Welsh Government

M4 Corridor Enhancement Measures (M4 CEM)

WelTAG Appraisal Report Stage 1 (Strategy Level)

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1 Introduction

1.1 Background

Earlier WelTAG Stage 1 Appraisal[1] of the M4 transport corridor between Magor and Castleton recommended that both the New M4 motorway[2] and a package of corridor efficiency measures be taken forward to Stage 2 WelTAG appraisal for detailed and quantitative assessment. The New M4 was deemed to perform strongly against the majority of the transport planning objectives (TPOs) with the package of corridor efficiency measures contributing positively to most objectives.

The Deputy First Minister Ieuan Wyn Jones announced that the New M4 was unaffordable in an oral statement in July 2009. The statement accepted *"the need to urgently address safety and capacity issues on the existing route"* through the introduction of *"a range of measures"*. As a consequence, investigations have been on-going into the development of a strategy to improve the operation of the existing M4 around Newport.

The M4 Corridor Enhancement Measures (CEM) Programme was initiated and this aims to create a package of measures to deal with resilience, safety and reliability issues within the M4 corridor between Magor and Castleton. The M4 CEM Programme is included in the National Transport Plan (March 2010), Prioritised National Transport Plan (December 2011) and Wales Infrastructure Investment Plan (2012).

1.2 WelTAG Appraisal Guidance[3]

WelTAG was formally published by the Welsh Assembly Government in June *2008. Paragraph 1.1.1 of WelTAG states that the guidance,*

"has been developed by the Welsh Assembly Government with the intention that it is applied to all transport strategies, plans and schemes being promoted or requiring funding from the Welsh Assembly Government".

WelTAG has two primary purposes:

- *"To assist in the development of proposals enabling the most appropriate scheme to be identified and progressed – one that is focused on objectives, maximises the benefits and minimises negative impacts; and*
- *To allow the comparison of competing schemes on a like-for-like basis, so that decision-makers can make funding decisions".*

WelTAG aims to ensure that transport proposals contribute to the wider policy objectives for Wales. Three pillars of sustainability, known as Welsh Impact Areas, underlie policy in Wales. These are:

[1] Transport and Strategic Regeneration, Welsh Assembly Government, New M4 Project Magor to Castleton, WelTAG Appraisal Report Stage 1, Draft 3 Working Document, Arup
[2] Also commonly referred to as the M4 Relief Road
[3] Welsh Transport Planning and Appraisal Guidance, WelTAG, June 2008, The Welsh Assembly Government

- Economy: this reflects the importance of a strong and developing economy for Wales;
- Environment: this reflects both the legal requirements and desire to protect and enhance the condition of the built and natural environment; and
- Society: this reflects the desire to address issues of social exclusion and to promote social justice and a high quality of life for Welsh people.

1.3 Significance of Impact

Following each impact appraisal for both Stages 1 and 2, WelTAG recommends that the significance of impact for each criterion is assessed using a seven point scale detailed in Paragraph 3.7.1 of the guidance. This scale includes the following assessment criteria:

- Large beneficial[4] (+++);
- Moderate beneficial (++);
- Slight beneficial (+);
- Neutral0);
- Slight adverse (-);
- Moderate adverse (--);
- Large adverse (---).

The assessment of impact on each of the Welsh Impact Areas should be provided in the Appraisal Summary Tables (ASTs).

1.4 Distribution

WelTAG also requires, in Paragraph 3.5.1, that the distribution of impacts is carefully considered. This part of the assessment refers to how impacts might be distributed geographically and how they might affect different groups in society

1.5 Purpose of this Report

This report describes the results of the WelTAG Stage 1 Appraisal for the M4 CEM Programme. Appraisal Summary Tables (ASTs) are provided for each of the transport options assessed at Stage 1.

