALITY BENEFITS

Each of the options have been modelled to identify their potential impacts on NO₂ concentrations. The results of this modelling can be summarised as follows:

Reference	Measure Description	Summary of Impacts
1	Change Signal Timings at Crumlin Junction	This option has imperceptible impacts on NO ₂ concentrations.
2	Signalise the A472/B4471 Swyffryd Junction	This option has imperceptible impacts on NO ₂ concentrations. This option has significant Transport Economic Efficiency (TEE) benefits associated with improving eastbound traffic flow during the morning peak period.
3	Demolish Dwellings at Woodside Terrace	This option does not reduce emissions overall though does remove the receptor and reduce NO ₂ concentrations along the study corridor therefore bringing forward compliance (to 2023) as per the objective.
4	Peak Period HGV Bans	This option results in minor reductions in NO ₂ concentrations though would have significant adverse impacts on the local economy and may potentially displace HGV traffic through other areas and create additional Air Quality Management Areas and/or unsafe routes.
5	Clean Air Zone / Low Emission Zone	This option would result in significant reductions in NO ₂ concentrations in the implementation year of 2026. This option has significant adverse impacts on the local economy, road users and could potentially displace traffic through other areas and create additional Air Quality Management Areas and/or unsafe routes. The HIA and Distributional Analysis has identified unacceptable adverse impacts resulting from this option given the lack of alternate route choice on this part of the local highway network.

6	Traffic Management Option (Changing Signal Timings at Crumlin Junction & Signalise the A472/B4471 Swyffryd Junction	This option has imperceptible impacts on NO ₂ concentrations.
7	Do Maximum Option (Changing Signal Timings at Crumlin Junction & Signalise the A472/B4471 Swyffryd Junction & Clean Air Zone / Low Emission Zone)	This option would result in significant reductions in NO ₂ concentrations in the implementation year of 2026. These benefits are primarily due to the CAZ within this option package. This option has significant adverse impacts on the local economy, road users and could potentially displace traffic through other Air Quality Management Areas and/or unsafe routes. The HIA and Distributional Analysis has identified unacceptable adverse impacts resulting from this option given the lack of alternate route choice on this part of the local highway network.

8.3 MEASURES FOR IMPLEMENTATION

The WeITAG Stage Three assessment has demonstrated that Option S3 (Demolish Dwellings at Woodside Terrace) would bring forward compliance in the shortest possible time. On this basis, this Stage Report concludes that this measure should be taken forward for implementation. Some risks have been identified which may impact on the implementation timeframe of this option, though despite these risks, this option would still bring forward compliance in the shortest possible time in line with the Air Quality Directive.

8.4 NEXT STEPS

To progress with Option S3 (Demolish Dwellings at Woodside Terrace), it will be necessary to undertake a topographical survey and geotechnical survey to inform detailed design. The cost estimates will need to be updated once the detailed design has been completed. It is anticipated that the completion of detailed design will reduce the risks which have been identified for this option and allow for robust costs and implementation timeframes to be identified.

Appendix A

SUMMARY OF CHANGES TO 2017
WELTAG GUIDANCE





WELTAG 2017 GUIDANCE UPDATE

The main changes in the final WelTAG 2017 relative to the Consultation Draft used for Stage One and Two are as follows:

- The application of the five ways of working to the consideration of possible solutions;
- A consideration of how solutions enable public bodies to maximise their contribution to each of the seven national 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, and a globally responsible Wales.
- A commitment towards the four aspects of well-being in Wales: economic, social, environmental and cultural; and
- A move from Delivery Case to Management Case.

WelTAG 2017 combines the principles of the HM Treasury Green Book and WG's Five Case Model for Better Business Cases, represented by the five WelTAG Stage Reports. The 2017 guidance also differs from the previous consultation version wherein the five-case business model now more closely reflects the model adopted by the DfT WebTAG guidance.

The contents of each Stage Report must be presented using the structure of the Five Cases Model as follows:

- Strategic case: the case for change, fit with other policies and objectives
- Transport case: does the proposal offer good public value for money and maximise contribution to the well-being goals?
- Financial case: is the proposed spend affordable?
- Commercial case: how can the scheme be procured? Is it commercially viable?
- Management case: is the scheme achievable? Can it be delivered?

Whilst WelTAG provides a fixed framework for appraisal, the guidance acknowledges that the level of detail provided in the WelTAG reports should be proportionate to the impacts under consideration and using the five ways of working set out in the Well-being of Future Generations Act. All major impacts and issues that could have a significant influence on delivery should be presented, but the level of detail in any analytical work should be proportionate to the scale and significance of the impact and sufficiently accurate for the decisions that need to be made.

The WelTAG Guidance has also been revised to reflect the Well-being of Future Generations (Wales) Act, which strives to improve the social, economic, environmental and cultural well-being of Wales and identifies seven well-being goals:

A prosperous Wales: An innovative, productive and low carbon society which recognises the limits of the global environment and therefore uses resources efficiently and proportionately (including acting on climate change); and which develops a skilled and well-educated population in an economy which generates wealth and provides employment opportunities, allowing people to take advantage of the wealth generated through securing decent work.

A resilient Wales: A nation which maintains and enhances a biodiverse natural environment with healthy functioning ecosystems that support social, economic and ecological resilience and the capacity to adapt to change (for example climate change).

A healthier Wales: A society in which people's physical and mental well-being is maximised and in which choices and behaviours that benefit future health are understood.

A more equal Wales: A society that enables people to fulfil their potential no matter what their background or circumstances (including their socio-economic background and circumstances).

A Wales of cohesive communities: Attractive, viable, safe and well-connected communities.



A Wales of vibrant culture and thriving Welsh language: 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.

A globally responsible Wales: A nation which, when doing anything to improve the economic, social, environmental and cultural well-being of Wales, takes account of whether doing such a thing may make a positive contribution to global well-being.

Appendix B

LOCAL BUSINESS QUESTIONNAIRE



Hafodyrynys Business Questionnaire

This report was generated on 11/02/19. Overall 21 respondents completed this questionnaire. The report has been filtered to show the responses for 'All Respondents'.

The following charts are restricted to the top 12 codes. Lists are restricted to the most recent 100 rows.

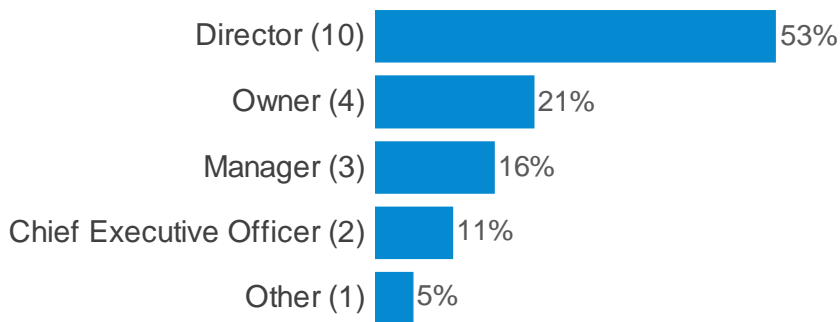
Business Name:

Businesses names have been removed from these questionnaire results.

What is the first half of your business postcode (e.g. CF1) ? We use this to better understand the responses to the consultation by looking at where people work.

NP11 3EH	NP12	NP11 3PL	NP11	NP12	NP11
NP12	NP11	CF82	NP11	NP13	NP11
NP12	NP11	NP12	NP11	np12	NP13
NP11	NP11				

Position within the business:



If other, please specify:

Assistant plant manager & Transport Manager
Env, H & S Co-Ordintaor

Hafodyrnys Business Questionnaire

Please can you confirm the following:



What type of organisation are you representing?



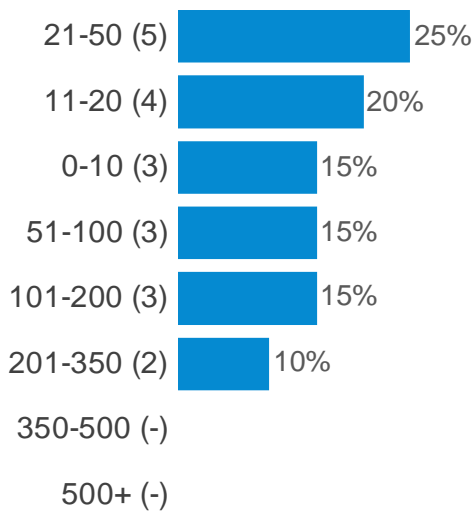
If other, please specify

Laundry Facility (Nuclear)

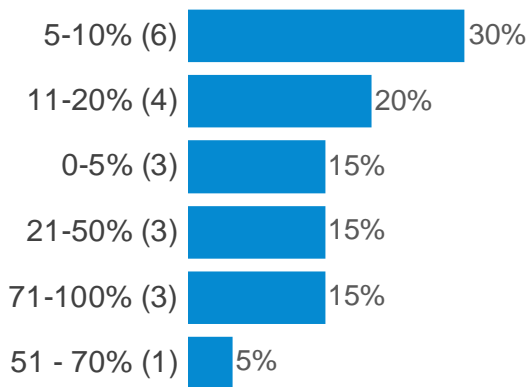
groundworks, demolition, aggregate recycling

Hafodyrynys Business Questionnaire

What is the total number of employees within your local branch?



Approximately what percentage of your workforce currently commutes to work via the A472 where the proposed Clean Air Zone (CAZ) would be located?



Does your business provide vehicles for staff i.e. pool cars/business vehicles?

