Welsh Government

M4 NEWPORT J25-26 - WELTAG STAGE 2 REPORT

Consideration of interventions on the Welsh Government Trunk Road and Motorway Network for Nitrogen Dioxide reduction

70040135
JANUARY / FEBRUARY 2018

PUBLIC

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DRAFT (FINAL) PUBLIC

PROJECT NO. 70040135
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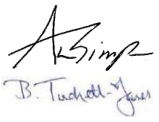
Signature					
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CONTENTS

TABLES

FIGURES

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 (NO_2).

In July 2017, the UK Government published its Air Quality Plan (the 2017 Plan) for tackling roadside NO_2 concentrations[1]. 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 4 zones under the Directive:

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

WSP have been commissioned by Welsh Government (WG) to undertake a WelTAG Stage 1 (Strategic Outline Case) and 2 (Outline Business Case) appraisals of potential Network Management measures for reducing NO_2 levels arising from traffic emissions at five separate locations on the Welsh Strategic Road Network. The five locations (and the respective zones) are:

- A494 Deeside (North Wales)
- A483 Wrexham (North Wales)
- A470 Upper Boat to Pontypridd (South Wales)
- M4 J41 – J42, Port Talbot (South Wales and Swansea)
- M4 J25 – J26, Newport (South Wales)

Given the differences between the five identified locations, five separate WelTAG Stage 1 reports have been produced. It is acknowledged that what might represent a practical measure in one location, might not be viable or deliverable in another. Therefore, the reports have been produced independently in parallel to ensure that the individual requirements of any one location do not dictate the measures considered at the others.

For parity with the Stage 1 reports, five separate WelTAG Stage 2 reports have been produced. All the reports are supported by the WelTAG Impact Assessment Report (IAR) and Effectiveness Review which are reported in separate documents from this Report.

1.2 STUDY CORRIDOR

This report presents the Stage 2: Outline Business Case of the WelTAG process for reducing the levels of NO_2 on the M4 motorway between J25-26 in South Wales through shortlisted network management measures. The other four locations are considered under separate cover.

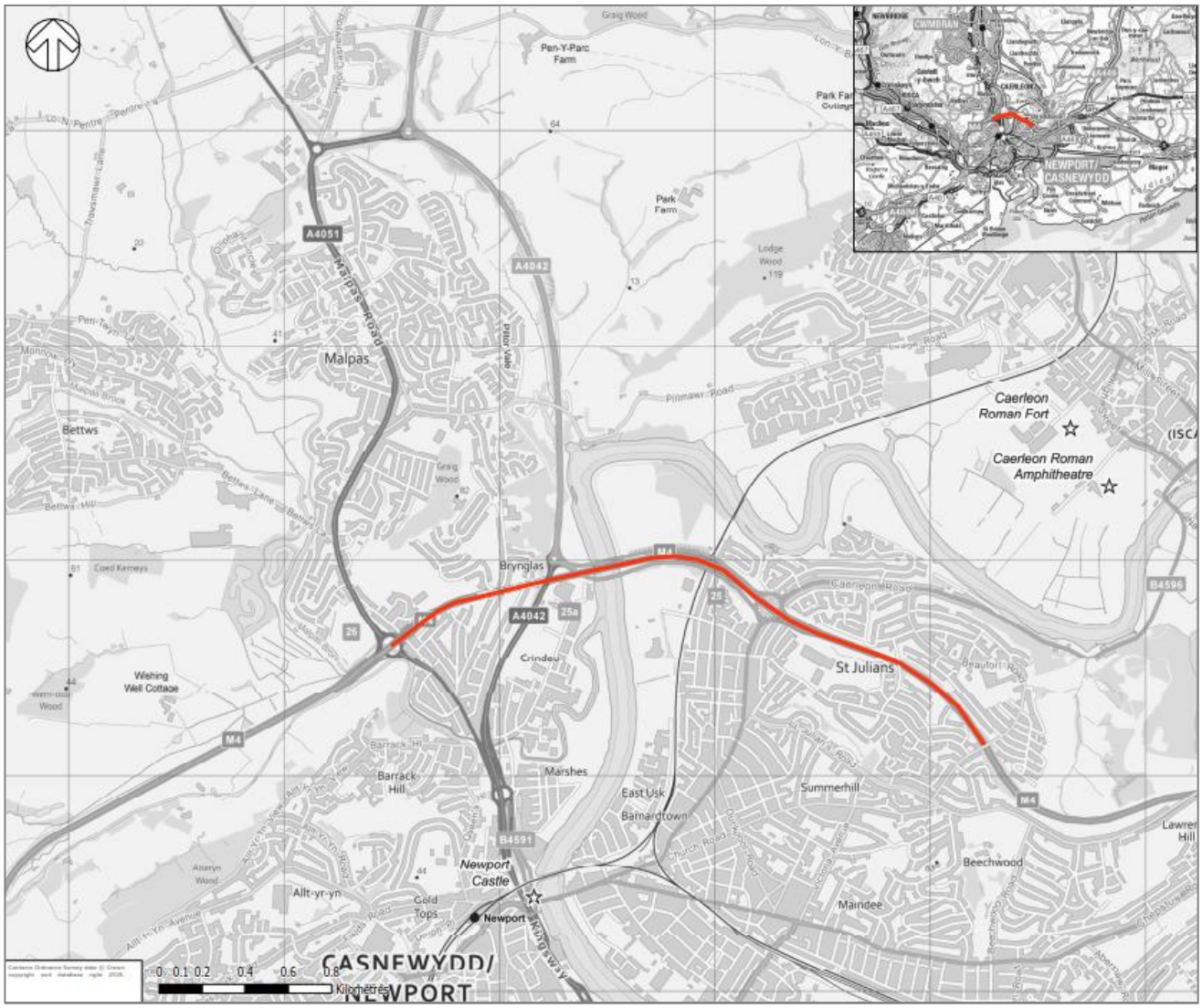
The M4 study corridor is located in Newport, which is the third largest city in Wales. The city forms part if the Cardiff-Newport metropolitan area, and is located on the River Usk close to its confluence with the Severn Estuary, approximately 19km northeast of Cardiff.

The study corridor considered in this report covers the principal corridor on the M4 motorway between the east of J25 (Caerleon Road) and J26 (Malpas Road). This is shown in Figure 1.

[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

The M4 study corridor assumed for the purposes of this WelTAG study is independent of the PCM model. Whilst the study corridor encompasses the links in the PCM model that have shown an exceedance in limit values, it is not limited to these. This acknowledges that the measures and their subsequent impacts may be realised beyond the identified area with NO_2 exceedances.

Figure 1: The Study Corridor



The study corridor is approximately 1.4km in length and has an east to west alignment. The length of the M4 study corridor between J25 and J26 is a 2 lane all-purpose motorway with the exception of a stretch on the eastbound carriageway reaching from J25A (Grove Park) to J25, which is a 3 lane all-purpose motorway. Westbound between J25 and J25A, there are also 3 lanes; however, Lane 1 forms the off-slip for J25A. The study corridor also features the Brynglas Tunnels, which carry the M4 motorway under Brynglas Hill, between J25A and J26.

1.3 APPROACH

The Draft WelTAG 2017 Guidance[2], which was out for consultation when this study commenced, is used as the basis for this appraisal. The guidance is significantly different to the 2008 version and provides a switch to the WG's Five Case Model for Public Sector Business Cases.
The Five Cases in the draft guidance are:

- **The strategic case**: the case for change, fit with other policies and objectives
- **The transport case**: the social and cultural, environmental, and economic impacts of the change including a value for money assessment
- **The delivery case**: can the scheme be delivered?
- **The financial case**: is the proposed spend affordable?
- **The commercial case**: how can the scheme be procured, is it attractive to the private sector, is it commercially viable?

The WelTAG guidance states that the purpose of the Stage 2: Outline Business Case is to:

'examine in greater detail the short list of options (measures) for tackling the problem under consideration'.

As such, this Stage 2: Outline Business Case report:

- Determines whether there are any transport measures that can address the identified problem(s) and can be delivered;
- Selects a preferred measure(s) to be taken forward to Stage Three (the Full Business Case);
- Agrees the methods to be used to provide additional evidence where required for the Stage Three (Full Business Case) assessment;
- Identifies any legislative requirements that need to be met during the Stage Three (Full Business Case) assessment; and,
- Documents the decisions of the Stage Two Review Group, and the basis for these decisions.

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. 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 objective of this study is to carry out an initial investigation and identify potential network management measures which will assist in bringing forward reductions in NO_2 in the shortest possible time to ensure compliance with the Air Quality Framework Directive requirements in five locations on the Welsh SRN listed above. Therefore, the transport case will focus on air quality and reflect the key considerations in relation to the EU Air Quality Directive and bringing forward compliance with limit values.

[2] Available at: https://consultations.gov.wales/sites/default/files/consultation_doc_files/161208-weltag-consultation-en.pdf Accessed 3rd November 2017

1.4 REPORT STRUCTURE

The structure of this Stage 2 report is as follows:

Chapter 2: Strategic case

This chapter presents a baseline of the existing situation, including an overview of legislation and policies and a description of the current EU Limit Value compliance status. It outlines the objective and the EU Air Quality Directive and includes an evidence-based description of the current problem. A brief commentary is provided regarding the development of the long list of measures and how they plan to address the current problem. Information is provided on how the Well-Being of Future Generation Act (2015) Goals, related Objectives and Ways of Working have been considered.

Chapter 3: 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 relevant WelTAG impact areas.

Chapter 4: Delivery case

This chapter identifies the WelTAG Review Group and the delivery arrangements of any potential measures.

Chapter 5: Financial case

This chapter provides a high level analysis of 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.

The conclusion of this Stage 2 report includes a list of preferred measures, or package of measures which should be taken forward to Stage 3 (Full Business Case), based on their ability to solve the problem, their fit with the objective, and their impacts, deliverability and robustness under uncertainty.

The Impact Assessment Report is structured in the same way as this report; and provides evidence of the assessments and information used to support the work reported here.

2 STRATEGIC CASE

2.1 CASE FOR CHANGE

2.1.1 LEGISLATIVE AND POLICY CONTEXT

This Chapter of the Stage 2 report builds on the Strategic Case included as part of the Stage 1 report for the M4 J25-J26. It provides a narrative of how the short list of measures was derived and considers in greater detail how each measure tackles the problem.

This section provides a brief summary of relevant policies and plans that are pertinent to the M4 J25-J26 WelTAG Stage 2 appraisal. There are a number of overarching policies that set the context for the study, and those set out below have been used to assess against any potential network management measures for reducing NO_2 levels along the corridor.

UK and Welsh policies shape and guide respective regional and local plans and policies. Reference is made to them as appropriate.

UK and Welsh legislation and policy Summary

The requirements of the EU Ambient Air Quality Directive are transcribed into Welsh legislation via the Air Quality Standards (Wales) Regulations 2010 (Welsh Statutory Instrument No 1433 (W.126)). The regulations designate Welsh Ministers as the competent authority for the purposes of the Directive and place duties on Welsh Ministers to draw up and implement air quality plans in relation to achieving the Directive limit values where they are currently exceeded. The latest overarching UK Air Quality Plan was published in July 2017[3], including zone plans for all four Welsh zones[4].

National policies highlight commitment within the UK to reduce the amount of airborne pollutants, with the 1995 Environment Act making air quality control a statutory requirement for all local authorities. Thereafter, air quality has been monitored annually with action plans and Air Quality Management Areas (AQMAs) being set up where standards fall below the limits set by the Environment Act and the Air Quality (Wales) Regulations. The Environment (Wales) Act 2016 imposes various duties relation to the sustainable management of natural resources, including the air.

In Wales, national planning policy is comprised of Planning Policy Wales (PPW), Technical Advice Notes (TANs), circulars and policy clarification letters. PPW states “Development plan policies and decisions on planning applications should take into account national air quality objectives, EU limit and target values”. The Local Air Quality Management (LAQM) Policy Guidance in Wales provides guidance for local authorities on how to meet the statutory objectives set within the UK legislation.

Air quality related commitments are included in a number of policy documents, such as The Wales Transport Strategy (which is currently under review and will be published in draft for consultation during 2018), and the National Transport Finance Plan which are designed to promote a shift to more sustainable methods of transport such as walking and cycling and integrated public transport; and supporting highway schemes that are designed to reduce traffic congestion.

[3] Available at https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017
[4] Available at https://uk-air.defra.gov.uk/library/no2ten/2017-zone-plan-documents

The Well-being of Future Generations (Wales) Act strives to improve the social, economic, environmental and cultural well-being of Wales. Its goals, as summarised in The Essentials of the Act[5], are as follows:

Goal	Description of the goal
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.

Regional Summary

Newport City Council's (NCC) Local Transport Plan (LTP) implemented in 2015 provided an update of schemes and prioritises identified in the adopted RTP. As Newport has a commitment to the Cardiff Capital Region, the LTP looks to work with Welsh Government and the City-Region Board to implement better regional links to Cardiff and other schemes to grow the local/regional economy. The LTP aims to support economic growth, provide access to employment, tackle poverty, provide sustainable travel, and improve access to services.

Local Summary

The Air Quality Action Plan for Newport lists seven AQMAs and sets out a plan to improve air quality at these locations. The plan details timescales and funding for measures and provides a review of any improvements that can be expected if those measures are implemented. An AQMA was set up alongside the M4 as a result of the 2007 annual review. The corresponding Action Plan led to the implementation of variable speeds on the M4 between Junctions 24 and 28, through the Newport area. As a result of this, Newport was able to meet the Air Quality Objective (AQO) in the 2009 review.

[5] Available at: https://futuregenerations.wales/wp-content/uploads/2017/01/150623-guide-to-the-fg-act-en.pdf - Accessed 8th January 2018

NCC's 2017 Air Quality Progress Report found that NO_2 results remained broadly the same as previous years across Newport. The three AQMAs that were found to exceed AQO in the 2015 review met acceptable standards during the 2016 review. The report recognised that measures at the three locations, Chepstow Road, Caerleon, and Glasllwch, still had to be implemented as soon as possible. The report did not propose any additional AQMAs, but it did propose a revised Air Quality Action Plan for 2017 and additional monitoring tubes at points on the road network that have not been previously recorded.

2.1.2 AIR QUALITY

The section of the M4 under consideration in this study sits within Newport City Council. Newport City Council has declared a number of AQMA that lie adjacent to the M4 between Junctions 25 and 26: St Julians AQMA at J25 (Caerleon Road) and Shaftesbury AQMA at J26 (Malpas Road). In addition, the Malpas Road AQMA lies around 400m to the south of J26 and the Caerleon Road AQMA lies around 700m to the south of J25.

Air quality baseline data for the M4 around Newport has been derived from both local authority (as uploaded on the Air Quality in Wales website[6]) and UK air quality reports.

Specifically, baseline and future baseline air quality NO_2 concentrations has considered outputs from the Pollution Climate Mapping (PCM) model developed by Ricardo AEA on behalf of Defra/DfT.