[4] It should be noted that, for the purposes of the M4 CEM Consultation, the phrase “positive impact” was used in place of “beneficial”; “no (or minimal) impact” was used in place of “neutral”; and “negative impact” was used in place of “adverse”

2 Planning Stage

2.1 Context

A WelTAG Stage 1 appraisal had been undertaken as part of the New M4 Project. This has shown that a strategy based on corridor enhancement measures (CEMs) would make a contribution to most of the transport planning objectives (TPOs) that had been drawn up at the WelTAG Planning Stage[5].

The National Transport Plan (March 2010) recognised that *"for a long time there have been concerns about the section of the motorway around Newport, which falls well short of modern design standards. These centre on peak-time capacity, safety and the resilience of the local network"*.

As part of the National Transport Plan, the Welsh Government aims to *"deliver a package of measures designed to improve the efficiency of the M4 in south east Wales, including public transport enhancements, making the best possible use of the motorway and improving the resilience of the network"*.

A strategy was thus required to embrace the three themes referred to. A report[6] was prepared which outlined the process of strategy development and the conceptual strategy that emerged from the process and which underpins the M4 CEM initiative.

2.2 Transport Problems on the M4 Corridor

The Welsh Government has looked in detail at what travel related problems exist on the M4 Corridor Magor to Castleton, and asked people, stakeholders and those involved in managing transport in and around Newport what they thought the problems amount to. The problems have been defined as:

Capacity

1. A greater volume of traffic uses the M4 around Newport than it was designed to accommodate, resulting in regular congestion at peak times over extended periods.
2. The M4 around Newport is used as a convenient cross town connection for local traffic, with insufficient local road capacity.
3. HGVs do not operate efficiently on the motorway around Newport.
4. There is insufficient capacity through some of the Junctions (e.g. 3 lane capacity drops to 2 lane capacity).
5. The 2-lane Brynglas tunnels are a major capacity constraint.
6. The M4 cannot cope with increased traffic from new developments.

[5] New M4 Project Magor to Castleton - Addendum to WelTAG Planning Stage Report - Draft 2 Working Document, Arup, June 2009
[6] M4 Corridor Enhancement Measures - Strategy, Appraisal and Monitoring - Draft 2 Working Document, Arup, May 2010

Resilience

7. Difficulties maintaining adequate traffic flows on the M4 and alternative highway routes at times of temporary disruption; alternative routes are not able to cope with M4 traffic.

8. The road and rail transport system in and around the M4 Corridor is at increasing risk of disruption due to extreme weather events.

9. When there are problems on the M4, there is severe disruption and congestion on the local and regional highway network.

10. The M4 requires essential major maintenance within the next 5-10 years; this will involve prolonged lane and speed restrictions, thus increasing congestion problems.

11. There is insufficient advance information to inform travel decisions when there is a problem on the M4.

Safety

12. The current accident rates on the M4 between Magor and Castleton are higher than average for UK motorways.

13. The existing M4 is an inadequate standard compared to modern design standards.

14. Some people's driving behaviour leads to increased accidents (e.g. speeding, lane hogging, unlicensed drivers).

Sustainable Development

15. There is a lack of adequate sustainable integrated transport alternatives for existing road users.

16. Traffic noise from the motorway and air quality is a problem for local residents in certain areas.

17. The existing transport network acts as a constraint to economic growth and adversely impacts the current economy.

2.3 Aims of the M4 CEM Programme

The aims of the M4 CEM Programme are to:

1. Make it easier and safer for people to access their homes, workplaces and services by walking, cycling, public transport or road.

2. Deliver a more efficient and sustainable transport network supporting and encouraging long-term prosperity in the region, across Wales, and enabling access to international markets.

3. To produce positive effects overall on people and the environment, making a positive contribution to the overarching Welsh Government

goals to reduce greenhouse gas emissions and to making Wales more resilient to the effects of climate change.