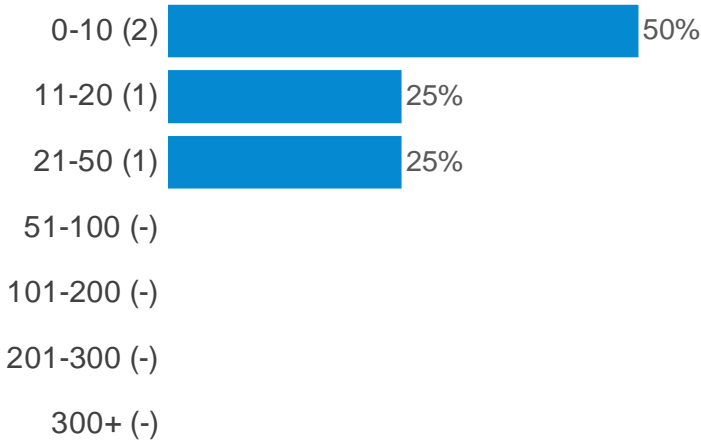


If you have answered yes to Q8, please state how many business vehicles you have:

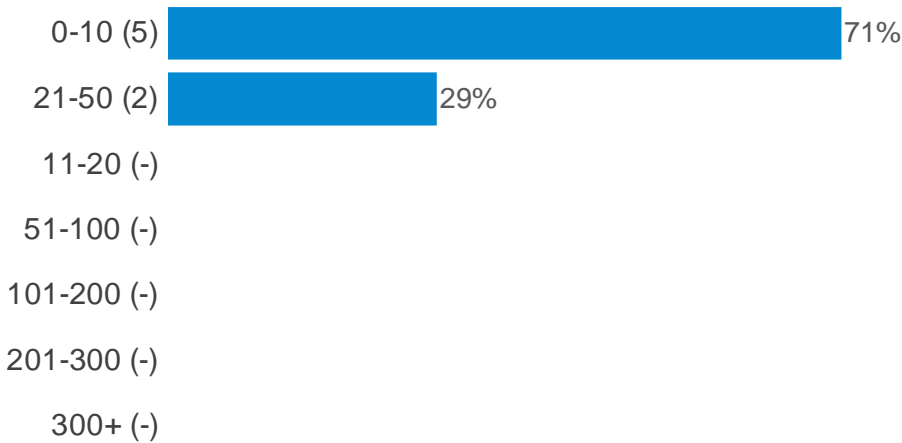
4	65
Three cars	1
8	1
35	

Hafodyrnys Business Questionnaire

To help us understand your fleet composition, please could you advise how many vehicles per each category below: (HGV)



To help us understand your fleet composition, please could you advise how many vehicles per each category below: (Van)



To help us understand your fleet composition, please could you advise how many vehicles per each category below: (Coach)

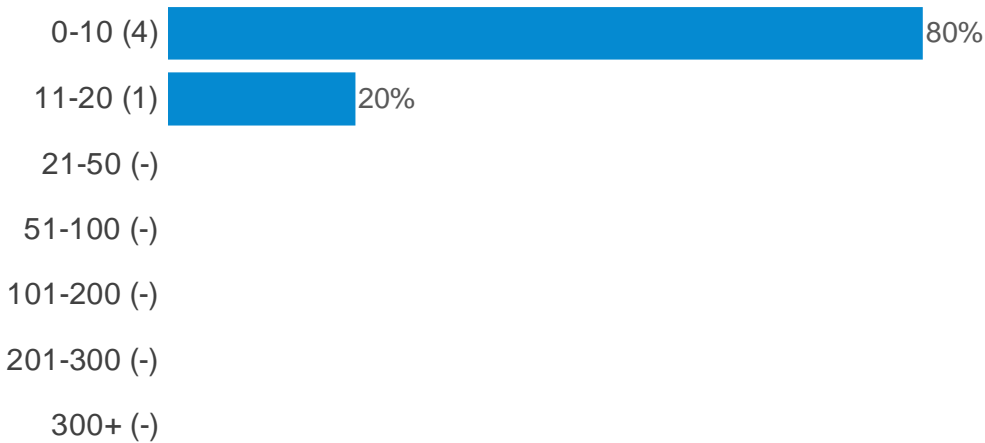


Hafodyrnys Business Questionnaire

To help us understand your fleet composition, please could you advise how many vehicles per each category below: (Bus)



To help us understand your fleet composition, please could you advise how many vehicles per each category below: (Car)



To help us understand your fleet composition, please could you advise how many vehicles per each category below: (Motorcycle/Moped)



Hafodyrynys Business Questionnaire

To help us understand your fleet composition, please could you advise how many vehicles per each category below: (Minibus)

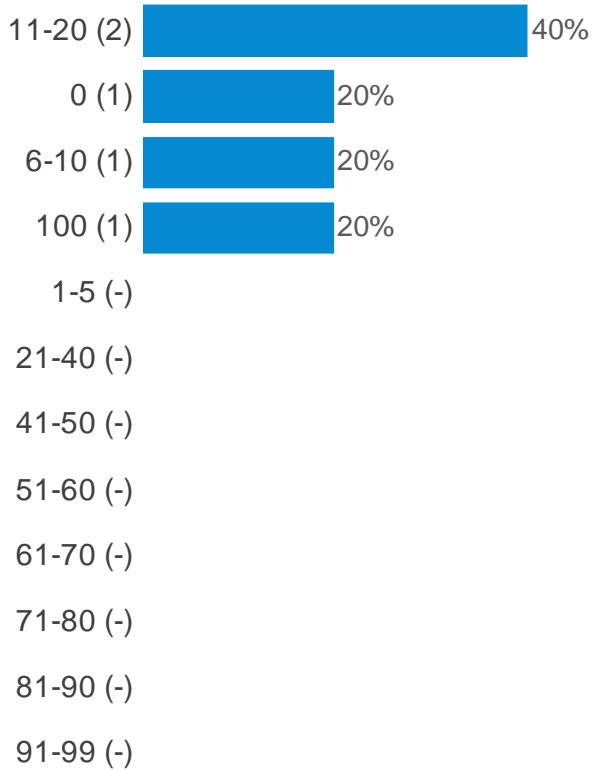


To help us understand your fleet composition, please could you advise how many vehicles per each category below: (LGV)



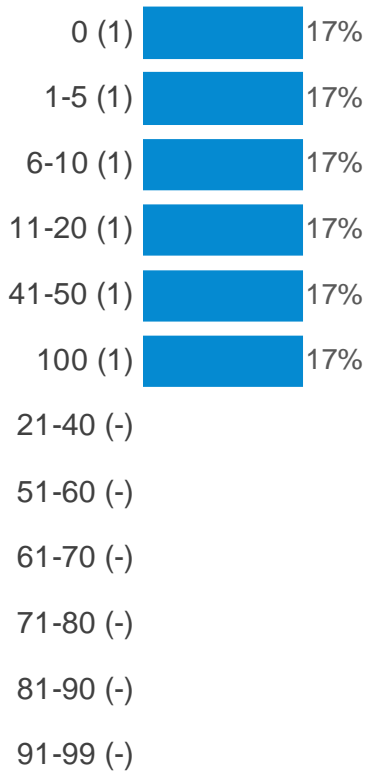
Hafodyrynys Business Questionnaire

Following on from question 10, please could you indicate what percentage of your vehicles (if any), are compliant with the following euro emission standard for each vehicle category below: (HGV Euro 6 diesel)



Hafodyrnys Business Questionnaire

Following on from question 10, please could you indicate what percentage of your vehicles (if any), are compliant with the following euro emission standard for each vehicle category below: (Van Euro 4 Petrol/Euro 6 diesel)



Hafodyrnys Business Questionnaire

Following on from question 10, please could you indicate what percentage of your vehicles (if any), are compliant with the following euro emission standard for each vehicle category below: (Coach Euro 6 diesel)



Hafodyrnys Business Questionnaire

Following on from question 10, please could you indicate what percentage of your vehicles (if any), are compliant with the following euro emission standard for each vehicle category below: (Bus Euro 6 diesel)



Hafodyrnys Business Questionnaire

Following on from question 10, please could you indicate what percentage of your vehicles (if any), are compliant with the following euro emission standard for each vehicle category below: (Car Euro 4 petrol/Euro 6 diesel)



Hafodyrnys Business Questionnaire

Following on from question 10, please could you indicate what percentage of your vehicles (if any), are compliant with the following euro emission standard for each vehicle category below: (Motorcycle/Moped Euro 4 petrol/Euro 6 diesel)



Hafodyrnys Business Questionnaire

Following on from question 10, please could you indicate what percentage of your vehicles (if any), are compliant with the following euro emission standard for each vehicle category below: (Minibus Euro 4 petrol/ Euro 6 diesel)

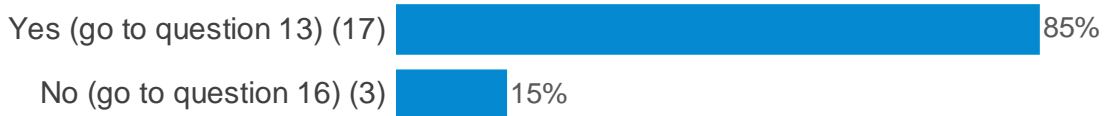


Hafodyrnys Business Questionnaire

Following on from question 10, please could you indicate what percentage of your vehicles (if any), are compliant with the following euro emission standard for each vehicle category below: (LGV Euro 6 diesel)

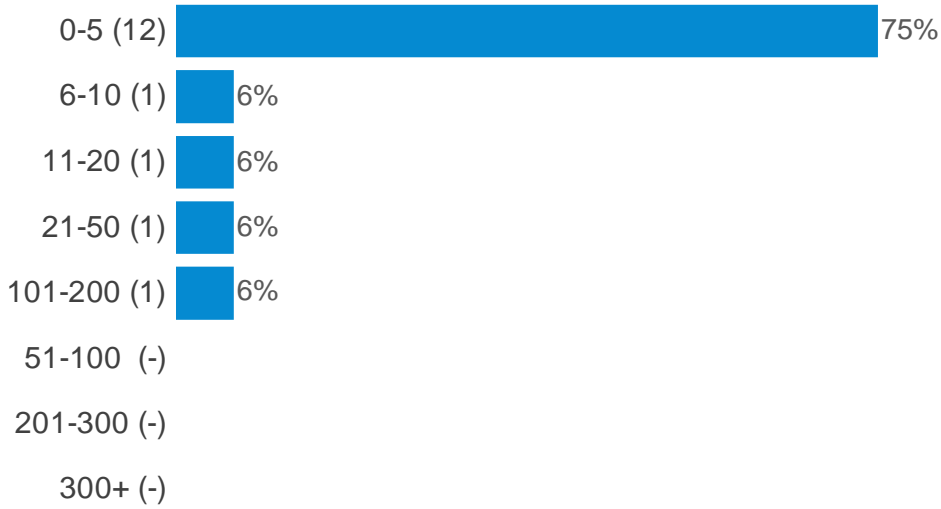


Does your business deliver to customers (business and private) via the A472?