The PCM model projections presented in support of the 2017 Plan indicate that annual mean NO_2 concentrations will reach compliance with air quality limit values on the M4 around Newport between 2018 and 2021 (i.e. projected concentrations at or below 40µg/m3).

The dates in Table 1 set the timescales within which the measures must be deliverable to bring forward compliance. The percentage reduction in emissions from road transport required to achieve compliance has been estimated using the maximum PCM concentration in any given year, the corresponding background NO_2 concentration and Defra's NOx to NO_2 calculator (v6.1) to calculate the roadside contribution to NOx concentrations and the level of emissions required to give a roadside concentration of 40µg/m^3.

Table 1: Baseline PCM Predicted NO_2 Concentrations at Newport, without NO_2 reduction network measures (projections from 2017 Plan, July 2017)

Site Location	NO_2 Predicted Baseline Concentration (µg/m^3)					
	2015	2017	2018	2019	2020	2021
M4 J25 – J26 Newport (west of River Usk)	**51**	**48**	**46**	**44**	**42**	39
M4 J25 – J26 Newport (east of River Usk)	**43**	**41**	39	37	35	33
Approx. % Reduction in NOx Emissions from Road Transport Required for Complianc	41%	33%	25%	8%	-	-

The PCM modelled concentrations in Table 1 are consistent with the concentrations monitored by Newport City Council along the M4 Corridor (Table 2), although monitored concentrations are typically lower than the PCM concentrations to the west of the River Usk and higher than the PCM concentrations to the east of the Usk.

[6] Available at: http://www.welshairquality.co.uk/

Table 2: Monitored Annual Mean NO_2 concentrations alongside the M4 J25-J26 (µg/m³)

ID	Location	Distance to M4 J25-J26	Bias-adjusted Annual Mean			Adjusted to 4m from M4 J25-J26		
			2014	2015	2016	2014 (4m)	2015 (4m)	2016 (4m)
NCC6B	153 Malpas Road	4m	39.8	**41.1**	-	39.8	**41.1**	-
NCC17A	179 Malpas Road	20m	32.4	31.3	-	**40.1**	**40.2**	-
NCC19B	177 Malpas Road	40m	38.3	36.1	-	Not Applicable		
NCC16A	40 Denbigh Road	9m	38.7	36.0	-	**43.4**	**40.4**	-
NCC25B	41 Denbigh Road	9m	29.7	26.6	-	31.7	28.3	-
NCC21D	M4 Old Barn	11m	**58.3**	**61.8**	-	**72.2**	**77.8**	-
NCC23E	M4 Old Barn	11m	**57.6**	**58.2**	-	**71.2**	**72.8**	-
NCC 37 - 39	St Julians School	55m	20.9	20.5	-	Not Applicable		

2.1.3 INFRASTRUCTURE AND LOCAL FACILITIES

The M4 between J25 (Caerleon Road) and J26 (Malpas Road) is a 2 lane all-purpose motorway with the exception of an eastbound stretch from J25A (Grove Park) to J25, which is a 3 lane all-purpose motorway. The study corridor is subject to Variable Speed Limits, which extends on the M4 for 13km from J24 (Coldra) to J28 (Tredegar Park). It is managed by the WG from the South Wales Traffic Management Centre in Cardiff, who adjust the mandatory speed limit according to traffic conditions to keep vehicles moving at a steady rate, helping to make journeys safer and more reliable.

The study corridor is subject to motorway restrictions i.e. Prohibition of Pedestrians and Cyclists and No Stopping (Clearway). Bristol and Cardiff are to the east and west, respectively.

The infrastructure, including structures and junctions, on the M4 study corridor between the east of J25 and J26 from east to west is summarised as follows:

- Beaufort Road overbridge;
- VMS on eastbound carriageway west of Beaufort Road overbridge;
- VMS on both carriageways east of Rembrandt Way overbridge;
- Rembrandt Way overbridge;
- Steel gantry on the westbound carriageway west of Rembrandt Way overbridge;
- VMS on both carriageways west of Rembrandt Way overbridge;
- Steel gantry on the westbound carriageway at J25 offslip; Grade separated roundabout at J25, connecting the M4 with the B4596. The circulatory forms two consecutive overbridges;
- Steel gantry on the westbound carriageway at J25;
- VMS on both carriageways at J25;
- Structure over Stockton Road and the Welsh Marches railway line east of J25A;
- Steel gantry with VMS on both carriageways east of J25A;

- Steel gantry on the westbound carriageway west of J25A;
- Bridge over the River Usk;
- A4042 overbridge;
- Steel gantry on both carriageways east of Brynglas Tunnels;
- VMS on westbound carriageway east of Brynglas Tunnels;
- Brynglas Tunnels between J26 and River Usk;
- Steel gantry on both carriageways west of Brynglas Tunnels;
- VMS on eastbound carriageway west of Brynglas Tunnels; and
- Grade separated roundabout at J26 with the M4 on structures above the circulatory.

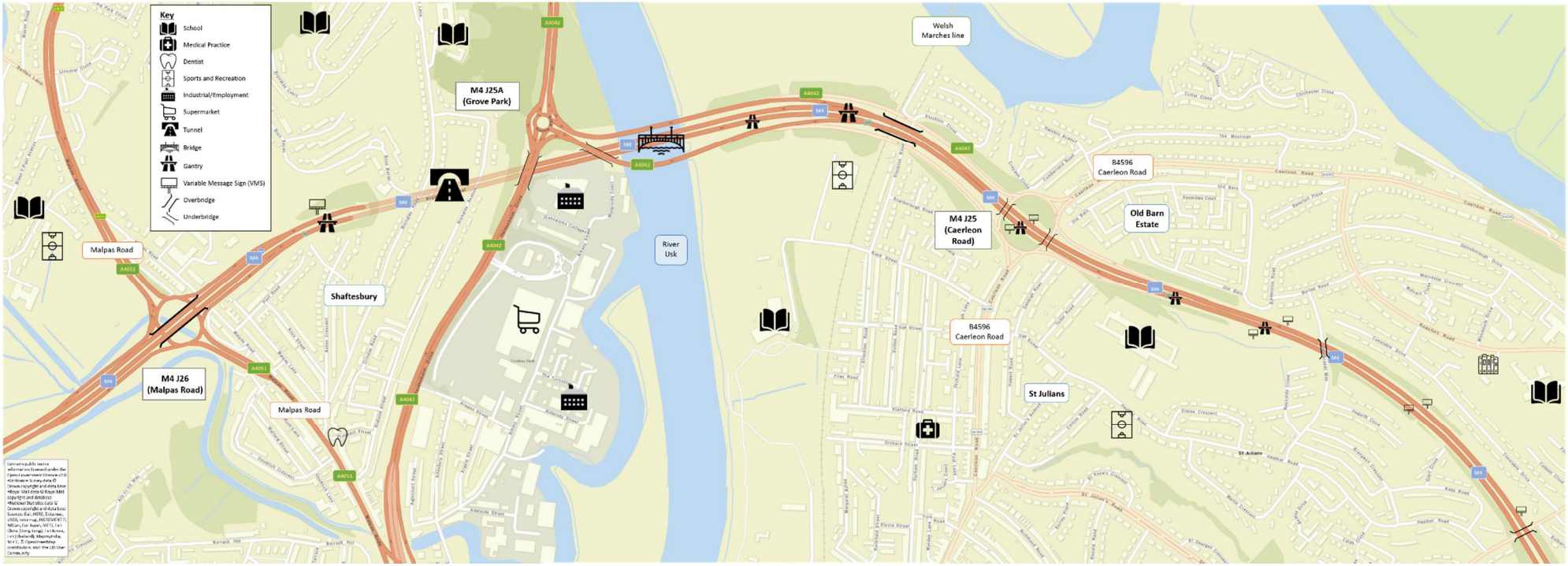
The M4 study corridor between J25 and J26 passes through a relatively built-up area through the north of Newport. The residential area of St Julians traverses the M4 around J25 and J25A, with some properties overlooking the carriageway. Similarly, the electoral ward of Shaftesbury includes the areas north and south of the M4 between the River Usk and west of J26, with residences in very close proximity and located on top of the Brynglas Tunnels. The carriageway is limited to 2 lanes for most of the study corridor, which can restrict vehicle flow throughout the day. The A4051 and A4042 also connect the city centre to the M4 at J26 and J25A respectively; and areas to the north of the motorway such as Cwmbran, Pontypool, and Abergavenny.

Around the study corridor, there are some community facilities including several schools. There is a Welsh Medium primary school to the north of the Brynglas tunnels, which is adjacent to the site of Newport's first Welsh Medium secondary school. This opened in 2016 at a temporary location for year 7 pupils and will expand each year until it is fully operational by 2020, with its catchment area extending across the whole of the city of Newport.

There are also medical and dental practices, leisure centres and recreation facilities, employment areas, and a large Sainsbury's supermarket within close proximity to the study corridor. There is a much wider range of cultural and community facilities in Newport city centre, including the Riverfront Arts Centre, Friars Walk shopping complex, the Royal Gwent Hospital, and the University of South Wales Newport City Campus.

The infrastructure and local facilities in the vicinity of the M4 study corridor are illustrated in Figure 2.

Figure 2: Infrastructure and Local Facilities nearby the M4 Study Corridor



2.1.4 MAJOR SCHEMES

M4 Junction 28

WG and Newport City Council are currently improving the M4 J28 Tredegar Park roundabout, the A467 Bassaleg roundabout, and the Southern Distributor Road (SDR) Pont Ebbw roundabout in partnership with Newport City Council (NCC). This is located outside of the area of exceedance.

These improvements are aimed at increasing capacity and safety at these junctions, and so reduce delays on the M4, A48, A467 and the SDR. It is hoped that this will increase the flow of traffic on the SDR by removing local trips from the M4 around Newport.

Construction work started in March 2017 and the programmed completion date is September 2018. Therefore, the scheme has not been included in the long list of measures in this WelTAG appraisal.

M4 Corridor around Newport

WG are proposing a new section of motorway, and complementary measures, which are considered to be the sustainable, long-term solution to current social, environmental and economic problems associated with this route. It forms an essential part of Welsh Government's vision for an efficient integrated transport system in South Wales, and will improve accessibility for people as well as Welsh goods and services to international markets.

Ken Skates, Cabinet Secretary for Economy and Transport, released a Written Statement7 in December 2017 to update members on the integration of the proposed M4 Corridor around Newport with Newport Docks. This statement established that the public inquiry is ongoing to scrutinise whether the M4 Project, in collaboration with the Cardiff City Region Metro, is the long-term, sustainable solution to the serious and worsening problems associated with the M4 around Newport. At the time of preparing this report, the public inquiry has adjourned and will resume on 31st January 2018.

Due to the extension of the public inquiry the opening date of the new section of motorway is now forecast to be autumn 2023, although consideration is being given to phasing of opening sections in 2022. As this is later than the current projected compliance date for the section of the M4 under consideration in this study, the scheme has not been included in the long list of measures in this WelTAG appraisal.

M4: Brynglas Tunnel

The Brynglas tunnels were built under old design standards and are no longer compliant with current design standards. In addition, the Usk River Bridge and Malpas Viaduct need essential maintenance.

This work involves replacing all the mechanical and electrical systems in the tunnels, as well as the carriageways, drainage and the lining of the tunnel. The works also includes resurfacing the Usk River Bridge.

WG scheduled construction so that any closures for the main works are mostly overnight, but with some over weekends. Closures are between J24 (The Coldra) and J28 (Tredegar Park), and are usually in one direction only. The Southern Distributor Road (the A48) is used as a diversion for the closed section of tunnel. Local traffic will be able to travel to junctions 25A and 26 to access local routes.

Construction work began June 2016 and is programmed to end early 2018. Whilst the maintenance work should not result in any change in traffic flows post opening of the scheme, it is worth noting that traffic flows, and subsequently air quality monitoring during this time, may have been affected by temporary traffic management during this period. The scheme has not been included in the in the long list of measures in this WelTAG appraisal.

[7] Available at http://gov.wales/about/cabinet/cabinetstatements/2017/m4corridor/?lang=en

2.1.5 TRAFFIC FLOWS

Annual Average Daily Flows (AADF) have been extracted from the Department for Transport (DfT). Traffic flows along the M4 study corridor range from approximately 115,000 vehicles between J25 (Caerleon Road) and J25A (Grove Park), approximately 83,000 vehicles through the Brynglas Tunnels between J25A and J26 (Malpas Road). Along the study corridor, the percentage of Heavy Goods Vehicles (HGVs) varies from 10% between J25 and J25A, 9% through the Brynglas Tunnel, and 8% between J26 and J27.

Trafficmaster Data

Trafficmaster has been used to analyse the difference in annual average weekday vehicle speeds between cars / Light Good Vehicles (LGVs), and HGVs for both directions on the M4 J25-26 study corridor. The data has been separated into four periods, as follows; AM Peak (07:00-10:00), Inter Peak (10:00-16:00), PM Peak (16:00-19:00), and Off Peak (19:00-07:00). The data has been collected for the study corridor between 1st June 2015 and 30th July 2016. Vehicle speeds below are all presented in kilometres per hour (kph).

Vehicle Speeds

Speeds of cars and LGVs are slightly greater than HGVs along the M4 between J25 and J26 in both directions. Eastbound car and LGV speeds are at their highest during the Off Peak (103kpm), and lowest during the AM Peak (91kph). The eastbound Inter Peak and PM Peak share similar speeds of 92kph and 95kph respectively. Westbound car and LGV speeds are at their highest during the Off Peak (92kpm), and lowest during the PM Peak (49kph). The westbound AM Peak and Inter Peak exhibit speeds of 73kph and 80kph respectively.

Likewise, there is some variation in HGV speeds, with the greatest eastbound speeds recorded during the Off Peak (87kph), and lowest in the Inter Peak (79kph). Eastbound speeds during the AM and PM peaks were 81kph and 84kph respectively. Westbound, the greatest HGV speeds occurred in the Off Peak (89kph), with the lowest speeds occurring in the PM Peak (47kph). Westbound speeds during the AM and Inter Peak periods were 66kph and 79kph respectively.

2.1.6 PUBLIC TRANSPORT

The study corridor along the M4 between J25-J26 runs parallel to part of the South Wales Main Line, which is a branch of the Great Western Main Line. This operates services between London Paddington and Swansea, via Bristol and Cardiff. The study corridor also passes over the Welsh Marches line, which runs between Newport and Shrewsbury in the West Midlands via Abergavenny and Hereford.

Newport railway station is the third-busiest railway station in Wales and is operated by Arriva Trains Wales, although Great Western Railway and CrossCountry also provide services. There are regular services that run across the country, for instance to Manchester, Nottingham, Holyhead, Taunton, and Portsmouth Harbour.

Analysis[8] shows that there was an annual increase of 3.5% in the number of station entries/exits across Wales in 2015-16 compared to the year before, with Newport observing an increase in passenger numbers of 7.2%. Parking provision is reasonable at Newport; there is an NCP car park that has 246 spaces available, with 14 accessible.

Local bus services in the vicinity of the study corridor are operated by Newport Bus, with services to Chepstow, Cwmbran, and Cardiff. National buses also operate, with National Express and Megabus offering direct routes to Bristol, London, and Swansea.