2.4 Transport Planning Objectives (Goals[7]) of the M4 CEM Programme

The Welsh Government has identified the following goals, which the M4 CEM Programme should aim to achieve, in order to ease the flow in the M4 Corridor between Magor and Castleton:

TPO 1 Safer, easier and more reliable travel east-west in South Wales.

TPO 2 Improved transport connections within Wales and to England, the Republic of Ireland and the rest of Europe on all modes on the international transport network.

TPO 3 More effective and integrated use of alternatives to the M4, including other parts of the transport network and other modes of transport for local and strategic journeys around Newport.

TPO 4 Best possible use of the existing M4, local road network and other transport networks.

TPO 5 More reliable journey times along the M4 Corridor.

TPO 6 Increased level of choice for all people making journeys within the transport Corridor by all modes between Magor and Castleton, commensurate with demand for alternatives.

TPO 7 Improved safety on the M4 Corridor between Magor and Castleton.

TPO 8 Improved air quality in areas next to the M4 around Newport.

TPO 9 Reduced disturbance to people from high noise levels, from all transport modes and traffic within the M4 Corridor.

TPO 10 Reduced greenhouse gas emissions per vehicle and/or person kilometre.

TPO 11 Improved travel experience into South Wales along the M4 Corridor.

TPO 12 An M4 attractive for strategic journeys that discourages local traffic use.

TPO 13 Improved traffic management in and around Newport on the M4 Corridor.

TPO 14 Easier access to local key services and residential and commercial centres.

TPO 15 A cultural shift in travel behaviour towards more sustainable choices."

[7] It should be noted that the Transport Planning Objectives were referred to as "*Goals*" in the M4 CEM Consultation generally and specifically in the Welsh Government Consultation Document (Number: WG14775), M4 Corridor Enhancement Measures, Magor to Castleton (M4 CEM), Easing the Flow, 6 March 2012.

3 M4 CEM Programme

The M4 in South Wales forms part of the Trans-European Transport Network (TEN-T), which provides connections throughout Europe by road, rail, sea and air. The M4 plays a key strategic role in connecting South Wales with the rest of Europe, providing links to Ireland via the ports in South West Wales and England and mainland Europe to the east. It is a key east-west route being the main gateway into South Wales and also one of the most heavily used roads in Wales. Providing a facility for transporting goods, linking people to jobs and employment sites as well as serving the Wales tourism industry, the M4 is critical to the local South Wales economy. Cardiff and Newport have ambitious regeneration strategies and Monmouthshire is developing areas around Junction 23a of the M4. Congestion on the M4 could hamper these plans.

The M4 between Junctions 28 and 24 was originally designed as the 'Newport Bypass' with subsequent design amendments in the 1960s to include the first motorway tunnels to be built in the UK. The M4 Motorway between Magor and Castleton falls well short of modern motorway design standards. This section of the M4 has many lane drops and lane gains, resulting in some two-lane sections, an intermittent hard shoulder and frequent junctions. It is congested during weekday peak periods resulting in slow and unreliable journey times and stop-start conditions with frequent incidents causing delays.