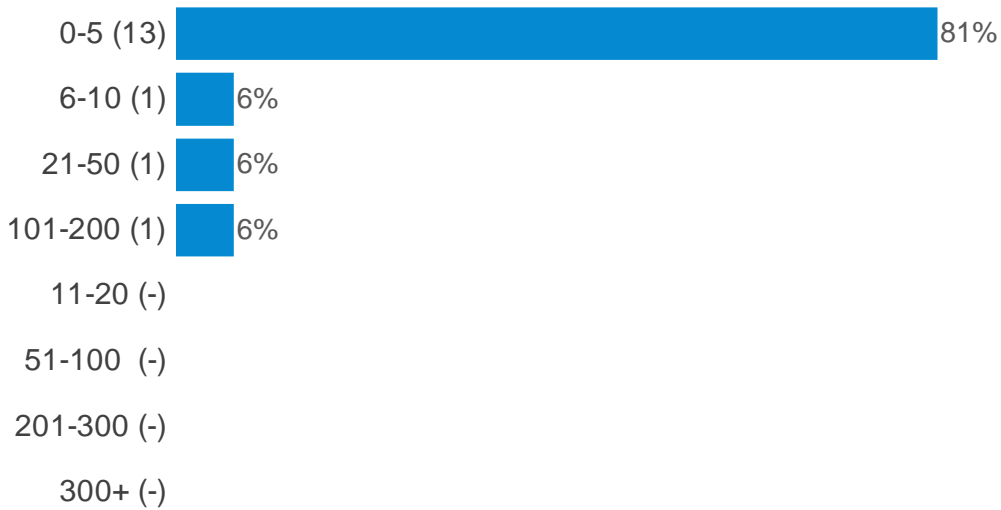


Hafodyrnys Business Questionnaire

How many deliveries does your business make in a typical week that travel through the A472? (Please select the number of delivers per day) (Monday)

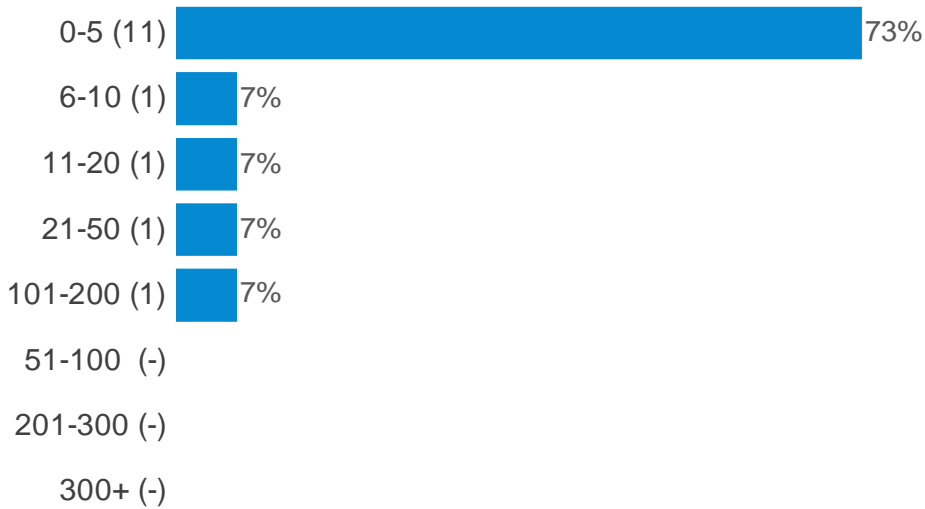


How many deliveries does your business make in a typical week that travel through the A472? (Please select the number of delivers per day) (Tuesday)

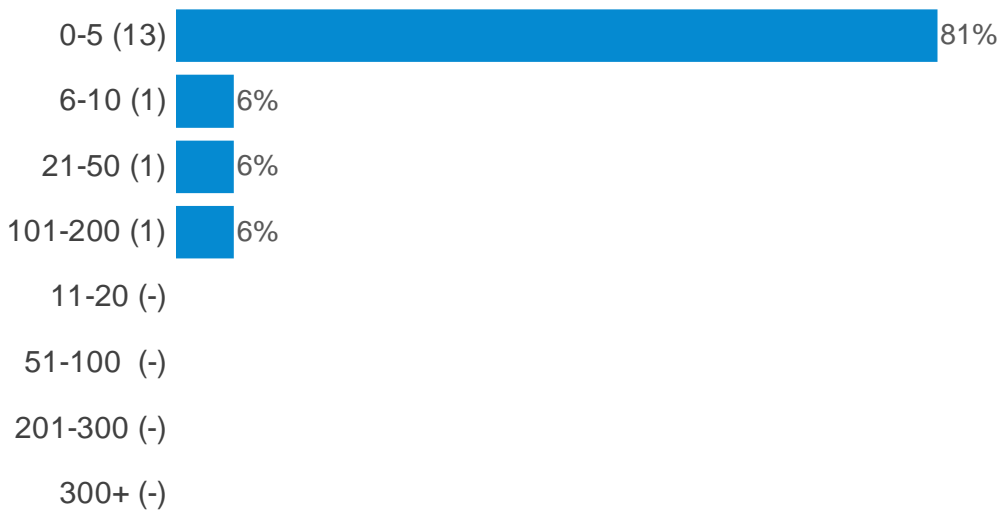


Hafodyrnys Business Questionnaire

How many deliveries does your business make in a typical week that travel through the A472? (Please select the number of delivers per day) (Wednesday)

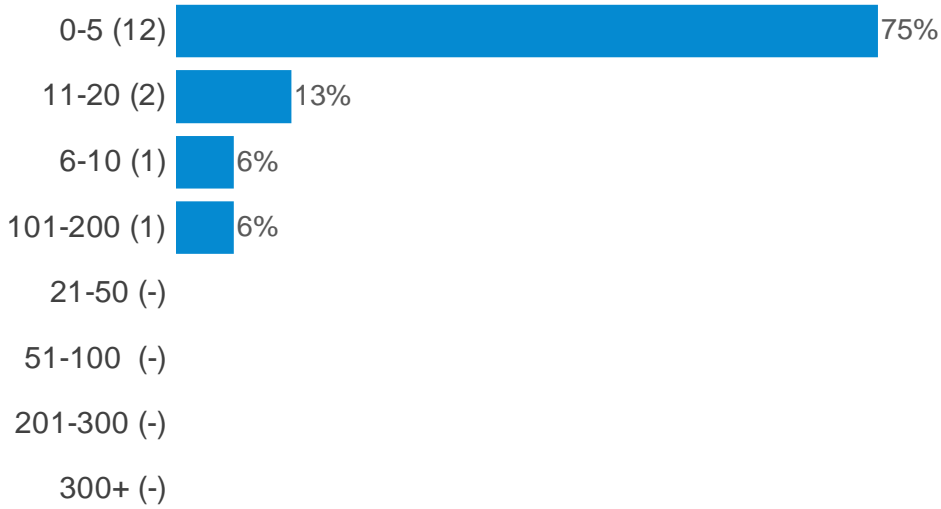


How many deliveries does your business make in a typical week that travel through the A472? (Please select the number of delivers per day) (Thursday)

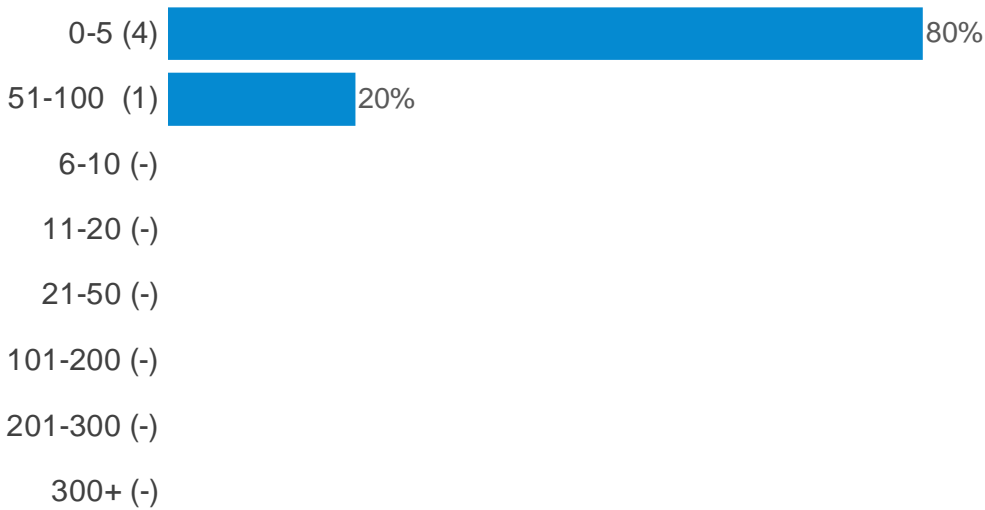


Hafodyrnys Business Questionnaire

How many deliveries does your business make in a typical week that travel through the A472? (Please select the number of delivers per day) (Friday)