2.1.7 ECONOMY

The Labour Market Profile of Newport[9] has identified that 77.2% are economically active (for those aged 16-64), which is above the average in Wales of 75.2%. There are 7,700 workless households in Newport, which equates to 16.8% of households, which is 1% lower than across Wales. Newport also has lower than average earnings, and higher than average out-of-work benefits claimants.

[8] Source Location: http://gov.wales/docs/statistics/2017/170510-rail-station-usage-2015-16-en.pdf - Accessed 13th November 2017
[9] Nomisweb.co.uk – Accessed on 9th November 2017

2.1.8 DEMOGRAPHICS

The Local Area Report for Newport[10] covers the characteristics of people and households with information sourced from the 2011 Census key statistics. Of the 145,736 usual residents, 49.0% were males and 51.0% were females. 98.9% of the usual residents lived in households and 1.1% lived in communal establishments. Furthermore, the average (mean) age of residents was 38.8 years, which is younger than the national average of 40.6 across Wales.

Of all usual residents aged 3 and over in Newport, 86.9% have no Welsh language skills, which is 13.6% higher than across Wales. 9.3% of residents in Newport can speak Welsh, and 6.5% can speak, read, and write Welsh. This compares to the national average of 19.0% and 14.6% respectively.

2.1.9 OTHER SENSITIVE ENVIRONMENTAL AREAS

This section of the report identifies and determines the potential environmental constraints and opportunities within the vicinity of the M4 between J25-J26. The report has been compiled using aerial imagery and ordnance survey maps.

Statutory Designations

European Designated Sites (also known as Natura 2000 Sites) include any Special Protection Area (SPA), Special Area of Conservation (SAC), and RAMSAR sites located within 1km of the M4 between the M4 J26 and J25 (measured from closest point). There is one SAC within proximity to the M4 between J25 and J26 comprising the River Usk SAC, which is located beneath the M4 near the Brynglas Tunnels (within 0m).

There is one Site of Special Scientific Interest (SSSI) within proximity to the M4 between J25 and J26 comprising the River Usk SSSI located beneath the M4 near the Brynglas Tunnels (within 0m). There is also one Local Nature Reserve (LNR) within 1km of the M4 highway comprising the Allt-Yr-Yn LNR.

There are no Areas of Outstanding Natural Beauty (AONB), nor any other Statutory Designations (National Parks and Country Parks), located within 1km proximity to the M4 study corridor.

Non Statutory Designations

There are no or Natural Nature Reserves (NNR) within 1km and there are also no Special Landscape Areas within the vicinity of the highway on the M4 study corridor between J25 and J26.

Areas of Population, Community Resources and Infrastructure

There are more than 25 sensitive human receptors (i.e. residential properties, hotels etc.) and community resources (i.e. footpaths, cycleways etc.) located within 1km of the M4 corridor. For instance, there are several areas of residential dwellings that are within 50m of the M4 at the closest point, as well as care homes, and recreational facilities, and schools within 100m of the carriageway.

Sensitive Noise Receptors

Noise Sensitive Areas located within 1km of the M4 study corridor include a designated Noise Action Planning Priority Area (NAPPA) for road noise on the majority of the M4 highway between J24 and J26. The A4051 between J26 and the roundabout at the northern end of Malpas is also a designated NAPPA for road noise.

Water Environment

There are seven water courses and permanent water bodies located within 1km of the M4, including the River Usk and Crindau Pill, which flow beneath the study corridor.

Cultural Heritage, Historic and Landscape designations

There are five Listed Buildings within 1km of the M4 study corridor, including the aqueduct over Malpas Brook and bridges over the Monmouthshire and Brecon Canal.

[10] Nomisweb.co.uk – Accessed on 8th January 2018

There are no Scheduled Monuments within proximity to the M4 between J25-J26. The closest Scheduled Monument is Newport Castle located approximately 1.3km south east from the M4.

There are no Conservation Areas within 1km of the M4 between J26-25.

There is one Historic Park and Garden comprising the land surrounding the Brynglas House and Community Learning Centre located approximately 150m north west from the M4 near the Brynglas Tunnels.

2.2 PROBLEM IDENTIFICATION

The M4 between J25-J26 lies within the South Wales zone for the purpose of the assessment of compliance with the EU Air Quality Directive.

The national assessment[1] of roadside NO_2 undertaken for the South Wales zone indicates that the annual limit value was exceeded in 2015 but it is likely to be achieved by 2026. The compliance date of the South Wales zone is, in current projections, determined by the compliance of the A4772 in Hafod-yr-Ynys.

The section of the M4 under consideration in this study is expected to achieve compliance by 2021. Elevated concentrations of NO_2 on the M4 around Newport are due to a combination of high traffic volumes, large volumes of HGVs and routine peak period congestion. WG are investigating additional network management measures for the strategic trunk road and motorway network that could bring forward the projected compliance date.

2.3 OBJECTIVE OF THE STUDY

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.

As identified in the Stage 1 report, **the objective of this study is to carry out an initial investigation and identify potential network management measures which will assist in bringing forward reductions in NO_2 in the shortest possible time to ensure compliance with the Air Quality Framework Directive in five locations on the Welsh SRN listed above. Therefore, the transport case will focus on air quality and reflect the key considerations in relation to the EU Air Quality Directive and bringing forward compliance with the limit values.**

The following **key criteria** were described in the Project Brief for the high level appraisal of the potential measures:

- ***Effectiveness***
- ***Timescales***
- ***Feasibility***

This has been interpreted for the purposes of this appraisal as meaning:

- ***Effectiveness*** – Is the measure likely to deliver reductions in roadside concentrations proportionate to the scale of the exceedance above the 40µg/m^3 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
- ***Feasibility/Deliverability*** – Can the measure be delivered in the location involved with the powers available to the Highway Authority

For the purpose of this appraisal, the phrase deliverability has been used, instead of feasibility to match more clearly the requirements of WelTAG for delivery.

In addition to the Air Quality Directive, 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, based on the Future Generations Act and the recommendations within The National Institute for Health and Care Excellence (NICE) air quality guidelines[11] so that health impacts can be more fully considered, the following are considered as **secondary criteria** in the appraisal process:

- Will the measure deliver an overall reduction in NO_2 emissions to air
- Will the measure result in unintended consequences or other environmental impacts
- Will the measure contribute to well-being

  - 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

It is possible that measures could be used in combination. Each individual measure need not bring forward compliance in itself but the improvement in NO_2 brought about by the measure should be proportionate to the scale of the exceedance of the limit value.

The Stage 1 appraisal focused on the three key criteria. The secondary criteria has been considered in further detail during this Stage 2 appraisal, and will likely be significant where two measures are mutually incompatible. In such cases, delivery against the secondary criteria could weigh in favour of a particular measure.

Information was collected on the legislative, policy and context of the area (see 2.1 Case for Change) and used within the WelTAG process to inform consideration of the implications of measures on the impact areas as reported in the Appraisal Summary Tables for each measure. The impacts are organised by the four areas of Sustainable Development – Environment, Economy, Social and Cultural.

More detailed consideration of how the goals and objectives are integrated with other objectives, including objectives of other public bodies, will be undertaken in WelTAG stage 3, when further detail of the measures will be available.

While this appraisal is aimed as shortening the period of compliance against the required limit values, the measures when applied could themselves be helpful in the longer term by providing solutions which prevent environmental, social and health issues getting worse or even occurring. Collaboration and involvement while limited to WG Departments and Trunk Road Agents at this stage, will need to be continued and expanded in later stages to ensure the appraisal, development and delivery of the measures considers the views of those affected and avoids unintended consequences.

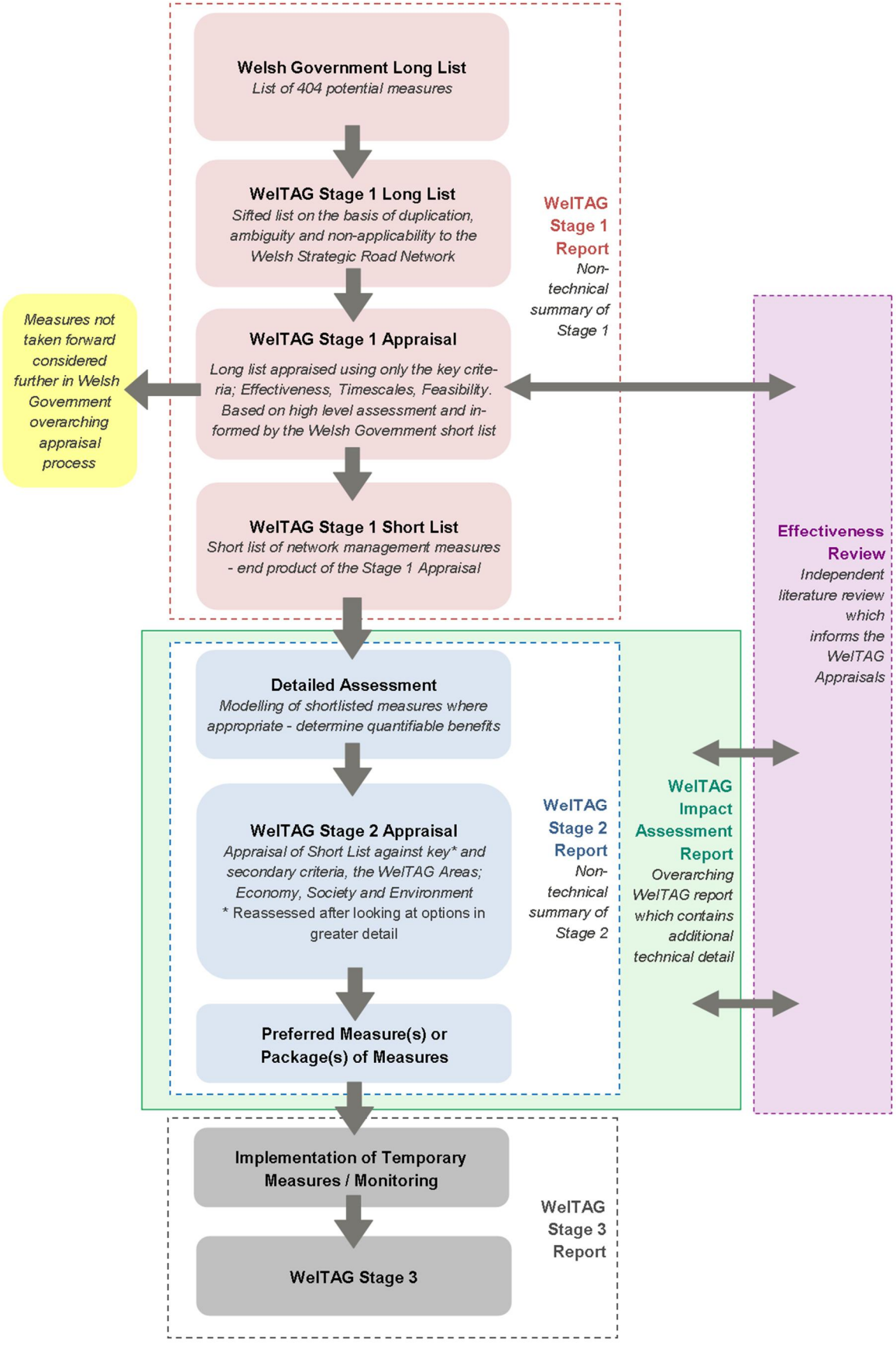
2.4 THE PROCESS

This study has been undertaken following the WelTAG framework and with consideration of the goals of the Future Generations Act as above. Preliminary work was undertaken by the WG, who produced a long list and short list of measures. These are not the WelTAG long list and short list, although they have been used to inform this study.

Stage 1 (Strategic Outline Case) identified the issue and objective, developed a long list of possible measures, and recommended a short list of measures to take forward to Stage 2 (Outline Business Case). The WelTAG documents are supported by an Effectiveness Review, which considers documented evidence of the effectiveness of measures. This process is summarised in Figure 3.

[11] Air pollution: outdoor air quality and health, NICE guideline [NG70] Published date: June 2017

Figure 3: The Process



2.5 SHORT LIST OF MEASURES

The WelTAG Stage 1 appraised the long list of 57 measures against the key criteria for meeting the objective. The sifting of measures resulted in the short list of 13 network management measures for Stage 2 (the Outline Business Case), based on their ability to bring forward the date of compliance with EU Limit Values on the M4 J25-J26 against the key criteria (Effectiveness, Timescales, and Deliverability), as follows:

- S1: NOx Absorbing Materials
- S8: HGV Overtaking Bans
- S7: Enforce/Reduce Speed Limit
- S14: Ramp Metering
- S16: Junction Closures
- S19: Variable Diversions
- S28: Behaviour Change
- S44: Vehicle Emission Testing
- S46: Clean Air Zones / Low Emission Zones
- S51: Intelligent Traffic Management
- S53: Enhanced Traffic Officer Service
- S65: Air Quality Areas
- S66: Air Quality Communications

The appraisal of this short list is documented in Chapter 3.

3 TRANSPORT CASE

3.1 METHODOLOGY

The approach to the Stage 2 level of appraisal is intended to examine in greater detail the short list of measures for tackling the problem under consideration. The short list of measures has been appraised against the key criteria and secondary criteria for the objective and the three WelTAG areas.

The objective of this study is to carry out an initial investigation and identify potential network management measures which will assist in bringing forward reductions in NO_2 in the shortest possible time to ensure compliance with the Air Quality Framework Directive requirements in five locations on the Welsh SRN. Therefore, the transport case will focus on air quality and reflect the key considerations in relation to the EU Air Quality Directive and bringing forward compliance with limit values.

Whilst the measures have already been appraised against the key criteria for the objective, this has been revaluated at Stage 2. It is recognised that in looking at measures in greater detail during Stage 2, the findings of Stage 1 may need updating.

The three WelTAG areas are:

- Economy
- Environment
- Society

The measures have been appraised against the WelTAG Impact Areas that were identified within the Scoping Report and are outlined in Table 3. For a selection of impact areas, denoted with strikethrough, the decision was taken against undertaking an appraisal. Given that the measures are targeted at reducing NO_2 levels, it was not considered necessary to appraise against every impact area. The areas which have been excluded from the appraisal have been done so on the basis of there being no notable impacts resulting from any of the measures. Equally, it has not been possible to appraise some of the impact areas due to the limitations of Stage 2, which are outlined in Section 4.4. It may be pertinent to re-introduce these impact areas at Stage 3.

Table 3: WelTAG Impact Areas

Environment	Social and Cultural	Economy
Air Quality	Physical Activity	Journey time changes and Journey time reliability
Noise	Journey Quality	Capital Cost
Landscape	Accidents	Land
Townscape	Access to employment and services	~~Transport costs~~
Historic Environment	~~Security~~	~~Accidents~~
Biodiversity	~~Affordability~~	~~Changes in productivity~~
Water Environment	~~Severance~~	~~Local Economy~~
~~Greenhouse gases~~	~~Option and non-use values~~	~~Revenue costs~~

3.2 APPRAISAL OF WELTAG IMPACT AREAS

The following sections set out how each of the impact areas were appraised during Stage 2 of the study. The appraisals undertaken adhere to the WelTAG 2017 consultation guidance.