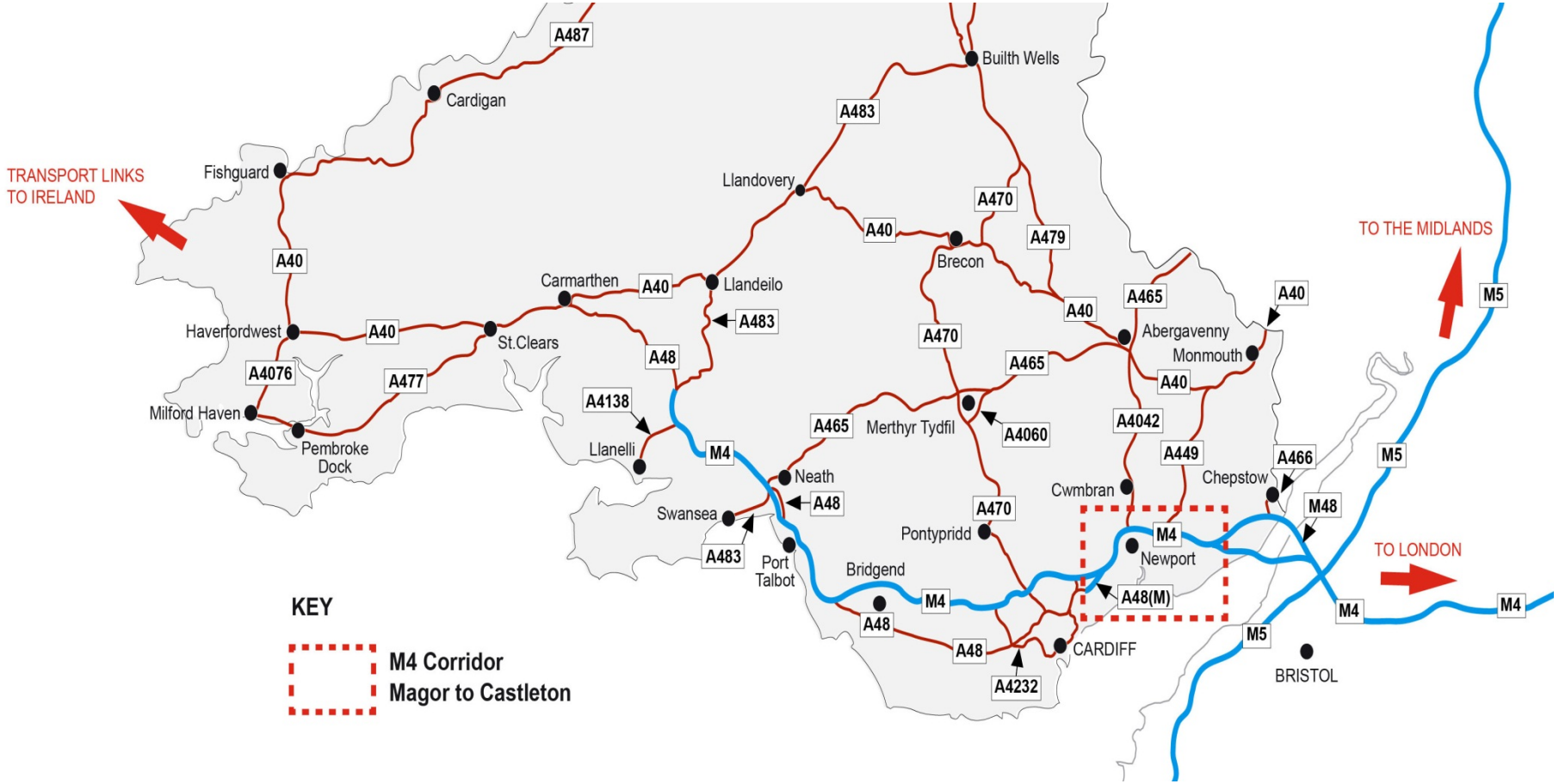
This together with increasing traffic, is why problems with congestion and unreliable journey times have been a fact of life on the M4 around Newport for many years. The motorway and surrounding highway network does not cope with sudden changes in demand or operation, as a result of accidents or extreme weather events for example. These issues are worse at times of peak travel and, as the number of users on the network increase, they are set to worsen.

To address these issues, the feasibility of developing the M4 Relief Road was studied in significant detail. In July 2009, the Welsh Government announced that the project had become unaffordable. However, the Welsh Government recognised that important improvements should be made to the existing transport network. The M4 Magor to Castleton, Corridor Enhancement Measures Programme (M4 CEM) was set up to explore ways of making such improvements.

Practical measures to make travel safer and easier on the M4 between Junctions 23a and 29 began in 2008. Early work to improve safety included replacing sections of steel central barriers with concrete ones, the introduction on Variable Speed Limit systems and the deployment of traffic officers. To ease congestion, improvements have been made to the roundabout at Junction 24 Coldra.