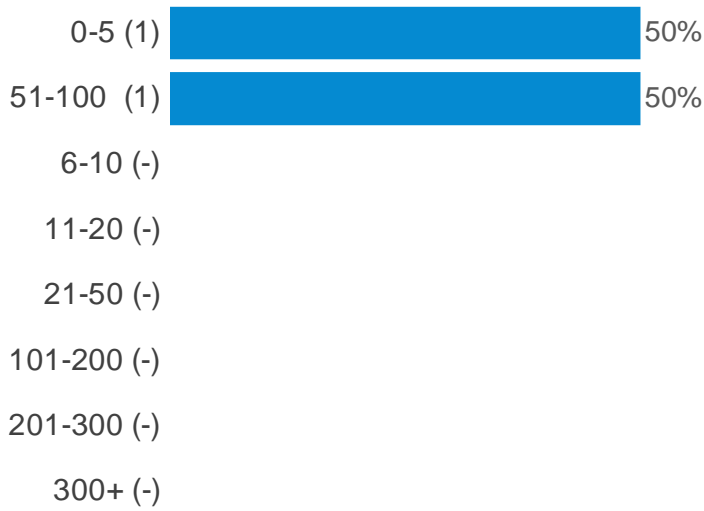


How many deliveries does your business make in a typical week that travel through the A472? (Please select the number of delivers per day) (Saturday)



Hafodyrynys Business Questionnaire

How many deliveries does your business make in a typical week that travel through the A472? (Please select the number of delivers per day) (Sunday)



How many of the above deliveries would take place during the morning peak traffic times (between 07:00 and 10:00) ?

- 3 - 5
- 2
- 0
- 2
- Variable Not quantifiable
- Somewhere in the region of 150 deliveries across 5 vehicles
- 2
- 10%
- 1-2
- 20%
- NONE
- 22
- 3
- 2
- Typically this would be "0" as most of our bookings are in the afternoon.
- zero

Hafodyrynys Business Questionnaire

How many of the above deliveries would take place during the evening peak traffic times (between 16:00 and 19:00)?

10 - 15

1

0

2

Variable , not quantifiable

5 Vehicles carrying an estimate of 30 deliveries

0

10%

0

20%

50 %

2

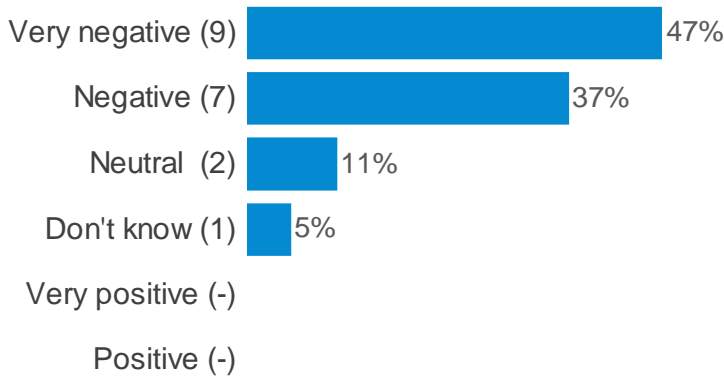
0

0

Collections are usually booked for the afternoon around midday - 1pm. Guess it may be 0-1 per day.

50%

What impact do you feel restricting access to vehicles along the A472 would have on your business?



A proposed Clean Air Zone could be similar to the London's Low Emission Zone (LEZ), which also imposes a defined boundary which the most polluting vehicles are charged for entering. With this in mind, do you think the London LEZ charges for the vehicles that do not meet the minimum emission requirements are too much, too little, or about right for Caerphilly's Clean Air Zone? (HGVs £100)



Hafodyrynys Business Questionnaire

A proposed Clean Air Zone could be similar to the London's Low Emission Zone (LEZ), which also imposes a defined boundary which the most polluting vehicles are charged for entering. With this in mind, do you think the London LEZ charges for the vehicles that do not meet the minimum emission requirements are too much, too little, or about right for Caerphilly's Clean Air Zone? (Buses £100)



A proposed Clean Air Zone could be similar to the London's Low Emission Zone (LEZ), which also imposes a defined boundary which the most polluting vehicles are charged for entering. With this in mind, do you think the London LEZ charges for the vehicles that do not meet the minimum emission requirements are too much, too little, or about right for Caerphilly's Clean Air Zone? (Coaches £100)



A proposed Clean Air Zone could be similar to the London's Low Emission Zone (LEZ), which also imposes a defined boundary which the most polluting vehicles are charged for entering. With this in mind, do you think the London LEZ charges for the vehicles that do not meet the minimum emission requirements are too much, too little, or about right for Caerphilly's Clean Air Zone? (Taxis £12.50)

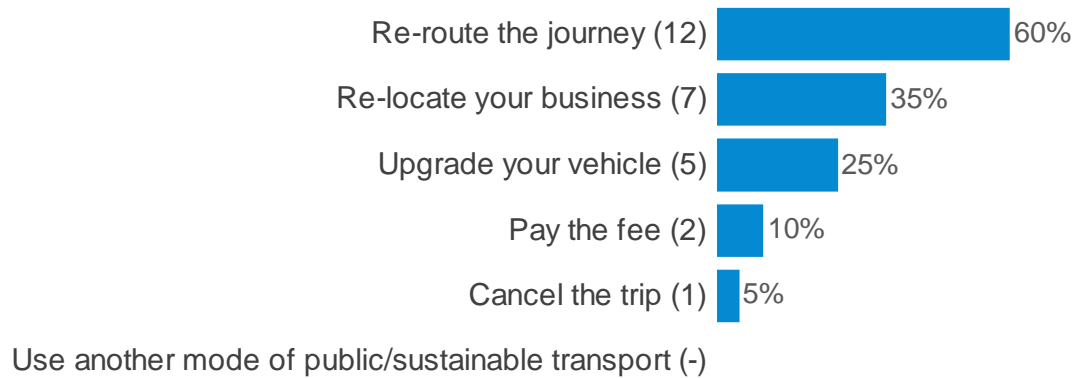


Hafodyrynys Business Questionnaire

A proposed Clean Air Zone could be similar to the London's Low Emission Zone (LEZ), which also imposes a defined boundary which the most polluting vehicles are charged for entering. With this in mind, do you think the London LEZ charges for the vehicles that do not meet the minimum emission requirements are too much, too little, or about right for Caerphilly's Clean Air Zone? (Private vehicles £12.50)



If there was a daily charge at the above rates, how would you be most likely to respond?



Do you feel your suppliers and/or customers will be affected by potential vehicle access restrictions on the A472?

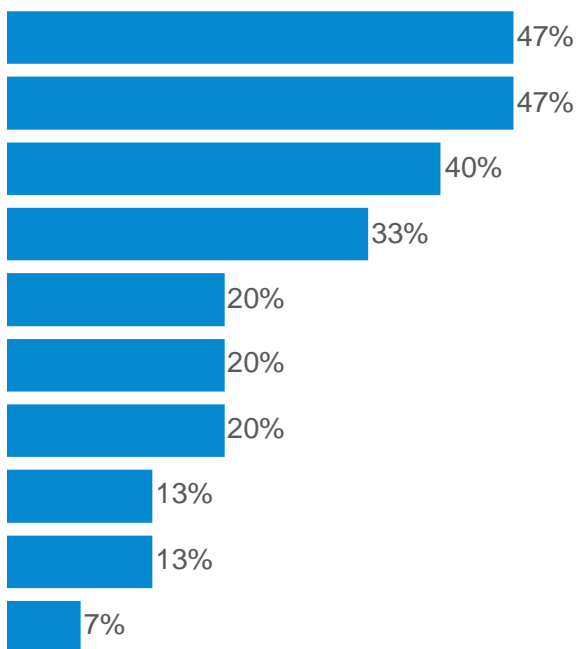


Hafodyrynys Business Questionnaire

If you answered yes to question 19, please indicate why you think that this is the case in the space provided below:

- Delays to delivery schedules and cancellation of work (due to the increased impact on drivers hours)
- Any additional costs incurred would need to be passed on.
- Increased journey length / time
- Critical shipments and turnaround times to nuclear power station sites across UK.
- Deliveries and couriers will travel their own routes and any charges will impact on pricing all ways
- This road is used as our main access to the M4 and M50, Raw materials are delivered daily
- Any costs put onto our suppliers will eventually make its way to us.
- Our customers have many options of who to buy from Cost is critical in our business.
- IT WOULD MAKE MY BUSINESS LESS ACCESSIBLE TO BOTH CUSTOMERS AND SUPPLIERS
- Potential delays in receiving their deliveries/collections
- Additional costs and delivery schedules
- Delay of goods and or expensive to travel here
- costs would passed on to the customer; they might go elsewhere - detrimental to the business
- their company would be less productive
- Would affect companies delivering products which are seeking approval from us
- Increased charges to business from suppliers/couriers.
- We would have to relocate outside as this would push our prices up which would cripple our business

What steps (if any) has your business already taken to reduce air pollution? (tick all that apply)



If other, please specify

All of our HGVs are post 2014 build, so are fitted with Adblue NOx reduction equipment.

None apply

Vehicle renewal plans in place which replaces older vehicles with new.

We are a welsh government gold Corporate Health Standard Company and have ISO 14001 also cycle to wo

Do you have any further comments or suggestions relating to the improvement of air quality along the A472 and what it means for your business?

Restricting traffic or imposing a chargeable clean air zone will only move this problem South.