3.2.1 ENVIRONMENTAL APPRAISAL

Air Quality

The appraisal of air quality impacts was undertaken semi-quantitatively using a combination of professional judgement and, where possible, robust, detailed emissions and dispersion modelling. A three step approach was adopted for each potential measure:

Step 1: The output of the effectiveness review and professional judgement were used in combination with baseline vehicle speed and flow data to review whether the measure has the potential to significantly affect emissions of nitrogen oxides. This review extended the WelTAG Stage 1 appraisal by incorporating more detailed traffic information and location specific conditions. Where no likely impact was identified, the measure was assumed to have a neutral impact and to be ineffective. In this case, no further appraisal was undertaken.

Step 2: Where a likely impact was identified, the measure was subject to NO_X *emissions modelling*. Defra's Emissions Factor Toolkit v8.01[12] (EfT) was used to model the change in emissions for a representative section of the PCM link in exceedance of the limit value. The modelling was based on traffic data for 2018, for scenarios without and with the measure. The percentage change in emissions between the without and with measure scenarios was used to categorise the impact of the measure using the following criteria:

- Large impact = change of >5% of emissions without the measure
- Moderate impact = change of >1% - 5% of emissions without the measure
- Slight impact = change of ~1% of emissions without the measure

Step 3: Where possible, the measure was subject to detailed *dispersion modelling* using the ADMS new generation dispersion model to quantify the potential change in roadside NO_2 concentrations. ADMS is the model most commonly used within the UK for dispersion modelling of air quality impacts. If the measure resulted in an increase in emissions on the PCM link in exceedance of the limit value, the measure was considered ineffective even if there were potential air quality benefits elsewhere.

The impacts of some measures could not be modelled at Step 2 above, due to their impact being unrelated to either changes in traffic or dispersion conditions e.g. the use of surface coating to remove NO_2 from air. For these measures, the potential impact of the measure was estimated using the outcome of the Effectiveness Review.

Where the impacts have been calculated as a range, the worst case scenario is presented within the ASTs.

Noise

The WelTAG 2017 Consultation guidance states that the Noise appraisal should be an evaluation of the degree to which any changes in noise levels occur and are experienced. A qualitative appraisal has been undertaken.

Landscape

A qualitative appraisal has been undertaken in order to assess both visual as well as other impacts on the landscape which occur as a result of the measure.

Townscape

A qualitative appraisal has been undertaken in order to assess both the visual impact as well as other impacts on the townscape which occur as a result of the measure.

Historic Environment

A qualitative appraisal has been undertaken in order to assess the extent of any changes which occur in areas of historical interest as a result of the measure.

[12] Available at https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html, accessed 02/01/2018

Biodiversity

A qualitative appraisal has been undertaken in order to assess the extent to which there is an impact on wildlife and the number of species as a result of the measure.

Water Environment

A qualitative appraisal has been undertaken in order to assess the extent to which water courses are impacted as a result of the measure.

3.2.2 SOCIAL AND CULTURAL APPRAISAL

Physical Activity

A qualitative appraisal has been undertaken in order to assess the amount of walking, cycling and other physical exercise which is undertaken as a result of the measure.

Journey Quality

A qualitative appraisal has been undertaken in order to assess the extent of impact of each of the measures on journey quality, taking into consideration the following aspects:

- Traveller care: aspects such as cleanliness, level of facilities, information and the general transport environment
- Travellers' views: the view and pleasantness of the external surroundings in the duration of the journeys
- Traveller stress: frustration, fear of accidents and route uncertainty

Accidents

A qualitative appraisal has been undertaken in order to assess the extent of potential anticipated change which occurs in the number and severity of injuries as a result of the measure.

Access to Employment and Services

A qualitative appraisal has been undertaken in order to assess how many jobs people can reach and the respective journey times, and the impact on journeys to key services such as health facilities and schools which occurs as a result of the measure.

Whilst the WelTAG 2017 consultation guidance outlines access to employment and access to services as two separate appraisal areas, both areas have been combined within this assessment, as the appraisals will be proportionate to one another, with little to no difference in appraisal outcomes between the two considered likely to take place.

3.2.3 ECONOMIC APPRAISAL

Journey Time and Journey Time Reliability Changes

A qualitative appraisal has been undertaken in order to assess changes in journey times across all affected modes both for users and non-users of the measure. The appraisal also takes into account changes in the variation in journey times between times of day and between journeys made at the same time each day i.e. morning and evening peak periods.

Whilst the WelTAG 2017 consultation guidance outlines journey time and journey time reliability changes as two separate appraisal areas, both areas have been combined within this assessment, as the appraisals are proportionate to one another, with little to no difference in appraisal outcomes between the two considered likely to take place.

Capital Costs

The measures have been costed within the following cost bands:

- Low – up to £500k
- Medium – £500k – £2m
- High – £2m+

Cost banding has been used to denote the costs of each measure in order to differentiate between more cost effective measures which could be implemented within a shorter timeframe, and those which will require more funds and longer lead-in periods. The banding takes into account the capital costs of each measure, and does not take account of revenue costs.

Land

A qualitative appraisal has been undertaken to assess the extent to which the measure will potentially reduce the amount of agricultural land, and open up development sites.

3.2.4 VALUE FOR MONEY ASSESSMENT

The value for money assessment categorises measures within banded ranges. Categorisation has been determined based on the banding of capital costs and broad benefits which have been weighted as far as possible in favour of the objective. Whilst all benefits have been be taken into account, the final value for money score has taken into the impact on air quality as the primary consideration. Value for money will be presented in line with anticipated Benefit to Cost ratios as per the following:

Poor: BCR of 0 – 1
Fair: BCR of 1 – 2
Good: BCR of 2+

3.2.5 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 in order 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, it is difficult to identify issues regarding deliverability and risk given the high level nature of the measure's development. Where possible, this has been identified as qualitative statements though should be reassessed at WelTAG Stage 3 when the measures are developed further.

3.3 APPRAISAL AGAINST OBJECTIVES

The Stage 1 procedure involved undertaking the appraisal of the long list of measures, with each measure assessed against the WelTAG criteria, and then considered within the context of the study objective; namely, the extent to which each measure would be successful in bringing forward reductions in NO_2 in the shortest possible time to ensure compliance with the air quality framework directive requirements within each of the 5 specified study corridors on the Welsh Strategic Road Network.

The Stage 2 appraisal essentially comprised a re-undertaking of this process. This was necessary, as it elicited different results in cases where additional evidence had been produced or sourced, allowing appraisals to be undertaken in greater detail and with a greater degree of certainty, with the potential for differing appraisal outcomes in comparison to Stage 1.

3.3.1 KEY CRITERIA

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

This has been updated in lieu of more detailed assessment work at Stage 2.

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

This has been updated in lieu of more detailed assessment work at Stage 2.

Deliverability – *Can the measure be delivered in the location involved with the powers available to the Welsh Government as Highway or Traffic Authority*

This has been updated in lieu of more detailed assessment work at Stage 2.

3.3.2 SECONDARY CRITERIA

Will the measure deliver an overall reduction in NO_2 emissions to air

This is a qualitative appraisal based on the likelihood of overall reduction to NO_2 resulting from the measure. This will enable the differentiation of measures which simply redistribute the impacts rather than seeking to reduce overall NO_2 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 Impact Areas.

Will the measure contribute to well-being

This will be a qualitative appraisal which considers the objectives of the Well-being of Future Generations (Wales) Act 2015.

3.4 STAGE 2 APPRAISAL

For Stage 2 of the study, the appraisal outcomes have been summarised solely within the Appraisal Summary Table (AST) in order to avoid unnecessary duplication of summaries and appraisal outcomes within the report. The appraisals have been undertaken on a measure by measure basis, and the appraisal outcomes have been derived based upon the assessments undertaken in accordance with the WelTAG 2017 consultation guidance. The AST provides a breakdown of the impact of each measure on each of the WelTAG appraisal areas. The scoring has been undertaken using the WelTAG 7-point scale where applicable.

The outcome of the Stage 2 appraisal is summarised in Table 4.

Date Produced - 06/02/2018

Appraisal Summary Table

Option No. / Theme S1 / Air Quality Technology

	Name of scheme:	**NOx Absorbing Materials**
	Location:	**M4 Newport**
	Description of scheme:	**NOx absorbing paint / coatings and fencing / panels. This could either be added to existing fencing, structures, and walls; painted over hard surfaces; or as new installations. 'Air purifying concrete', which contains Titanium Dioxide, and can also be used combined with Asphalt.**
Key Criteria	**Effectiveness:**	**Ineffective**
	Timescales:	**Up to 5 months**
	Feasibility:	**Yes. WG Network management division could commissioned application of NOx absorbing paint on their assets.**

Impacts		**Summary of key impacts**	**Assessment**
			Qualitative
Environmental	Air Quality	Photocatalytic coating applied to surfaces such as existing barriers/concrete removes NO2 from ambient air. The removal rate is, however, likely to be negligible in comparison to the rate of emission of NOx from vehicles on the road resulting in negligible change to air pollutant concentrations.	Neutral
	Noise	There are three noise important areas on the J25-26 route at Brynglas in Newport. The scheme runs between Brynglas and St Julians and is surrounded by sensitive receptors including residential housing and a community centre. This is unlikely to have a significant noise impact.	Neutral
	Landscape	The site is not situated within 1km of or within close proximity to an AONB area, Special Landscape Area, National Nature Reserve or Country Park. Depending on the colour of the proposed paint this could have a slight adverse impact to the M4.	Slight Adverse
	Historic Environment	There are no scheduled ancient monuments within 1km of the route with only Crindau Bridge being a listed building at the western extent of the site. No World Heritage Sites, registered battlefields, or parks and gardens have been identified within 1km of the route. This scheme is unlikely to have an impact other than a slight adverse impact on the setting of listed buildings.	Neutral
	Biodiversity	The River Usk SSSI, SAC site is located at the eastern extent of the route and passes under the M4. No SPAs, RAMSAR sites or National Nature Reserves are located within 1km of the route. With limited vegetation clearance required no significant impact upon ecology is anticipated to occur.	Neutral
	Water Environment	The River Usk runs beneath the M4 at the eastern extent of the site. Monmouthshire and Brecon Canal runs immediately west of J26 underneath the M4. With the use of best practise and the pollution prevention guidelines no significant impact is anticipated to occur as a result of this scheme.	Neutral
	Townscape	No conservation areas have been identified within 1km of the proposed site. Only one listed building Crindau Bridge is present at the western extent of the site. This scheme is unlikely to generate a significant effect upon the townscape of the local area.	Neutral
Economy	Journey Time Changes	NOx absorbing paint / coatings and fencing / panels should not on impact journey time changes or reliability along the study route. Therefore, it is considered that the impact should be neutral on the study route.	Neutral
	Capital Costs	Low (up to £500k)	N/A
	Land	It is anticipated that this option can be accommodated within the verge, and on existing infrastructure. This is not anticipated to have any requirements for additional land.	Neutral
S&C	Journey Quality	NOx absorbing paint / coatings and fencing / panels should not impact on journey quality along the study route. Therefore, it is considered that the impact should be neutral on the M4.	Neutral
	Physical Activity	NOx absorbing paint / coatings and fencing / panels should not on impact physical activity along the study route. Therefore, it is considered that the impact should be neutral on the M4.	Neutral
	Accidents	NOx absorbing paint / coatings and fencing / panels is not expected to impact on accidents along the study route. Therefore, it is considered that the impact should be neutral.	Neutral
	Access	NOx absorbing paint / coatings and fencing / panels is not expected to impact on access to services, employment, or healthcare along the study route. Therefore, it is considered that the impact should be neutral.	Neutral
VfM	Value For Money	It is anticipated that the Benefit to Cost ratio for this option would be within the range of 1 to 2	Fair
Other Issues	Acceptability	Given the nature of the proposals, this measure is unlikely to be opposed by any groups or individuals.	
	Technical, Operational & Financial Feasbility	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
	Deliverability & Risk	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	It is considered that NOx absorbing materials should have minimal impacts on overall reduction in NO2	
	Will the intervention result in unintended consequences or other environmental impacts	Yes, there is a slight adverse impact on the Biodiversity and Landscape	
	Will the intervention impact equally across multiple vehicle classes and journey types	Yes. This scheme should have an equal impact on all vehicle classes/well-being.	
	Will the intervention have a positive impact on wider public health and inequalities	No. NOx absorbing paint / coatings and fencing / panels should not impact wider public health and inequalities. Therefore, it is considered that the impact should be neutral.	

Date Produced - 06/02/2018

Appraisal Summary Table

Option No. / Theme S7 / Network Demand and Capacity

	Name of scheme:	**Enforce/Reduce Speed Limit**
	Location:	**M4 Newport**
	Description of scheme:	**Ensure that the strategic routes are run efficiently, for instance by introducing average speed limits in the areas most impacted by poor air quality. Could reduce speed limit and enforce current (or revised) speed limit using either spot cameras or average speed cameras. Predictable speed control on sections of trunk road network - can be refined to deliver specific levels of improvement.**
Key Criteria	**Effectiveness:**	**High**
	Timescales:	**Up to 5 months**
	Feasibility:	**Yes - This option can be delivered by WG Network Management Division**

Impacts		**Summary of key impacts**	**Assessment**
			Qualitative
Environmental	Air Quality	The measure reduces emissions and hence roadside pollutant concentrations where vehicles currently travel at high speed (i.e. speeds greater than the optimal speed for minimising emissions from light duty vehicles ~60 - 70 kph). For maximum impacts the speed limit should be enforced with average speed cameras and include off-peak /inter-peak periods. Advisory speed limits could be accompanied by Air Quality Communications measures to maximise efficacy. It has little impact in areas of congestion (am and pm peak flows) Emissions reduced by up to 4%; Roadside concentrations reduced by up to 3.8ug/m3	Large Beneficial
	Noise	There are three noise important areas on the J25-26 route at Brynglas in Newport. The scheme runs between Brynglas and St Julians and is surrounded by sensitive receptors including residential housing and a community centre. This scheme could generate a slight beneficial impact by reducing noise levels between source and receptor.	Slight Beneficial
	Landscape	The site is not situated within 1km of or within close proximity to an AONB area, Special Landscape Area, National Nature Reserve or Country Park. This scheme is unlikely to generate significant impacts upon the landscape.	Neutral
	Historic Environment	There are no scheduled ancient monuments within 1km of the route with only Crindau Bridge being a listed building at the western extent of the site. No World Heritage Sites, registered battlefields, or parks and gardens have been identified within 1km of the route. This scheme is not anticipated to impact upon the Historic Environment.	Neutral
	Biodiversity	The River Usk SSSI, SAC site is located at the eastern extent of the route and passes under the M4. No SPAs, RAMSAR sites or National Nature Reserves are located within 1km of the route. This is unlikely to generate impacts upon ecology due to the lack of vegetation clearance.	Neutral
	Water Environment	The River Usk runs beneath the M4 at the eastern extent of the site. Monmouthshire and Brecon Canal runs immediately west of J26 underneath the M4. With the use of best practise and the pollution prevention guidelines no significant impact is anticipated to occur as a result of this scheme.	Neutral
	Townscape	No conservation areas have been identified within 1km of the proposed site. Only one listed building Crindau Bridge is present at the western extent of the site. This scheme is unlikely to generate a significant effect upon the townscape of the local area.	Neutral
Economy	Journey Time Changes	Reducing speed limits on the strategic route should allow for a more efficient carriageway, therefore benefitting the reliability of journeys. However, it is considered that there should be minimal benefits in terms of improved journey times.	Slight Beneficial
	Capital Costs	Medium (£500k - £2m)	N/A
	Land	It is anticipated that this option can be accommodated within the verge, and on existing infrastructure. This is not anticipated to have any requirements for additional land.	Neutral
S&C	Journey Quality	Reducing speed limits on the strategic route should allow for a more efficient carriageway, therefore improving journey quality.	Slight Beneficial
	Physical Activity	A reduction in speed limit should not impact on physical activity along the study route. Therefore, it is considered that the impact should be neutral along the study route.	Neutral
	Accidents	It is envisaged that enforcing and/or reducing the speed limit should have a benefit on the number and severity of recorded accidents.	Slight Beneficial
	Access	It is envisaged that enforcing and/or reducing the speed limit should not have an impact on the access to services, employment, or healthcare.	Neutral
VfM	Value For Money	It is anticipated that the Benefit to Cost ratio for this option would be within greater than 2	Good
Other Issues	Acceptability	Given the nature of the proposals, this measure is anticipated to be opposed by some groups or individuals.	
	Technical, Operational & Financial Feasbility	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
	Deliverability & Risk	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	Yes. Marginal reductions anticipated.	
	Will the intervention result in unintended consequences or other environmental impacts	Yes. There are slight adverse consequences to historic environment	
	Will the intervention impact equally across multiple vehicle classes and journey types	Yes. This scheme should have an equal impact on all vehicle classes/well-being.	
	Will the intervention have a positive impact on wider public health and inequalities	Yes - A reduction is speed is believed to have associated public health (related to air quality) and noise benefits.	

Date Produced - 06/02/2018

Appraisal Summary Table

Option No. / Theme S8 / Network Demand and Capacity

	Name of scheme:	**HGV Overtaking Bans**
	Location:	**M4 Newport**
	Description of scheme:	**Prohibit HGVs from overtaking other vehicles (either full time or part time, such as peak hours) with enforcement - particularly for high speed carriageways.**
Key Criteria	**Effectiveness:**	**Ineffective**
	Timescales:	**6 months**
	Feasibility:	**Yes - This option can be delivered by WG Network Management Division**

Impacts		Summary of key impacts	Assessment
			Qualitative
Environmental	Air Quality	Prohibiting HDVs from overtaking on the uphill stretch of carriageway may reduce the number of braking/acceleration events and increase average speeds. Evidence suggests negligible impact on HDV speed (at <10% HGV%) but increase in speed of LDVs. The measure is potentially ineffective in that outside congested periods net emissions would increase with LDV speed increase. Likely neutral impact during peak hours when vehicles are already advised to avoid lane changes. Emissions increase by up to 4%. Roadside pollutant concentrations increase by up to 3.3ug/m3.	Moderate Adverse
	Noise	There are three noise important areas on the J25-26 route at Brynglas in Newport. The scheme runs between Brynglas and St Julians and is surrounded by sensitive receptors including residential housing and a community centre. This is unlikely to have a significant noise impact.	Neutral
	Landscape	The site is not situated within 1km of or within close proximity to an AONB area, Special Landscape Area, National Nature Reserve or Country Park. This scheme is unlikely to generate significant impacts upon the landscape.	Neutral
	Historic Environment	There are no scheduled ancient monuments within 1km of the route with only Crindau Bridge being a listed building at the western extent of the site. No World Heritage Sites, registered battlefields, or parks and gardens have been identified within 1km of the route. This scheme is not anticipated to impact upon the Historic Environment.	Neutral
	Biodiversity	The River Usk SSSI, SAC site is located at the eastern extent of the route and passes under the M4. No SPAs, RAMSAR sites or National Nature Reserves are located within 1km of the route. This is unlikely to generate impacts upon ecology due to the lack of vegetation clearance.	Neutral
	Water Environment	The River Usk runs beneath the M4 at the eastern extent of the site. Monmouthshire and Brecon Canal runs immediately west of J26 underneath the M4. This scheme is unlikely to generate significant water environment impacts.	Neutral
	Townscape	No conservation areas have been identified within 1km of the proposed site. Only one listed building Crindau Bridge is present at the western extent of the site. This scheme is unlikely to generate a significant effect upon the townscape of the local area.	Neutral
Economy	Journey Time Changes	Prohibiting HGVs from overtaking is not likely to have a significant benefit to journey time changes or reliability. Therefore the impact is considered to be neutral.	Neutral
	Capital Costs	Low (up to £500k)	N/A
	Land	It is anticipated that this option can be accommodated within the verge, and on existing infrastructure. This is not anticipated to have any requirements for additional land.	Neutral
S&C	Journey Quality	Prohibiting HGVs from overtaking is not likely to have a significant benefit to journey quality. Therefore the impact is considered to be neutral.	Neutral
	Physical Activity	Implementing HGV overtaking bans should not impact physical activity along the study route. Therefore, it is considered that the impact should be neutral on the M4 Newport.	Neutral
	Accidents	It is thought that preventing HGV overtaking should have a minor benefit to the number of recorded accidents along the study route.	Neutral
	Access	It is not expected that preventing HGVs from overtaking should impact the access to services, employment, or healthcare.	Neutral
VfM	Value For Money	It is anticipated that the Benefit to Cost ratio for this option would be within the range of 0 to 1	Poor
Other Issues	Acceptability	Given the nature of the proposals, this measure is anticipated to be opposed by some groups or individuals.	
	Technical, Operational & Financial Feasbility	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
	Deliverability & Risk	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	No. Preventing HGVs from over taking is considered to have a negative impact on NO2 levels.	
	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/well-being.	
	Will the intervention have a positive impact on wider public health and inequalities	No. Preventing HGV overtaking is unlikely to have a positive impact on wider public health and inequalities.	

Date Produced - 06/02/2018

Appraisal Summary Table

Option No. / Theme S14 / Network Demand and Capacity

	Name of scheme:	**Ramp Metering**
	Location:	**M4 Newport**
	Description of scheme:	**Use ramp metering to control traffic entering the road in question from side junctions / slip roads by traffic lights**
Key Criteria	**Effectiveness:**	**Ineffective**
	Timescales:	**Up to 5 months**
	Feasibility:	**Yes. Road network is managed by WG Network Management Division.**

Impacts		Summary of key impacts	Assessment
			Qualitative
Environmental	Air Quality	Measure unlikely to have an effect since there is no evidence for congestion being significantly linked to traffic merging at slip roads, rather it is influenced by capacity through the Brynglas tunnels	Neutral
	Noise	There are three noise important areas on the J25-26 route at Brynglas in Newport. The scheme runs between Brynglas and St Julians and is surrounded by sensitive receptors including residential housing and a community centre. This is unlikely to have a significant noise impact.	Neutral
	Landscape	The site is not situated within 1km of or within close proximity to an AONB area, Special Landscape Area, National Nature Reserve or Country Park. This scheme is unlikely to generate significant impacts upon the landscape.	Neutral
	Historic Environment	There are no scheduled ancient monuments within 1km of the route with only Crindau Bridge being a listed building at the western extent of the site. No World Heritage Sites, registered battlefields, or parks and gardens have been identified within 1km of the route. This scheme is not anticipated to impact upon the Historic Environment.	Neutral
	Biodiversity	The River Usk SSSI, SAC site is located at the eastern extent of the route and passes under the M4. No SPAs, RAMSAR sites or National Nature Reserves are located within 1km of the route. This is unlikely to generate impacts upon ecology due to the lack of vegetation clearance.	Neutral
	Water Environment	The River Usk runs beneath the M4 at the eastern extent of the site. Monmouthshire and Brecon Canal runs immediately west of J26 underneath the M4. This scheme is unlikely to generate significant water environment impacts.	Neutral
	Townscape	No conservation areas have been identified within 1km of the proposed site. Only one listed building Crindau Bridge is present at the western extent of the site. This scheme is unlikely to generate a significant effect upon the townscape of the local area.	Neutral
Economy	Journey Time Changes	Introducing ramp metering is likely to improve journey time changes on the strategic network. However, this could lead to increased congestion and delays on the more local network, effecting the reliability of a journey. Ramp metering is considered to have a neutral impact	Neutral
	Capital Costs	Medium (£500k - £2m)	N/A
	Land	It is anticipated that this option can be accommodated within the verge. This is not anticipated to have any requirements for additional land.	Neutral
S&C	Journey Quality	Introducing ramp metering is likely to improve flow on the strategic network. However, this could lead to increased congestion on the local network. Ramp metering is considered to have a neutral impact	Neutral
	Physical Activity	Ramp Metering should not impact physical activity along the study route. Therefore, it is considered that the impact should be neutral on the M4 Newport.	Neutral
	Accidents	Ramp metering should contribute to smoother flows during peak hours. This should decrease the likelihood of accidents.	Slight Beneficial
	Access	Ramp metering could cause congestion on roads connecting to the strategic network. Therefore impacting on local trips to services, employment, and healthcare. The impact is considered to be slightly adverse.	Slight Adverse
VfM	Value For Money	It is anticipated that the Benefit to Cost ratio for this option would be within the range of 0 to 1	Poor
Other Issues	Acceptability	Given the nature of the proposals, this measure is anticipated to be opposed by some groups or individuals.	
	Technical, Operational & Financial Feasbility	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
	Deliverability & Risk	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	This scheme is anticipated to result in minor overall benefits with respect to the overall reduction in NO2 emissions to air.	
	Will the intervention result in unintended consequences or other environmental impacts	Yes. Ramp metering could have a slightly adverse impact on access to local services. There are not deemed to be any 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/well-being.	
	Will the intervention have a positive impact on wider public health and inequalities	No. Ramp metering should have a neutral impact on public health and inequalities.	

Date Produced - 06/02/2018

Appraisal Summary Table

Option No. / Theme S16 / Network Demand and Capacity

	Name of scheme:	**Junction Closures**
	Location:	**M4 Newport**
	Description of scheme:	**Close individual junction or junctions – either full time or part time, temporarily or permanently.**
Key Criteria	**Effectiveness:**	**Medium**
	Timescales:	**Up to 5 months**
	Feasibility:	**Yes. Junction closures can managed by WG Network Management Division.**

Impacts		Summary of key impacts	Assessment
			Qualitative
Environmental	Air Quality	Measure reduced emissions by potentially removing traffic from the link and is targeted at local journeys using the strategic network. The measure has an effect outside of peak hours if not limited to peak hours. There is potential for increased flows in other areas of poor air quality due to driver route selection. Emissions reduced by up to 2% near junction; Roadside pollutant concentrations reduced by 0.6ug/m3.	Moderate Beneficial
	Noise	There are three noise important areas on the J25-26 route at Brynglas in Newport. The scheme runs between Brynglas and St Julians and is surrounded by sensitive receptors including residential housing and a community centre. This is unlikely to have a significant noise impact.	Neutral
	Landscape	The site is not situated within 1km of or within close proximity to an AONB area, Special Landscape Area, National Nature Reserve or Country Park. This scheme is unlikely to generate significant impacts upon the landscape.	Neutral
	Historic Environment	There are no scheduled ancient monuments within 1km of the route with only Crindau Bridge being a listed building at the western extent of the site. No World Heritage Sites, registered battlefields, or parks and gardens have been identified within 1km of the route. This scheme is not anticipated to impact upon the Historic Environment.	Neutral
	Biodiversity	The River Usk SSSI, SAC site is located at the eastern extent of the route and passes under the M4. No SPAs, RAMSAR sites or National Nature Reserves are located within 1km of the route. This is unlikely to generate impacts upon ecology due to the lack of vegetation clearance.	Neutral
	Water Environment	The River Usk runs beneath the M4 at the eastern extent of the site. Monmouthshire and Brecon Canal runs immediately west of J26 underneath the M4. This scheme is unlikely to generate significant water environment impacts.	Neutral
	Townscape	No conservation areas have been identified within 1km of the proposed site. Only one listed building Crindau Bridge is present at the western extent of the site. This scheme may have a slight beneficial effect upon the listed bridge by reducing vehicle numbers.	Slight Beneficial
Economy	Journey Time Changes	The closure of junctions is likely to improve journey times and reliability along the strategic route. However, the scheme may cause congestion and commuter journey time delay and reliability for vehicles looking to enter the strategic road network locally. Therefore the scheme is considered to have a neutral impact overall.	Neutral
	Capital Costs	Medium (£500k - £2m)	N/A
	Land	It is assumed that some junctions should be permanently closed. Permanent junction closure should result in land becoming available for alternative use.	Slight Beneficial
S&C	Journey Quality	The closure of junctions is likely to cause local congestion and commuter journey time delay. However, through traffic using the strategic network may benefit from improved journey quality. The scheme is considered to have slight adverse impacts on journey times, which can be primariliy attributed to the traffic currently using the junctions.	Slight Adverse
	Physical Activity	Junction closures should not impact on physical activity along the study route. Therefore, it is considered that the impact should be neutral along the study route.	Neutral
	Accidents	Junction closures are considered to have a neutral impact on accident rates.	Neutral
	Access	Junction closure could cause congestion on roads connecting to the strategic network. Therefore impacting on local trips to services, employment, and healthcare. Traffic currently using these junctions may experience increase journey times and find some services less accessible. The impact is considered to be moderately adverse.	Moderate Adverse
VfM	Value For Money	It is anticipated that the Benefit to Cost ratio for this option would be within the range of 1 to 2	Fair
Other Issues	Acceptability	Given the nature of the proposals, this measure is anticipated to be opposed by some groups or individuals.	
	Technical, Operational & Financial Feasbility	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
	Deliverability & Risk	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	No. Junction closures should divert traffic elsewhere causing similar NO2 emissions.	
	Will the intervention result in unintended consequences or other environmental impacts	Yes. Junction closures could have a slightly adverse impact on access to local services There are not deemed to be any 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/well-being.	
	Will the intervention have a positive impact on wider public health and inequalities	No. Junction closures should not have a positive impact on the wider public health and inequalities.	