No, not my area of expertise

Demolition of the properties on south side of the A472 as only long term feasible solution .

we supply the whole bereavement services U.K. wide.Only other, road infrastructure improved to m4

We're committed to replacing the fleet in line to a minimum of euro 6 compliance.

Access should be improved not restricted, S.wales is already disadvantaged by infrastructure.

DUEL CARRAGE WAY FOR THE WHOLE A472 FROM CRUMLIN TO PONTYPOOL.

NONE

The Residents should be relocated, then action plan to demolish in due course.

For the residents it would be better if the houses were demolished, it is clearly affecting them.

I've tried to put comment in this field but not enough room!

I am very sympathetic to the residents, something must be done to improve air quality

The effect on local business could be dramatic with extra charges on services. Employees re-routing

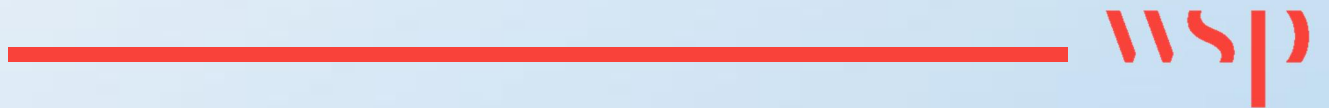
All options currently proposed will make Caerphilly and Blaenau Gwent unattractive to business

I confirm that I wish to submit the information entered into this form to Caerphilly County Borough Council. I understand that this information to be collated via Snap Surveys, a third party organisation (<https://www.snapsurveys.com/survey-software/privacy-policy-uk/>) and for it to be used as described in Caerphilly County Borough Council's privacy notice (<https://www.caerphilly.gov.uk/CaerphillyDocs/FOI/PrivacyNotices/Privacy-Notice-Consultations-Surveys.aspx>).

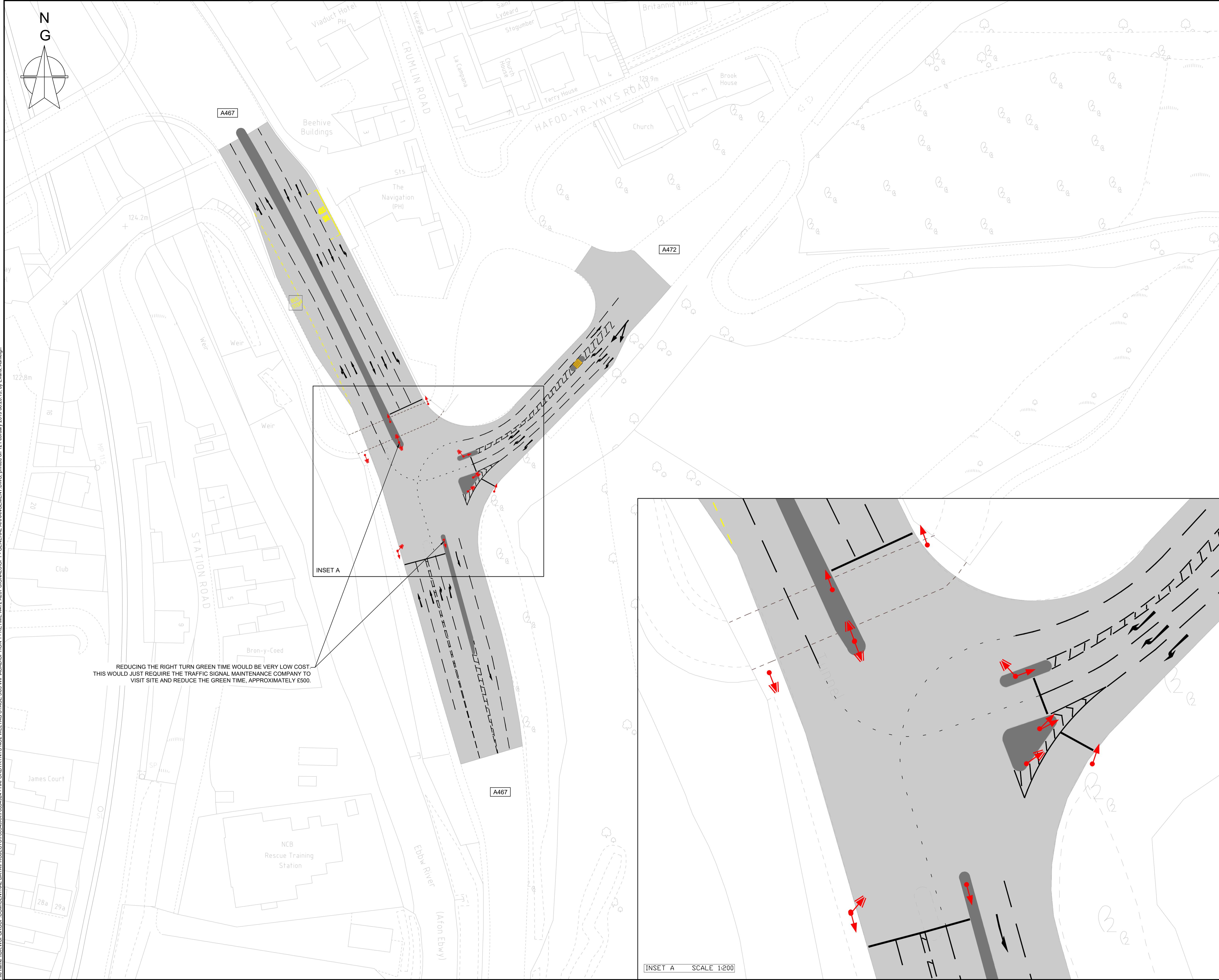
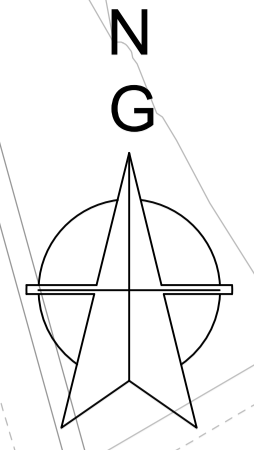


Appendix C

OPTION DRAWINGS



File name: \\UK.WSPGROUP.COM\CENTRAL_DATA\PROJECTS\70054924 - HAFODYRNYNS NO2 WELTAG STAGE 3003 WIP\ACAD\OPTION 1 - RETIME A472 A467 SIGNALS\OP1 - GENERAL ARRANGEMENT.DWG, printed on 12 February 2019 08:20:13, by Ewan.Ashleigh



REDUCING THE RIGHT TURN GREEN TIME WOULD BE VERY LOW COST. THIS WOULD JUST REQUIRE THE TRAFFIC SIGNAL MAINTENANCE COMPANY TO VISIT SITE AND REDUCE THE GREEN TIME, APPROXIMATELY £500.

INSET A SCALE 1:200

- NOTES**
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 6. CONTRACTOR TO ESTABLISH ALL UTILITY AND DRAINAGE LOCATIONS AND COORDINATE SAFE WORKING PROCEDURES BEFORE ANY EXCAVATION WORKS TAKE PLACE.
 7. THE WORKS SHALL BE PROGRAMMED TO ENSURE A CLEAR FOOTWAY IS AVAILABLE FOR PEDESTRIANS THROUGHOUT THE WORKS.
 8. DIAGRAM NUMBERS TO TSROD REFER TO THOSE SET OUT IN THE TRAFFIC SIGNS REGULATIONS AND GENERAL DIRECTIONS 2016.
 9. ALL ROAD MARKINGS ARE TO BE WHITE THERMOPLASTIC SCREED UNLESS STATED OTHERWISE.
 10. THE KERB AND THRESHOLD LEVELS SHOULD NOT BE ALTERED BY THE RE-SURFACING OF THE FOOTWAY.

- KEY**
- PRIMARY SIGNAL HEAD
 - SECONDARY SIGNAL HEAD

PO1	01/01/1901	XXX	FIRST ISSUE		XXX	XXX
REV1	DATE	BY	DESCRIPTION		CHK	APP

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ARCHITECT:

SITE/PROJECT: **HAFODYRNYNS, CAERPHILLY**

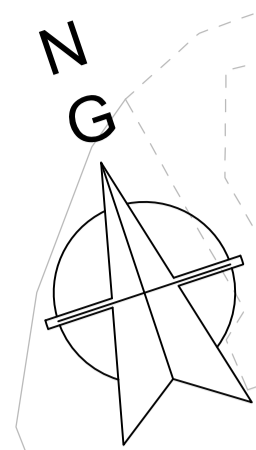
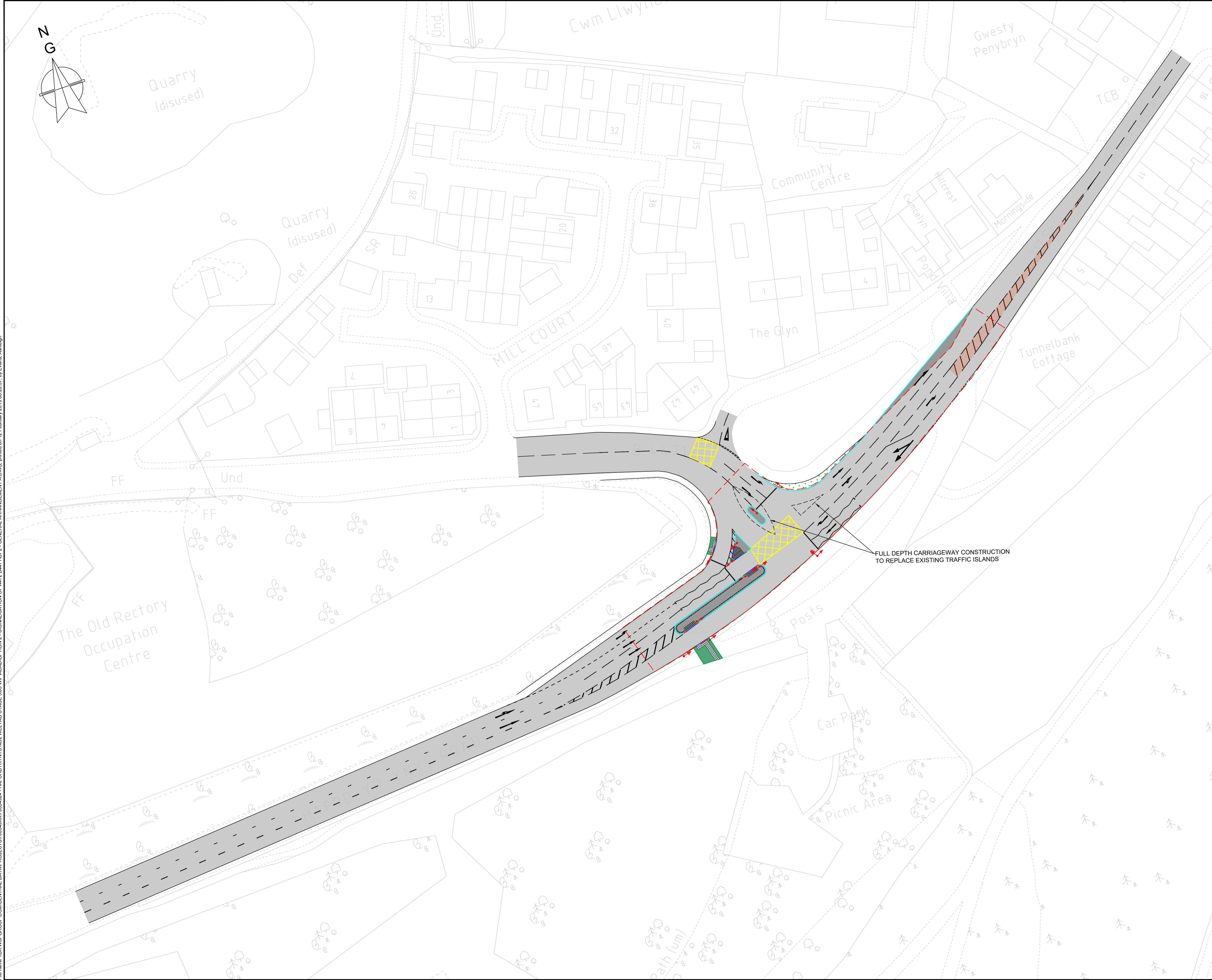
TITLE: **OPTION 1 - RETIMING OF A472/A467
SIGNALISED JUNCTION
GENERAL ARRANGEMENT**

SCALE @ A1:	1:500	CHECKED:	RM	APPROVED:	DM
PROJECT NO:	70054924	DESIGNED:	AE	DATE:	February 19

DRAWING NO:	70054924-OP1-100	REV:	P01
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File name: \\UK.WSPGROUP.COM\CENTRAL_DATA\PROJECTS\70054924 - HAFODRYRNYNS NO2 WELTAG STAGE 3\03 WIP\ACAD\OPTION 2 - SIGNALISATION OF A472 B447\OP2 - GENERAL ARRANGEMENT A.DWG, printed on 12 February 2019 08:20:57, by Evans, Ashleigh



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 - DIAGRAM NUMBERS TO TSRGD REFER TO THOSE SET OUT IN THE TRAFFIC SIGNS REGULATIONS AND GENERAL DIRECTIONS 2016.
 - ALL ROAD MARKINGS ARE TO BE WHITE THERMOPLASTIC SCREED UNLESS STATED OTHERWISE.
 - THE KERB AND THRESHOLD LEVELS SHOULD NOT BE ALTERED BY THE RE-SURFACING OF THE FOOTWAY.

- KEY**
- PRIMARY SIGNAL HEAD (8 no.)
 - SECONDARY SIGNAL HEAD (5 no.)
 - PEDESTRIAN GUARDRAIL (57 Lin.m)
 - 400mm x 400mm RED BLISTER TACTILE PAVING FOR CONTROLLED CROSSING POINTS
 - DROPPED KERBS (21.6m 24 units)
 - RIGHT TRANSITION KERB (5.4 Lin.m 6 units)
 - LEFT TRANSITION KERB (5.4 Lin.m 6 units)
 - HB2 KERB (172.5 Lin.m)
 - EXISTING CARRIAGEWAY RESURFACING EXTENTS (2350m²)
 - RE-SURFACING FLEXIBLE FOOTWAY CONSTRUCTION (41m²)
SURFACE COURSE: 20mm THICK 6mm NOMINAL SIZE TO BSEN13108:PART 1: CLAUSE 7.6 WITH 160/220 PEN ASPHALT CONCRETE BINDER AND IN ACCORDANCE WITH CLAUSE 912 OF THE SPECIFICATION FOR HIGHWAY WORKS 1996, AS AMENDED.
 - 500mm OF TOPSOIL AND GRASS SEEDING (78.7m²)
 - EXISTING CARRIAGEWAY
 - PROPOSED FULL CARRIAGEWAY CONSTRUCTION (56.5m²)

PO1	01/01/1901	XXX	FIRST ISSUE	XXX	XXX
REV1	DATE	BY	DESCRIPTION	CHK	APP

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SITE/PROJECT: HAFODRYRNYNS, CAERPHILLY

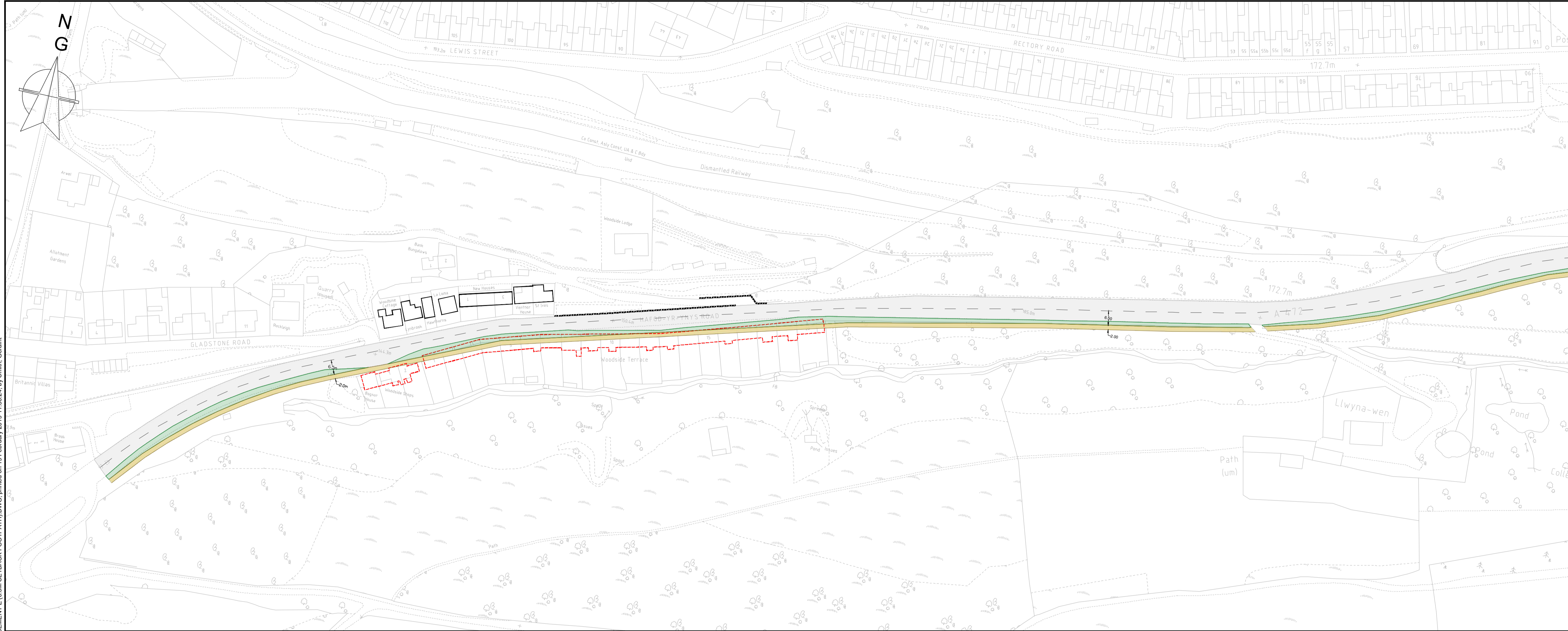
TITLE: OPTION 2 - SIGNALISATION OF A472/B4471
PRIORITY T- JUNCTION
GENERAL ARRANGEMENT

SCALE @ A1: 1:500	CHECKED: RM	APPROVED: DM
PROJECT NO: 70054924	DESIGNED: AE	DATE: February 19

DRAWING NO: 70054924-OP2-100	REV: P01
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File name: I:\UK\WSP\GROUP\COMMON\CENTRAL DATA\PROJECTS\70054924 - HAFODYRYNYS N02 WELTAG STAGE 3\03 WIP\ACAD\OPTION 5 - DEMOLITION OF A472 PROPERTIES\OP5 - GENERAL ARRANGEMENT E (6.5M SETBACK FOOTPATH).DWG, printed on 19 February 2019 11:36:24, by Smith, Geraint



- NOTES**
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 9. ALL ROAD MARKINGS ARE TO BE WHITE THERMOPLASTIC SCREED UNLESS STATED OTHERWISE.
 10. THE KERB AND THRESHOLD LEVELS SHOULD NOT BE ALTERED BY THE RE-SURFACING OF THE FOOTWAY.