Date Produced - 06/02/2018

Appraisal Summary Table

Option No. / Theme S19 / Diversion Routes

	Name of scheme:	**Variable Diversions**
	Location:	**M4 Newport**
	Description of scheme:	**Variable diversions within set NO2 limits (using continuous monitoring equipment)**
Key Criteria	**Effectiveness:**	**Medium**
	Timescales:	**12 months**
	Feasibility:	**Yes. Traffic management is within WG Network Management Division scope.**

Impacts		Summary of key impacts	Assessment
			Qualitative
Environmental	Air Quality	The measure has the potential to reduce emissions and hence roadside pollutant concentrations through the removal of traffic from the strategic road network. If linked to real time air quality and/or congestion, impacts are likely to be limited to reductions in peak hour flows. Traffic may be diverted into areas of poor air quality. Emissions reduced by up to 5% Roadside pollutant concentrations reduced by 2.0ug/m3	Moderate Beneficial
	Noise	There are three noise important areas on the J25-26 route at Brynglas in Newport. The scheme runs between Brynglas and St Julians and is surrounded by sensitive receptors including residential housing and a community centre. This is likely to reduce noise on the M4 by removing some of the vehicles and reducing levels heard by the receptors.	Slight Beneficial
	Landscape	The site is not situated within 1km of or within close proximity to an AONB area, Special Landscape Area, National Nature Reserve or Country Park. This scheme is unlikely to generate significant impacts upon the landscape.	Neutral
	Historic Environment	There are no scheduled ancient monuments within 1km of the route with only Crindau Bridge being a listed building at the western extent of the site. No World Heritage Sites, registered battlefields, or parks and gardens have been identified within 1km of the route. This scheme is not anticipated to impact upon the Historic Environment.	Neutral
	Biodiversity	The River Usk SSSI, SAC site is located at the eastern extent of the route and passes under the M4. No SPAs, RAMSAR sites or National Nature Reserves are located within 1km of the route. This is unlikely to generate impacts upon ecology due to the lack of vegetation clearance.	Neutral
	Water Environment	The River Usk runs beneath the M4 at the eastern extent of the site. Monmouthshire and Brecon Canal runs immediately west of J26 underneath the M4. This scheme is unlikely to generate significant water environment impacts.	Neutral
	Townscape	No conservation areas have been identified within 1km of the proposed site. Only one listed building Crindau Bridge is present at the western extent of the site. This scheme is unlikely to generate a significant effect upon the townscape of the local area.	Neutral
Economy	Journey Time Changes	Variable Diversions are likely to increase journey times and negatively impact reliability. Therefore, the scheme is considered to have a negative impact.	Moderate Adverse
	Capital Costs	Medium (£500k - £2m)	N/A
	Land	It is anticipated that this option can be accommodated within the verge. This is not anticipated to have any requirements for additional land.	Neutral
S&C	Journey Quality	Depending on the extent of the diversion route, there could potentially be adverse impacts on journey quality given traffic is not using the strategic road network..	Slight Adverse
	Physical Activity	Diversions should not impact physical activity along the study route. Therefore, it is considered that the impact should be neutral on the M4 Newport.	Neutral
	Accidents	Variable diversions are not expected to result in any significant reduction/prevention of accidents	Neutral
	Access	Diversions on to local roads should potentially lead to congestion and a delay in access to services, employment, and healthcare.	Slight Adverse
VfM	Value For Money	It is anticipated that the Benefit to Cost ratio for this option would be within the range of 1 to 2	Fair
Other Issues	Acceptability	Given the nature of the proposals, this measure is anticipated to be opposed by some groups or individuals.	
	Technical, Operational & Financial Feasbility	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
	Deliverability & Risk	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	No. Diversions may potentially divert problems elsewhere.	
	Will the intervention result in unintended consequences or other environmental impacts	Yes. Variable diversions are predicted to have a moderately adverse impact on journey times, as they could have a negative impact on reliability. They could have a slightly adverse effect on journey quality, depending on the diversion route, and limit access to services due to congestion. There are not deemed to be any 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/well-being.	
	Will the intervention have a positive impact on wider public health and inequalities	No. Diversion of excluded vehicles via rat-runs and alternative routes which may be over capacity, leading to a reduction in road safety and rat-running, on a less local scale.	

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Appraisal Summary Table

Option No. / Theme S28 / Sustainable Travel

	Name of scheme:	**Behaviour Change**
	Location:	**M4 Newport**
	Description of scheme:	**Package of several options aimed at changing travel behaviour, resulting in a mode shift away from private car use. For instance, introducing Active Travel campaigns through school & business Travel Plans and using Personalised Travel Planning. Promote Active Travel with facilities, measures, incentives, and technology. Air quality awards for those organisations/companies that have changed behaviour. Measures could also include workplace Charging Levies and staggered timings for school buses. Potential to promote a 'No Car Day' event, which would encourage / incentivise the use of public transport. Whilst the benefit on the day may be minimal, it could provide long term benefits with a change in modal split.**
Key Criteria	**Effectiveness:**	**Medium**
	Timescales:	**Up to 5 months**
	Feasibility:	**Yes - This option can be delivered by WG Network Management Division**

Impacts		**Summary of key impacts**	**Assessment**
			Qualitative
Environmental	Air Quality	The package of measures may reduce total emissions through encouraging people to shift from private vehicles to more sustainable traffic modes. There is significant scope for a switch to public transport on the M4 through Newport, particularly in relation to the provision of east-west rail links. Emissions may reduce by up to 3%; Roadside pollutant concentrations reduce by up to 1.2ug/m3.	Moderate Beneficial
	Noise	There are three noise important areas on the J25-26 route at Brynglas in Newport. The scheme runs between Brynglas and St Julians and is surrounded by sensitive receptors including residential housing and a community centre. A reduction in cars on the road is likely to generate a slight beneficial impact upon noise in the local area.	Slight Beneficial
	Landscape	The site is not situated within 1km of or within close proximity to an AONB area, Special Landscape Area, National Nature Reserve or Country Park. This scheme is unlikely to generate significant impacts upon the landscape.	Neutral
	Historic Environment	There are no scheduled ancient monuments within 1km of the route with only Crindau Bridge being a listed building at the western extent of the site. No World Heritage Sites, registered battlefields, or parks and gardens have been identified within 1km of the route. This scheme is not anticipated to impact upon the Historic Environment.	Neutral
	Biodiversity	The River Usk SSSI, SAC site is located at the eastern extent of the route and passes under the M4. No SPAs, RAMSAR sites or National Nature Reserves are located within 1km of the route. This is unlikely to generate impacts upon ecology due to the lack of vegetation clearance.	Neutral
	Water Environment	The River Usk runs beneath the M4 at the eastern extent of the site. Monmouthshire and Brecon Canal runs immediately west of J26 underneath the M4. This scheme is unlikely to generate significant water environment impacts.	Neutral
	Townscape	No conservation areas have been identified within 1km of the proposed site. Only one listed building Crindau Bridge is present at the western extent of the site. This scheme is unlikely to generate a significant effect upon the townscape of the local area.	Neutral
Economy	Journey Time Changes	Delivery of a scheme that can capture a behaviour change using incentives and encouragement could result in less vehicles on the strategic network. Therefore a decrease in journey time and improved reliability could be achieved.	Slight Beneficial
	Capital Costs	Low (up to £500k)	N/A
	Land	Measure does not require any physical infrastructure. No land acquisition required	Neutral
S&C	Journey Quality	The package would look to achieve a change in driver behaviour, resulting in mode shift away from the private car. This would free up capacity on the strategic routes and therefore improve the journey quality.	Slight Beneficial
	Physical Activity	Achieving a behaviour change is likely to result in a slight improvement on physical activity. Therefore, a positive impact would be expected.	Slight Beneficial
	Accidents	A package of measures that encourages modal shift is not expected to have a significant impact on accidents.	Neutral
	Access	A package of measures that encourages modal shift could be expected to result in a minor impact on access to services, employment, and healthcare.	Neutral
VfM	Value For Money	It is anticipated that the Benefit to Cost ratio for this option would be within the range of 1 to 2	Fair
Other Issues	Acceptability	Given the nature of the proposals, this measure is unlikely to be opposed by any groups or individuals.	
	Technical, Operational & Financial Feasbility	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
	Deliverability & Risk	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	Yes. Modal shift to sustainable travel should see a reduction in NO2 levels.	
	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	This option aims to improve equality across all modes.	
	Will the intervention have a positive impact on wider public health and inequalities	Yes. Promotes opportunity for an increase in active travel. Car sharers and public transport users are more likely to walk longer distances to transport hubs than car users do to their parked vehicles.	

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Appraisal Summary Table

Option No. / Theme S44 / Policy and Funding

	Name of scheme:	**Vehicle Emission Testing**
	Location:	**M4 Newport**
	Description of scheme:	**Using The Road Traffic (Vehicle Emissions) (Fixed Penalty) (Wales) Regulations 2003 - Issue road-side penalties for vehicles exceeding emissions, and tackle unnecessary idling.**
Key Criteria	**Effectiveness:**	**Ineffective**
	Timescales:	**Up to 5 months**
	Feasibility:	**Yes - This option can be delivered by WG Network Management Division**

Impacts		**Summary of key impacts**	**Assessment**
			Qualitative
Environmental	Air Quality	Increased vehicle testing could have a beneficial impact on air quality through reducing the length of time that vehicles are driven with failed emissions control. The measure would need to target cars, lgv and hdvs. However, it is not considered feasible that sufficient numbers of vehicles should be affected to drive a perceptible decrease in vehicle emissions. Emissions should reduce by <<1%	Neutral
	Noise	There are three noise important areas on the J25-26 route at Brynglas in Newport. The scheme runs between Brynglas and St Julians and is surrounded by sensitive receptors including residential housing and a community centre. This is unlikely to have a significant noise impact.	Neutral
	Landscape	The site is not situated within 1km of or within close proximity to an AONB area, Special Landscape Area, National Nature Reserve or Country Park. This scheme is unlikely to generate significant impacts upon the landscape.	Neutral
	Historic Environment	There are no scheduled ancient monuments within 1km of the route with only Crindau Bridge being a listed building at the western extent of the site. No World Heritage Sites, registered battlefields, or parks and gardens have been identified within 1km of the route. This scheme is not anticipated to impact upon the Historic Environment.	Neutral
	Biodiversity	The River Usk SSSI, SAC site is located at the eastern extent of the route and passes under the M4. No SPAs, RAMSAR sites or National Nature Reserves are located within 1km of the route. This is unlikely to generate impacts upon ecology due to the lack of vegetation clearance.	Neutral
	Water Environment	The River Usk runs beneath the M4 at the eastern extent of the site. Monmouthshire and Brecon Canal runs immediately west of J26 underneath the M4. This scheme is unlikely to generate significant water environment impacts.	Neutral
	Townscape	No conservation areas have been identified within 1km of the proposed site. Only one listed building Crindau Bridge is present at the western extent of the site. This scheme is unlikely to generate a significant effect upon the townscape of the local area.	Neutral
Economy	Journey Time Changes	Vehicle emission testing is not though to significantly impact on journey time or reliability along the study route. Therefore, it is considered that the impact should be neutral on the study route.	Neutral
	Capital Costs	Low (up to £500k)	N/A
	Land	Measure does not require any physical infrastructure. No land acquisition required	Neutral
S&C	Journey Quality	It is considered that vehicle emission testing should not significantly impact on journey quality along the study route. Therefore, it is considered that the impact should be neutral.	Neutral
	Physical Activity	Vehicle emission testing should not impact on physical activity along the study route. Therefore, it is considered that the impact should be neutral on the study route.	Neutral
	Accidents	It is considered that vehicle emission testing should have a negligible impact on accidents.	Neutral
	Access	It is considered that vehicle emission testing should have a negligible impact on access to services, employment, and healthcare.	Neutral
VfM	Value For Money	It is anticipated that the Benefit to Cost ratio for this option would be within the range of 0 to 1	Poor
Other Issues	Acceptability	Given the nature of the proposals, this measure is anticipated to be opposed by some groups or individuals.	
	Technical, Operational & Financial Feasbility	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
	Deliverability & Risk	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	No. Vehicle emission testing should not result in a reduction in NO2 levels.	
	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	No. Older vehicles may be targeted.	
	Will the intervention have a positive impact on wider public health and inequalities	Yes. Vehicle emission testing should positively impact the wider public health and inequalities.	

Date Produced - 06/02/2018

Appraisal Summary Table

Option No. / Theme S46 / Policy and Funding

	Name of scheme:	**Clean Air Zones / Low Emission Zones**
	Location:	**M4 Newport**
	Description of scheme:	**Promotion of Clean Air Zones and/or Low Emission Zones - implement with use of ANPR cameras/GPS/Bluetooth. Negotiate new vehicle emissions standards, establish a bus operator NOx emissions cap, and determine specific targets in terms of vehicle type and journeys taken to inform measures focussed on specific effects on traffic in locations of interest. Including requirement to display stickers on vehicles showing emissions category - higher emission vehicles banned during periods of high pollution levels (as in France). Could involve limiting HGV weight or emission, and zone charging.**
Key Criteria	**Effectiveness:**	**High**
	Timescales:	**18-24 months**
	Feasibility:	**Yes. Traffic management is within WG Network Management Division scope.**

Impacts		**Summary of key impacts**	**Assessment**
			Qualitative
Environmental	Air Quality	The measure should improve air quality through acting as a deterrent for older/more polluting vehicles to use the strategic network. If the measure is limit to peak hours, the effects should be limited since significant emissions occur outside of such zones. The measure would be most effective if linked to road charges. If vehicles are limited to Euro 4 and above, emissions may reduce by up to 5% (or greater); Roadside pollutant concentration reduced by up to 2.0ug/m3.	Large Beneficial
	Noise	There are three noise important areas on the J25-26 route at Brynglas in Newport. The scheme runs between Brynglas and St Julians and is surrounded by sensitive receptors including residential housing and a community centre. This is unlikely to have a significant noise impact.	Neutral
	Landscape	The site is not situated within 1km of or within close proximity to an AONB area, Special Landscape Area, National Nature Reserve or Country Park. This scheme is unlikely to generate significant impacts upon the landscape.	Neutral
	Historic Environment	There are no scheduled ancient monuments within 1km of the route with only Crindau Bridge being a listed building at the western extent of the site. No World Heritage Sites, registered battlefields, or parks and gardens have been identified within 1km of the route. This scheme is not anticipated to impact upon the Historic Environment.	Neutral
	Biodiversity	The River Usk SSSI, SAC site is located at the eastern extent of the route and passes under the M4. No SPAs, RAMSAR sites or National Nature Reserves are located within 1km of the route. This is unlikely to generate impacts upon ecology due to the lack of vegetation clearance.	Neutral
	Water Environment	The River Usk runs beneath the M4 at the eastern extent of the site. Monmouthshire and Brecon Canal runs immediately west of J26 underneath the M4. This scheme is unlikely to generate significant water environment impacts.	Neutral
	Townscape	No conservation areas have been identified within 1km of the proposed site. Only one listed building Crindau Bridge is present at the western extent of the site. This scheme is unlikely to generate a significant effect upon the townscape of the local area.	Neutral
Economy	Journey Time Changes	It is not envisaged that Clean Air Zones and/or Low Emission Zones should have a significant impact on journey time or reliability. However., this could result in slightly less HGVs. Therefore the impact is considered to be neutral.	Neutral
	Capital Costs	High (£2m+)	N/A
	Land	It is anticipated that this option can be accommodated within the verge, and on existing infrastructure. This is not anticipated to have any requirements for additional land.	Neutral
S&C	Journey Quality	It is not envisaged that Clean Air Zones and/or Low Emission Zones should have a significant impact on journey quality. However., this could result in slightly less HGVs. Therefore the impact is considered to be neutral.	Neutral
	Physical Activity	Clean Air Zones / Low Emission Zones should not impact physical activity along the study route. Therefore, it is considered that the impact should be neutral on the M4 Newport.	Neutral
	Accidents	It is expected that clean air zones / low emission zones should not impact accidents along the study route. Therefore, it is considered that the impact should be neutral.	Neutral
	Access	It is expected that clean air zones / low emission zones may impact upon people's journeys and local business, thus it is considered that there may be a moderate adverse impact to access to services, employment, and healthcare along the study route.	Moderate Adverse
VfM	Value For Money	It is anticipated that the Benefit to Cost ratio for this option would be within the range of 1 to 2	Fair
Other Issues	Acceptability	Given the nature of the proposals, this measure is anticipated to be opposed by some groups or individuals.	
	Technical, Operational & Financial Feasbility	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
	Deliverability & Risk	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	There may potentially be an overall reduction to NO2 though it is likely that there may be localised increases in NO2 elsewhere.	
	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	No. Older/heavier vehicles may be targeted.	
	Will the intervention have a positive impact on wider public health and inequalities	No. Diversion of excluded vehicles via rat-runs and alternative routes which may be over capacity, leading to a reduction in road safety and rat-running.	

Date Produced - 06/02/2018

Appraisal Summary Table

Option No. / Theme S51 / Traffic Management

	Name of scheme:	**Intelligent Traffic Management**
	Location:	**M4 Newport**
	Description of scheme:	**Intelligent Traffic Management, linking real-time emissions/AQ data with TM - &/or remote monitoring through use of Intelligent Transport System (ITS) & other innovative technological systems. Linked to Air Quality and/or traffic flows. Use systems to smooth out traffic flows when AQ issues and/or traffic congestion occurs, and/or link to travel info to influence route / mode / time of travel choices.**
Key Criteria	**Effectiveness:**	**High**
	Timescales:	**18-24 months**
	Feasibility:	**Yes. Intelligent traffic management systems can be commissioned by WG Network Management Division.**

Impacts		Summary of key impacts	Assessment
			Qualitative
Environmental	Air Quality	Intelligent traffic management could reduce emissions on the strategic network by providing information on optimum route choices; air quality , and travel mode. The option could contribute to modal shift, diversions etc. Emissions are estimated to reduce by up to 5% The option could be used to set variable speed limits in the off-peak period which should provide users with real-time air quality information	Large Beneficial
	Noise	There are three noise important areas on the J25-26 route at Brynglas in Newport. The scheme runs between Brynglas and St Julians and is surrounded by sensitive receptors including residential housing and a community centre. This is unlikely to have a significant noise impact.	Neutral
	Landscape	The site is not situated within 1km of or within close proximity to an AONB area, Special Landscape Area, National Nature Reserve or Country Park. This scheme is unlikely to generate significant impacts upon the landscape.	Neutral
	Historic Environment	There are no scheduled ancient monuments within 1km of the route with only Crindau Bridge being a listed building at the western extent of the site. No World Heritage Sites, registered battlefields, or parks and gardens have been identified within 1km of the route. This scheme is not anticipated to impact upon the Historic Environment.	Neutral
	Biodiversity	The River Usk SSSI, SAC site is located at the eastern extent of the route and passes under the M4. No SPAs, RAMSAR sites or National Nature Reserves are located within 1km of the route. This is unlikely to generate impacts upon ecology due to the lack of vegetation clearance.	Neutral
	Water Environment	The River Usk runs beneath the M4 at the eastern extent of the site. Monmouthshire and Brecon Canal runs immediately west of J26 underneath the M4. This scheme is unlikely to generate significant water environment impacts.	Neutral
	Townscape	No conservation areas have been identified within 1km of the proposed site. Only one listed building Crindau Bridge is present at the western extent of the site. This scheme is unlikely to generate a significant effect upon the townscape of the local area.	Neutral
Economy	Journey Time Changes	Intelligent traffic systems are not expected to result in any significant improvements in journey time along the study route, however could have minor benefits to reliability.	Neutral
	Capital Costs	High (£2m+)	N/A
	Land	It is anticipated that this option can be accommodated within the verge, and on existing infrastructure. This is not anticipated to have any requirements for additional land.	Neutral
S&C	Journey Quality	Intelligent traffic systems are expected to result in minor positive impacts on journey quality along the study route.	Slight Beneficial
	Physical Activity	Traffic management should not impact physical activity along the study route. Therefore, it is considered that the impact should be neutral on the M4 Newport.	Neutral
	Accidents	It is thought that intelligent traffic management could smooth out traffic flows and therefore have a minor benefit to accident rates along the study route.	Neutral
	Access	Access to Services, Employment, and Healthcare is not expected to be significantly impacted from intelligent traffic management.	Neutral
VfM	Value For Money	It is anticipated that the Benefit to Cost ratio for this option would be within the range of 1 to 2	Fair
Other Issues	Acceptability	Given the nature of the proposals, this measure is unlikely to be opposed by any groups or individuals.	
	Technical, Operational & Financial Feasbility	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
	Deliverability & Risk	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	Yes. If used effectively, less congestion can result in reduced NO2 levels.	
	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/well-being.	
	Will the intervention have a positive impact on wider public health and inequalities	No. Intelligent Traffic Management should not impact on wider public health and inequalities.	

Date Produced - 06/02/2018

Appraisal Summary Table

Option No. / Theme S53 / Traffic Management

	Name of scheme:	**Enhanced Traffic Officer Service**
	Location:	**M4 Newport**
	Description of scheme:	**An enhanced Traffic Officer Service in Wales to clear motorway incidents quickly thereby reducing emissions from idling vehicles caught up in congestion. Could involve upgrading their operation, providing additional teams, or expanding the service to routes that are not currently being covered.**
Key Criteria	**Effectiveness:**	**Ineffective**
	Timescales:	**6 months**
	Feasibility:	**Yes - This option can be delivered by WG Network Management Division**

Impacts		**Summary of key impacts**	**Assessment**
			Qualitative
Environmental	Air Quality	An enhance traffic officer service could have a beneficial impact on air quality through reducing the length of time that there is road congestion (through clearly accidents etc.). The measure would need to target cars, lgv and hdvs. However, it is not considered feasible that air quality would be improved over sufficient number of incidents and times to drive a perceptible decrease in vehicle emissions. Emissions should reduce by <<1%	Neutral
	Noise	There are three noise important areas on the J25-26 route at Brynglas in Newport. The scheme runs between Brynglas and St Julians and is surrounded by sensitive receptors including residential housing and a community centre. This is unlikely to have a significant noise impact.	Neutral
	Landscape	The site is not situated within 1km of or within close proximity to an AONB area, Special Landscape Area, National Nature Reserve or Country Park. This scheme is unlikely to generate significant impacts upon the landscape.	Neutral
	Historic Environment	There are no scheduled ancient monuments within 1km of the route with only Crindau Bridge being a listed building at the western extent of the site. No World Heritage Sites, registered battlefields, or parks and gardens have been identified within 1km of the route. This scheme is not anticipated to impact upon the Historic Environment.	Neutral
	Biodiversity	The River Usk SSSI, SAC site is located at the eastern extent of the route and passes under the M4. No SPAs, RAMSAR sites or National Nature Reserves are located within 1km of the route. This is unlikely to generate impacts upon ecology due to the lack of vegetation clearance.	Neutral
	Water Environment	The River Usk runs beneath the M4 at the eastern extent of the site. Monmouthshire and Brecon Canal runs immediately west of J26 underneath the M4. This scheme is unlikely to generate significant water environment impacts.	Neutral
	Townscape	No conservation areas have been identified within 1km of the proposed site. Only one listed building Crindau Bridge is present at the western extent of the site. This scheme is unlikely to generate a significant effect upon the townscape of the local area.	Neutral
Economy	Journey Time Changes	Enhancing Traffic Officer Services is not considered to have a significant impact on journey time changes or reliability along the study route.	Neutral
	Capital Costs	Low (up to £500k) - revenue costs likely to outweigh capital costs	N/A
	Land	Measure does not require any physical infrastructure. No land acquisition required	Neutral
S&C	Journey Quality	Enhancing Traffic Officer Services is not thought to have a significant impact on journey quality along the study route.	Neutral
	Physical Activity	Enhanced traffic officer service is not thought to impact physical activity along the study route. Therefore, it is considered that the impact should be neutral.	Neutral
	Accidents	Enhancing Traffic Officer Services is not likely to have a significant impact on accidents along the study route.	Neutral
	Access	Enhanced traffic officer service is not thought to have an impact on access to services, employment, and healthcare.	Neutral
VfM	Value For Money	It is anticipated that the Benefit to Cost ratio for this option would be within the range of 0 to 1	Poor
Other Issues	Acceptability	Given the nature of the proposals, this measure is unlikely to be opposed by any groups or individuals.	
	Technical, Operational & Financial Feasbility	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
	Deliverability & Risk	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	Yes. Marginal reductions anticipated on occasions.	
	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/well-being.	
	Will the intervention have a positive impact on wider public health and inequalities	No. Enhanced traffic officer services should not have a significant impact on wider public health and inequalities.	

Date Produced - 06/02/2018

Appraisal Summary Table

Option No. / Theme S65 / Communication

	Name of scheme:	**Air Quality Areas**
	Location:	**M4 Newport**
	Description of scheme:	**Publicity campaigns to raise awareness using branding/presentation of areas where multiple activities are applied for air quality – e.g.: information, speed control, to raise awareness and encourage compliance.**
Key Criteria	**Effectiveness:**	**Low**
	Timescales:	**Up to 5 months**
	Feasibility:	**Yes. Branding of area can be developed by WG Network Management Division.**

Impacts		Summary of key impacts	Assessment
			Qualitative
Environmental	Air Quality	The measure may reduce emissions through smoothing traffic flows and increasing driver awareness of areas of poor air quality/campaigns. Emissions reduced by up to 1%	Slight Beneficial
	Noise	There are three noise important areas on the J25-26 route at Brynglas in Newport. The scheme runs between Brynglas and St Julians and is surrounded by sensitive receptors including residential housing and a community centre. This is unlikely to have a significant noise impact.	Neutral
	Landscape	The site is not situated within 1km of or within close proximity to an AONB area, Special Landscape Area, National Nature Reserve or Country Park. This scheme is unlikely to generate significant impacts upon the landscape.	Neutral
	Historic Environment	There are no scheduled ancient monuments within 1km of the route with only Crindau Bridge being a listed building at the western extent of the site. No World Heritage Sites, registered battlefields, or parks and gardens have been identified within 1km of the route. This scheme is not anticipated to impact upon the Historic Environment.	Neutral
	Biodiversity	The River Usk SSSI, SAC site is located at the eastern extent of the route and passes under the M4. No SPAs, RAMSAR sites or National Nature Reserves are located within 1km of the route. This is unlikely to generate impacts upon ecology due to the lack of vegetation clearance.	Neutral
	Water Environment	The River Usk runs beneath the M4 at the eastern extent of the site. Monmouthshire and Brecon Canal runs immediately west of J26 underneath the M4. This scheme is unlikely to generate significant water environment impacts.	Neutral
	Townscape	No conservation areas have been identified within 1km of the proposed site. Only one listed building Crindau Bridge is present at the western extent of the site. This scheme is unlikely to generate a significant effect upon the townscape of the local area.	Neutral
Economy	Journey Time Changes	It is not envisaged that Air Quality Areas should have an impact on journey time changes or reliability. Therefore the impact is considered to be neutral.	Neutral
	Capital Costs	Low (up to £500k)	N/A
	Land	It is anticipated that this option can be accommodated within the verge, and on existing infrastructure. This is not anticipated to have any requirements for additional land.	Neutral
S&C	Journey Quality	It is not envisaged that Air Quality Areas should have an impact on journey quality. Therefore the impact is considered to be neutral.	Neutral
	Physical Activity	Air Quality Areas should not impact on physical activity along the study route. Therefore, it is considered that the impact should be neutral on the study route.	Neutral
	Accidents	Air quality areas are not expected to impact accidents along the study route. Therefore, it is considered that the impact should be neutral.	Neutral
	Access	Air quality areas are not expected to impact on access to services, employment, or healthcare along the study route. Therefore, it is considered that the impact should be neutral.	Neutral
VfM	Value For Money	It is anticipated that the Benefit to Cost ratio for this option would be within the range of 1 to 2	Fair
Other Issues	Acceptability	Given the nature of the proposals, this measure is unlikely to be opposed by any groups or individuals.	
	Technical, Operational & Financial Feasbility	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
	Deliverability & Risk	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	Yes - though anticipated that the reduction would be marginal	
	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/well-being.	
	Will the intervention have a positive impact on wider public health and inequalities	No. publicity campaigns are unlikely to have a positive impact on wider public health and inequalities.	