- KEY**
- FULL 'FLEXIBLE' FOOTWAY CONSTRUCTION: (634m²)
SURFACE COURSE: 20mm THICK, 6mm NOMINAL SIZE TO BS EN 12185 PART 1, CLAUSE 7.6 WITH 160/220 PEN ASPHALT CONCRETE BINDER AND IN ACCORDANCE WITH CLAUSE 912 OF THE SPECIFICATION FOR HIGHWAY WORKS 1998, AS AMENDED.
BINDER COURSE: 50mm THICK, 20mm NOMINAL SIZE ASPHALT CONCRETE
SUB-BASE: 150mm GRANULAR SUB-BASE
 - EXISTING RETAINING WALL STRUCTURE
 - EXISTING PROPERTIES TO BE DEMOLISHED
 - EXISTING PROPERTIES TO REMAIN
 - 500mm OF TOPSOIL, GRASS SEEDING & PLANTING
 - EDGING KERB

PO1	01/01/1901	XXX	FIRST ISSUE		XXX	XXX
REV1	DATE	BY	DESCRIPTION		CHK	APP

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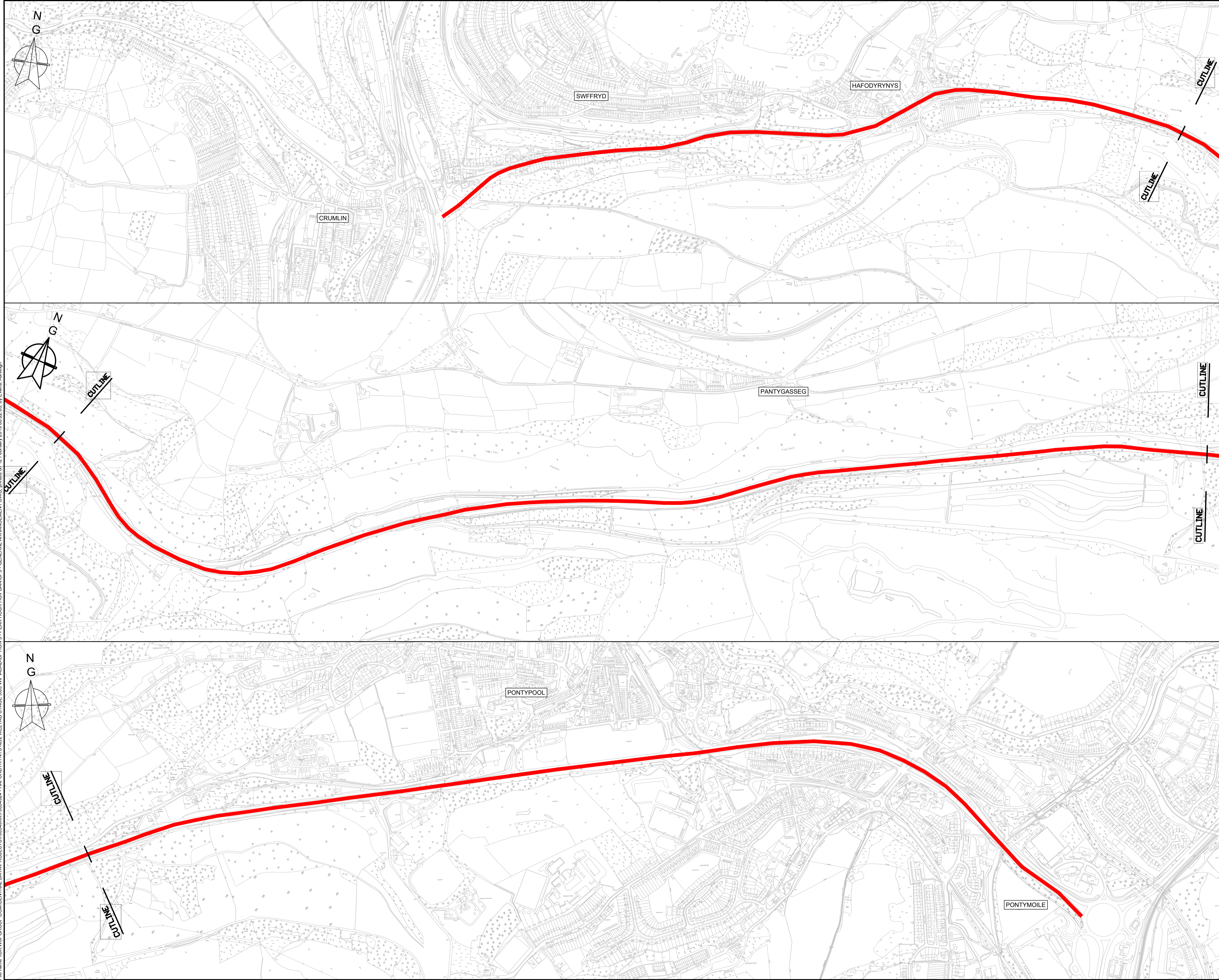
CLIENT: **CAERPHILLY COUNTY BOROUGH COUNCIL**

ARCHITECT:

SITE/PROJECT: **HAFODYRYNYS, CAERPHILLY**

TITLE: **Option 3 - Demolition of Dwellings at Woodside Terrace**

SCALE @ A1:	CHECKED:	APPROVED:
1:500	RM	DM
PROJECT NO:	DESIGNED:	DRAWN:
70054924	GS	GS
		DATE:
		February 19
DRAWING NO:		REV:
70054924-		P01
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 10. THE KERB AND THRESHOLD LEVELS SHOULD NOT BE ALTERED BY THE RE-SURFACING OF THE FOOTWAY.

KEY

█ PEAK HOUR HGV BAN ZONE

File name: \\UK.VSPGROUP.COM\CENTRAL_DATA\PROJECTS\70054924 - HAFODYRYNYS NO2 WELTAG STAGE 3\03 WPA\ACAD\OPTION 3 - PEAK HOUR HGV BAN\OP3 - GENERAL ARRANGEMENT.DWG, printed on 12 February 2019 09:22:03, by Evans, Ashleigh