Date Produced - 06/02/2018

Appraisal Summary Table

Option No. / Theme S66 / Communication

	Name of scheme:	**Air Quality Communications**
	Location:	**M4 Newport**
	Description of scheme:	**A package of measures that provides information regarding air quality that raise awareness. For instance, adding air quality locations to Traffic Wales Website and including air quality in outward facing communications plans / announcements to inform drivers alongside information on speeds/road works. Daily information should be added to the UK air website, and information provided for local residents. Real-time information should be provided, with online tools/phone apps that provide route options and times as well as air quality implications across all modes. Investing in smart technology should make it easier to 'see' air pollution and see effects of actions to tackle it. May also include the use of a pollution car labelling scheme and signage to influence route choice. A national communications strategy should be used to communicate risks and advice on measures.**
Key Criteria	**Effectiveness:**	**Low**
	Timescales:	**Up to 5 months**
	Feasibility:	**Yes. Traffic Wales Website managed by WG. WG can input data into this. Network Management Division.**

Impacts		**Summary of key impacts**	**Assessment**
			Qualitative
Environmental	Air Quality	The measure may reduce emissions through smoothing traffic flows and increasing driver awareness of areas of poor air quality/campaigns. Could include information about real time air quality. The measure should be most effective when combined with other measures such as speed advisories / diversions / junction closures etc. Emissions reduced by up to 1% (due to communications alone)	Slight Beneficial
	Noise	There are three noise important areas on the J25-26 route at Brynglas in Newport. The scheme runs between Brynglas and St Julians and is surrounded by sensitive receptors including residential housing and a community centre. This is unlikely to have a significant noise impact.	Neutral
	Landscape	The site is not situated within 1km of or within close proximity to an AONB area, Special Landscape Area, National Nature Reserve or Country Park. This scheme is unlikely to generate significant impacts upon the landscape.	Neutral
	Historic Environment	There are no scheduled ancient monuments within 1km of the route with only Crindau Bridge being a listed building at the western extent of the site. No World Heritage Sites, registered battlefields, or parks and gardens have been identified within 1km of the route. This scheme is not anticipated to impact upon the Historic Environment.	Neutral
	Biodiversity	The River Usk SSSI, SAC site is located at the eastern extent of the route and passes under the M4. No SPAs, RAMSAR sites or National Nature Reserves are located within 1km of the route. This is unlikely to generate impacts upon ecology due to the lack of vegetation clearance.	Neutral
	Water Environment	The River Usk runs beneath the M4 at the eastern extent of the site. Monmouthshire and Brecon Canal runs immediately west of J26 underneath the M4. This scheme is unlikely to generate significant water environment impacts.	Neutral
	Townscape	No conservation areas have been identified within 1km of the proposed site. Only one listed building Crindau Bridge is present at the western extent of the site. This scheme is unlikely to generate a significant effect upon the townscape of the local area.	Neutral
Economy	Journey Time Changes	It is not envisaged that Air Quality Communications should have an impact on journey times or reliability. Therefore the impact is considered to be neutral.	Neutral
	Capital Costs	Low (up to £500k)	N/A
	Land	Measure does not require any physical infrastructure. No land acquisition required	Neutral
S&C	Journey Quality	It is not envisaged that Air Quality Communications should have an impact on journey quality. Therefore the impact is considered to be neutral.	Neutral
	Physical Activity	Air Quality Communications should not impact on physical activity along the study route. Therefore, it is considered that the impact should be neutral on the study route.	Neutral
	Accidents	Air quality communications are not expected to impact on accidents along the study route. Therefore, it is considered that the impact should be neutral.	Neutral
	Access	Air quality communications are not expected to impact on access to services, employment, or healthcare along the study route. Therefore, it is considered that the impact should be neutral.	Neutral
VfM	Value For Money	It is anticipated that the Benefit to Cost ratio for this option would be within the range of 1 to 2	Fair
Other Issues	Acceptability	Given the nature of the proposals, this measure is unlikely to be opposed by any groups or individuals.	
	Technical, Operational & Financial Feasbility	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
	Deliverability & Risk	None identified at this stage. To be re-evaluated at Stage 3 when detailed scheme drawings and cost estimates are available.	
Secondary Criteria of the Objective	Will the intervention deliver an overall reduction in NO2 emissions to air	Yes. Marginal reductions anticipated. NO2 reduction should not be able to be attributed to Traffic Wales Website information supply.	
	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/well-being.	
	Will the intervention have a positive impact on wider public health and inequalities	No. Air quality communications are unlikely to have a positive impact on wider public health and inequalities.	

Table 4: Summary of WelTAG Stage 2 Appraisals

	Key Criteria			Environment							Social and Cultural				Economy			
Shortlisted Measure	Effectiveness	Timescales	Fesibility	Air Quality	Noise	Landscape	Historic Environment	Biodiversity	Water Environment	Townscape	Physical Activity	Journey Quality	Accidents	Access to Services	Journey time / reliability	Land	Capital Costs	Implementation Timeframe
S1: NOx Absorbing Materials	Ineffective	Y	Y	0	0	-	0	0	0	0	0	0	0	0	0	0	up to £500k	Up to 5 months
S7: Enforce/Reduce Speed Limit	High	Y	Y	+++	+	0	0	0	0	0	0	+	+	0	+	0	up to £500k	6 months
S8: HGV Overtaking Bans	Ineffective	Y	Y	- -	0	0	0	0	0	0	0	0	0	0	0	0	up to £500k	Up to 5 months
S14: Ramp Metering	Ineffective	Y	Y	0	0	0	0	0	0	0	0	0	+	-	0	0	£500k - £2m	Up to 5 months
S16: Junction Closures	Medium	Y	Y	++	0	0	0	0	0	+	0	-	0	- -	0	+	£500k - £2m	Up to 5 months
S19: Variable Diversions	Medium	Y	Y	++	+	0	0	0	0	0	0	-	0	-	- -	0	£500k - £2m	12 months
S28: Behaviour Change	Medium	Y	Y	++	+	0	0	0	0	0	+	+	0	0	+	0	up to £500k	Up to 5 months
S44: Vehicle Emission Testing	Ineffective	Y	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	up to £500k	Up to 5 months
S46: Clean Air Zones / Low Emission Zones	High	Y	Y	+++	0	0	0	0	0	0	0	0	0	- -	0	0	£2m+	18-24 months
S51: Intelligent Traffic Management	High	Y	Y	+++	0	0	0	0	0	0	0	+	0	0	0	0	£2m+	18-24 months
S53: Enhanced Traffic Officer Service	Ineffective	Y	Y	0	0	0	0	0	0	0	0	0	0	0	0	0	up to £500k	6 months
S65: Air Quality Areas	Low	Y	Y	+	0	0	0	0	0	0	0	0	0	0	0	0	up to £500k	Up to 5 months
S66: Air Quality Communications	Low	Y	Y	+	0	0	0	0	0	0	0	0	0	0	0	0	up to £500k	Up to 5 months

Where +++ *Large Beneficial*, ++ *Moderate Beneficial*, + *Slight Beneficial*, 0 *Neutral*, - *Slight Adverse*, - - *Moderate Adverse*, - - - *Large Adverse*

3.5 APPRAISAL OUTCOME

This Stage 2 has reappraised measures against the Key Criteria of the objective in lieu of further refinement of measures and more detailed appraisal. Consequently, the following measures have been identified as failing against one or more of the criteria:

- S1: NOx Absorbing Materials **[Fails on Effectiveness]**
- S8: HGV Overtaking Bans **[Fails on Effectiveness]**
- S14: Ramp Metering **[Fails on Effectiveness]**
- S44: Vehicle Emission Testing **[Fails on Effectiveness]**
- S53: Enhanced Traffic Officer Service **[Fails on Effectiveness]**

4 DELIVERY CASE

4.1 OVERVIEW

The Delivery Case 'covers the delivery arrangements for the project and proposed management during its life time'. The WelTAG guidance states that in the Stage 1 report the Delivery Case needs to 'set out which organisation and groups within that organisation will sit on the Review Group that meets at the end of each WelTAG stage'.

4.2 PROJECT PLANNING – GOVERNANCE, ORGANISATIONAL STRUCTURE

4.2.1 KEY PROJECT PARTIES & ROLES

Welsh Government (WG)

Ultimate client commissioning the study and part of the Project Board overseeing delivery.

WSP

Project Consultant, delivering the study.

4.2.2 REVIEW GROUP

A Project Board has been set up to guide the WelTAG 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:

- Welsh Government
- South Wales Trunk Road Agent (SWTRA)
- Third party consultants (WSP at Stage 1 and 2)

4.3 COMMUNICATIONS & STAKEHOLDER MANAGEMENT PLAN

Key stakeholders for the current stage of the study are:

Welsh Government and NMWTRA/SWTRA

The study team will consult with Welsh Government and NMWTRA/SWTRA staff who currently manage and operate the network to capture views on current processes, issues and potential measures. Consultation will be carried out informally throughout the study. These also form the Review Group and their comments have been incorporated into the Report.

Other Third Party Stakeholders

Third party stakeholders were not consulted to support the development of the study. Third party consultation will be carried out in a later stage of the WelTAG process.

The Public

Public consultation was not carried out during this stage of the study, however it will form part of a later stage.

4.4 KEY CONSIDERATIONS FOR WELTAG STAGE 3

This section highlights the key requirements for Stage 3, particularly with respect to the elements which have not been undertaken at Stage 2.

The WelTAG Stage 3 assessment will need to include:

- Preliminary scheme drawings
- Preliminary costs 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

4.5 MEASURE IMPLEMENTATION

There are a number of routes available to facilitate the implementation of preferred measures identified in Stage 2.

It is envisaged that measures that involve physical works, e.g. painting, installation of fencing, signing, are likely to be procured through the appropriate Trunk Road Agent (TRA) for geographical location of the site. The TRAs have further options to procure construction directly through their maintenance partnerships, or via existing Consultant and Contractor Frameworks.

Proposals associated with the use of Traffic Officers or which involve policy, publications, communication and advertising are likely to be undertaken jointly between the Welsh Government and Traffic Wales.

Traffic Wales also have the capability to implement ITS solutions themselves or via their own supply chain. The supply chain could also extend to the TRA's Consultant and Contractor Frameworks.

Given the uncertainties surrounding some aspects of the Stage 2 appraisal, it is recognised that it is important to use an adaptive approach to implementation of measures, whereby the impact of measures is monitored and adjusted based upon emerging evidence.

By adopting a flexible approach to implementation and integrating robust measurement and evaluation of the performance of these measures to meet the objective, measures can be adjusted based on an improving evidence base. As such, it has been identified that it may be beneficial to take forward the measures below as 'measure packages' as opposed to standalone measures. Similarly, consideration should be given as to whether there is merit in packaging the measures which have been identified as ineffective during the Stage 2 appraisal, should it be proven that the preferred measures are not as effective as this study has determined on the basis of the information available.

The implementation timeframes assumed for this report are considered to be an optimistic, best case scenario, and in reality some measures may take longer to implement.

4.6 IMPLEMENTATION TIMEFRAME

SHORT TERM MEASURES

It is recognised that many of the measures identified within this assessment have the potential for immediate implementation, with potential benefits to the reduction of NO_2. Immediate measures include the low cost, short timeframe measures, and other low to medium costs measures that could be implemented in a trial basis and then considered for longer term use. For the M4 J25-J26 these include:

- S7 Enforce/ Reduce Speed Limit
- S28 Behaviour Change
- S51 Intelligent Traffic Management
- S65 Air Quality Areas
- S66 Air Quality Communications

By implementing measures on a trial basis, on-site monitoring can be utilised to evidence the effectiveness of these measures before applying them permanently. The results of monitoring could also be used to inform the WelTAG Stage 3 appraisal process.

LONG TERM MEASURES

Other measures have been identified as meeting the objective, whilst ensuring acceptable impacts against the other appraisal areas. These may be implemented on a permanent basis though would be required to undergo Stage 3 (Business Case) appraisal. These are:

- S7 Enforce/ Reduce Speed Limit
- S16 Junction Closures
- S19 Variable Diversions
- S28 Behaviour Change

- S46 Clean Air Zones/ Low Emission Zones
- S51 Intelligent Traffic Management
- S65 Air Quality Areas
- S66 Air Quality Communications

5 FINANCIAL CASE

5.1 OVERVIEW

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

5.2 ASSESSMENT

The WelTAG Stage 2 report represents an Outline Business Case and the details to inform the financial case are of a preliminary nature at this stage. No lifetime costs have been calculated at this stage. The Stage 2 appraisals have been undertaken in line with broad capital cost estimates and should be refined at Stage 3.

Lifetime costs and the anticipated scheme life of measures have been identified as broad cost bands at Stage 2 for the short list of measures.

5.3 AFFORDABILITY

Capital scheme costs have been considered as broad costs bands. It is 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 3.

6 COMMERCIAL CASE

6.1 OVERVIEW

The commercial case covers ‘whether it is going to prove possible to procure the scheme and then to continue with it in the future’.

6.2 ASSESSMENT

It is not considered possible at this stage to determine the commercial case of each measure, given the preliminary information available.

7 SUMMARY AND NEXT STEPS

7.1 OVERVIEW

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 M4 lies within the South Wales zone for the purpose of the assessment of compliance with the EU Air Quality Directive. The national assessment[1] of roadside NO_2 undertaken for the South Wales zone indicates that the annual limit value was exceeded on the M4 around Newport in 2015 but it is likely to be achieved by 2021 through the introduction of committed measures. WG are investigating additional measures for the strategic trunk road and motorway network that could bring forward the projected compliance date.

The compliance date of the South Wales zone (2026 without additional measures) is, in current projections, determined by the compliance of the A472 in Hafod-yr-Ynys.

This report has presented the Stage 2: Outline Business Case of the WelTAG process for reducing the levels of NO_2 on the M4 J25-J26 motorway network in South East Wales. Elevated concentrations of NO_2 on the M4 around Newport are due to a combination of high traffic volumes, large volumes of HGVs and routine peak period congestion.

The appraisal of measures has been undertaken in accordance with the Welsh Government's consultation draft version of WelTAG [2017]. A short list of measures has been appraised against the key criteria and secondary criteria for the objective and the three WelTAG impact areas.

7.2 PREFERRED MEASURES

7.2.1 SHORT TERM MEASURES

It is recognised that many of the measures identified within this assessment have the potential for immediate implementation, with potential benefits to the reduction of NO_2. Immediate measures include the low cost, short timeframe measures, and other low to medium costs measures that could be implemented in a temporary, and then permanent basis. For the M4 J25-J26 these include:

- S7 Enforce/ Reduce Speed Limit
- S28 Behaviour Change
- S51 Intelligent Traffic Management
- S65 Air Quality Areas
- S66 Air Quality Communications

Given the uncertainties surrounding some aspects of the Stage 2 appraisal, it is recognised that it is important to use an adaptive approach to implementation of measures, whereby the impact of measures is monitored and adjusted based upon emerging evidence.

By implementing measures on a temporary basis, on-site monitoring can be utilised to evidence the effectiveness of these measures. This could be used to inform the WelTAG Stage 3 appraisal process. This could include trials of measures which have been identified as ineffective during the Stage 2 appraisal to provide a robust evidence base. However, it is believed that the preferred measures should be prioritised based on their effectiveness.

7.2.2 LONG TERM MEASURES

Other measures have been identified as meeting the objective, with acceptable impacts against the other appraisal areas. These may be implemented on a permanent basis though would be required to undergo Stage 3 (Business Case) appraisal. These are:

- S7 Enforce/ Reduce Speed Limit

- S16 Junction Closures
- S19 Variable Diversions
- S28 Behaviour Change
- S46 Clean Air Zones/ Low Emission Zones
- S51 Intelligent Traffic Management
- S65 Air Quality Areas
- S66 Air Quality Communications

7.3 NEXT STEPS

This study has taken appraisal of measures through WelTAG Stage 2. The Stage 2 appraisals have been undertaken at a high level in acknowledgement of the uncertainties of a number of the network management measures. It is recognised that it is important to use an adaptive approach to implementation of measures, whereby the impact of measures is monitored and adjusted based upon emerging evidence. This study has identified measures that are likely to bring forward the date of compliance with EU Limit Values, pending confirmation of future assessments and results on the ground.

The WelTAG Stage 3 assessment will need to include elements of the Stage 2 appraisal which have not been undertaken at this time and should be undertaken in accordance with the official release of the final WelTAG 2017 guidance, released 13 December 2017. The WelTAG 2017 guidance embeds the Well-being of Future Generations (Wales) Act 2015, to ensure that the network management measures are developed using the sustainable development principle and maximise their contribution to the well-being of future generations. There is a Future Generations framework, which is associated with the WelTAG guidance.

In addition to utilising the new WelTAG guidance, the Stage 3 will need to address the elements of Stage 2 which have not yet been undertaken for the reasons identified herein, these include:

- 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 costs estimates
- Assessment of Technical, Operational and Financial Feasibility, and Deliverability and Risk
- Quantitative Value for Money assessment

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