PO1	01/01/1901	XXX	FIRST ISSUE		XXX	XXX
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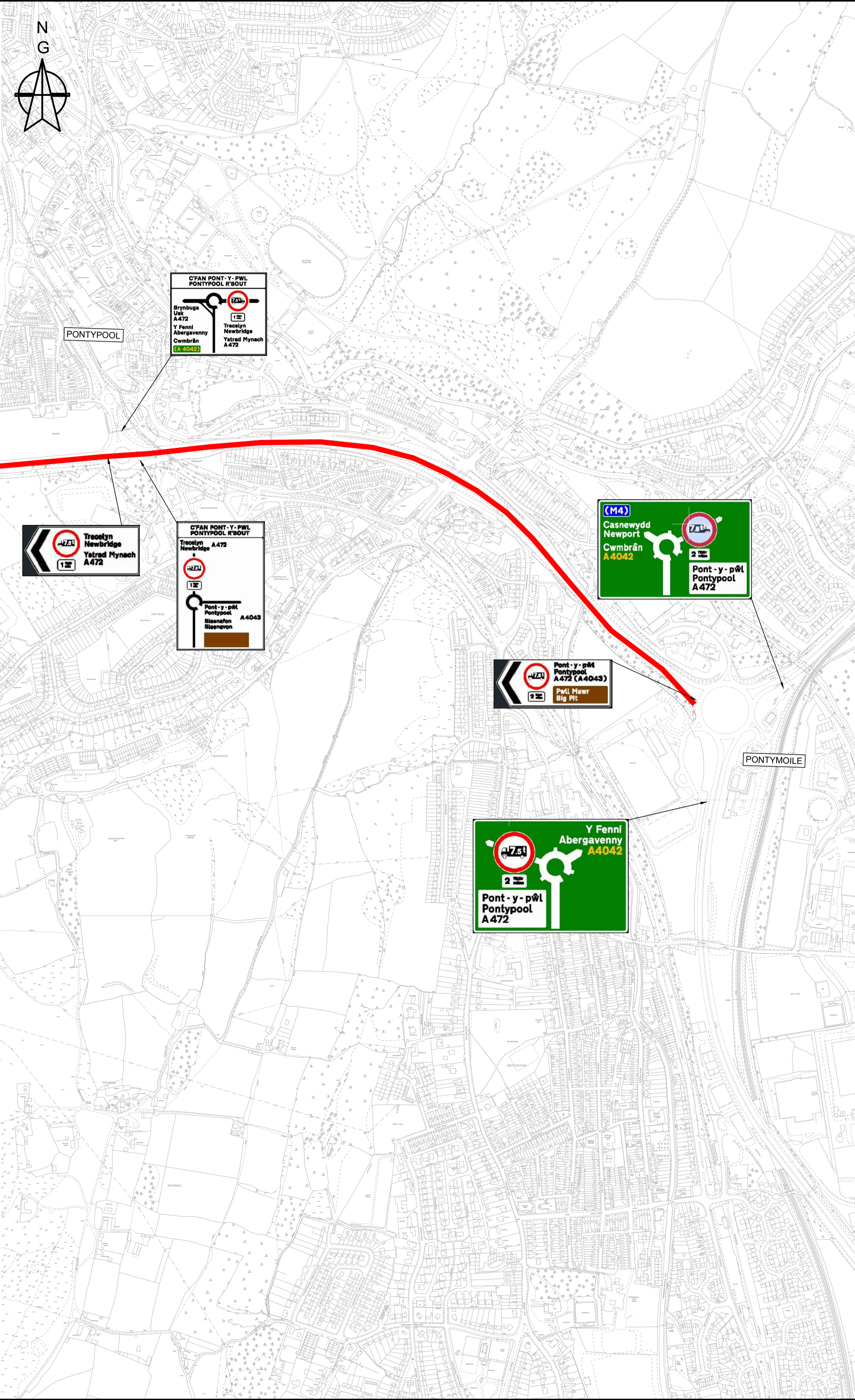
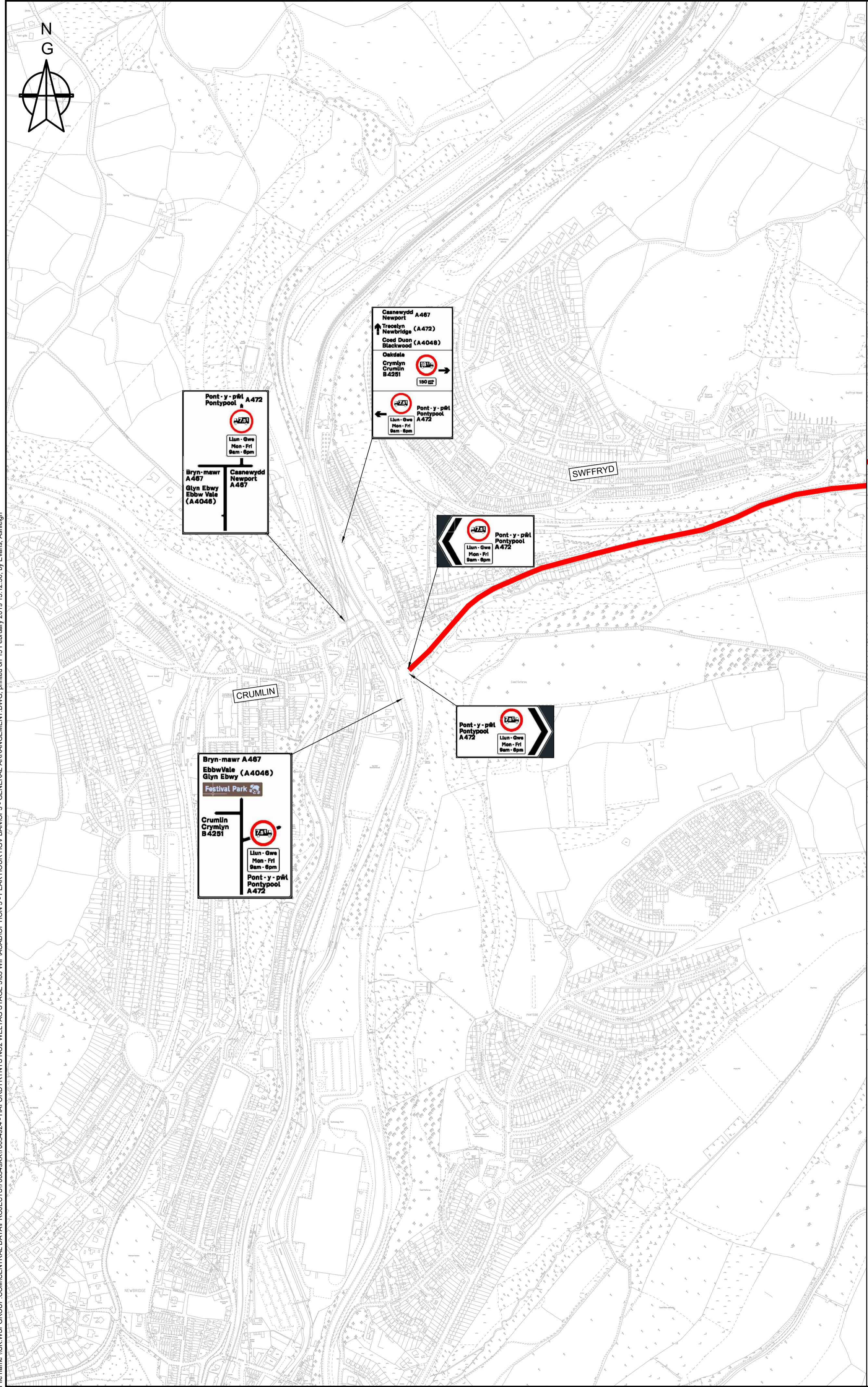
TITLE: Option 4 PEAK HOUR HGV BAN
GENERAL ARRANGEMENT
SHEET 1

SCALE @ A1: 1:5000	CHECKED: RM	APPROVED: DM
PROJECT NO: 70054924	DESIGNED: AE	DRAWN: AE
		DATE: February 19

DRAWING NO: 70054924-OP3-100-1	REV: P01
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KEY

— PEAK HOUR HGV BAN ZONE

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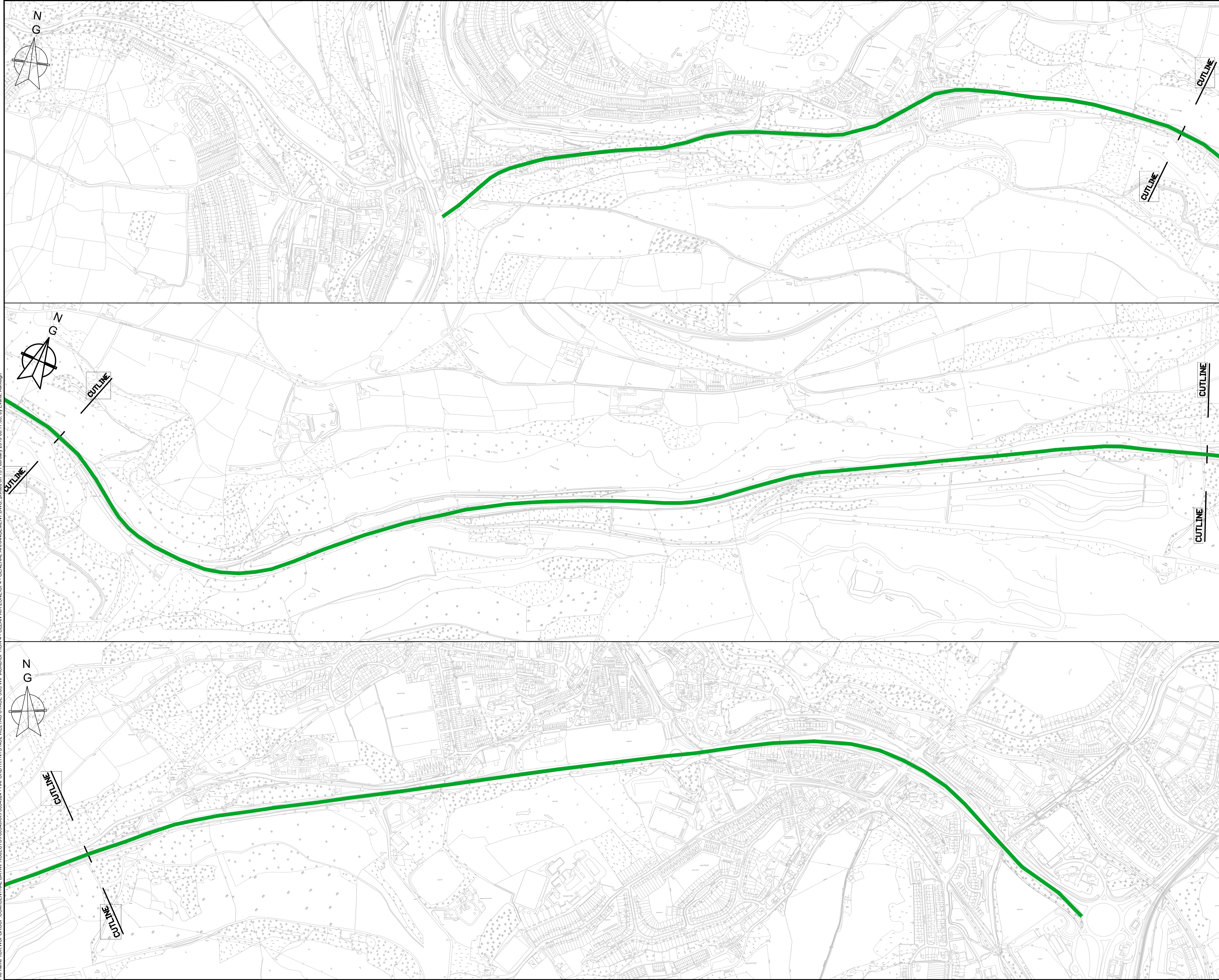
SITE/PROJECT: HAFODYRYNYS, CAERPHILLY

TITLE: Option 4 - PEAK PERIOD HGV BAN
GENERAL ARRANGEMENT
SHEET 2

SCALE @ A1:	CHECKED:	APPROVED:
1:5000	RM	DM
PROJECT NO:	DESIGNED:	DRAWN:
70054924	AE	AE
		DATE:
		February 19

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KEY

█ AREA OF CLEAN AIR ZONE IMPLEMENTATION

File name: I:\UK\WSP\GROUP\COM\CENTRAL DATA\PROJECTS\70054924 - HAFODYRNYNS NO2 WELTAG STAGE 303 WPA\ACAD\OPTION 4 - CLEAN AIR ZONE\OP4 - GENERAL ARRANGEMENT.DWG, printed on 13 February 2019 08:17:03, by Evans, Ashleigh

PO1	01/01/1901	XXX	FIRST ISSUE		XXX	XXX
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T+ 44 (0) 292 076 9200
wsp.com

CLIENT: **CAERPHILLY COUNTY BOROUGH COUNCIL**

ARCHITECT:

SITE/PROJECT: **HAFODYRNYNS, CAERPHILLY**

TITLE: **Option 5 - CLEAN AIR ZONE IMPLEMENTATION GENERAL ARRANGEMENT**

SCALE @ A1: 1:5000	CHECKED: RM	APPROVED: DM
PROJECT NO: 70054924	DESIGNED: AE	DRAWN: AE DATE: February 19

DRAWING NO: 70054924-OP4-100	REV: P01
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1 Capital Quarter
Tyndall Street
Cardiff
CF10 4BZ

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