Further details of the M4 CEM Programme and its evolution are available at www.m4cem.com.

Figure 1: The Location and Strategic Importance of the M4



3.1 Developing an M4 CEM Programme

Having established the problems and the need to tackle them, the Welsh Government has involved others in exploring a very wide range of possible ways of solving these problems and of delivering the goals of the M4 CEM Strategy. A long list of possible solutions has been explored. No single solution delivers all the goals, but through this methodology, measures that contribute towards a combination of compatible options, or 'Packages', have been identified. The Packages combine public transport, highway and other travel solutions.

The strategic approaches adopted by the Welsh Government to reduce congestion and to delivering the M4 CEM Goals all involve creating some new highway capacity on the M4, and/or elsewhere in the highway network between Magor and Castleton. To put transport onto a carbon reduction pathway, the M4 CEM Programme promotes increasing and improving the opportunities for access, and for travel and transport using alternatives modes, such as trains and buses (public transport), cycling and walking. It is would also promote minimising the need for certain types of journey.

To enable the sustained productivity and competitiveness of Wales, and the South East Wales region in particular, highway infrastructure must also be developed; several alternative approaches are possible, each with particular advantages and challenges. In addition, there are common measures that can enhance the effectiveness of each package of measures being considered.

The components of a potential M4 CEM Strategy are thus as follows:

Public Transport Measures	+	**Highway Infrastructure option A or B or C or D**	+	**Common Measures**	=	**M4 CEM Strategy (Package of measures)**

As shown in the diagram, a possible strategy could comprise a range of the following measures:

- Public transport measures.
- Highway infrastructure measures:
  - Highway Option A: additional high quality road to the south of Newport.
  - Highway Option B: at grade junction improvements to the A48 Newport Southern Distributor Road (SDR).
  - Highway Option C: grade separated junction improvements to the A48 SDR.
  - Highway Option D: online widening on the M4 between Junctions 24 and 29, including an additional tunnel at Brynglas.
- Common measures: these are additional measures being considered to support the strategic public transport and highway capacity measures in addressing travel related problems within the M4 Corridor between Magor and Castleton. They comprise a mix of network improvements/management, demand management, alternative modes and smarter sustainable choices.

4 Participation

4.1 Engagement and Consultation

Full details of the consultation results are provided in the M4 Corridor Enhancement Measures (CEM) Participation Report, January 2013[8] and are reflected in the Appraisal Summary Tables for each option.

Recognising the potential level of public interest in transport issues within the M4 corridor around Newport, and the numbers of people potentially affected by any new measures presented as part of the M4 CEM Programme, the Welsh Government has undertaken wide-ranging and focussed engagement with stakeholders and local people since September 2010. The approach to engagement has been based on established good practice in Wales and the UK, and has been fully compliant with Welsh Government principles for implementing public engagement, and the engagement values set out in Engage Wales[9]. The engagement work has been appropriately aligned, in terms of timing and decision making, to the technical assessment process of the M4 CEM Programme, helping to shape the Consultation Document. During the engagement process, the Welsh Government and its project team has conducted dialogue and deliberative sessions both with internal and external specialists and expert stakeholders, as well as with communities and other organisations likely to be interested in and affected by any transport related interventions.

The M4 CEM Consultation, which asked participants to comment on a range of options that could contribute towards a strategy to reduce traffic congestion on the M4 around Newport, ran between March and July 2012.

All available documents published as part of the engagement and consultation process associated with the M4 CEM Programme can be found at www.m4cem.com.

[8] Welsh Government, M4 Corridor Enhancement Measures (CEM), Participation Report, Arup & Catrin Ellis Associates, Draft, January 2013
[9] www.participationcymru.org.uk

4.2 Activities Undertaken

The M4 CEM Programme has involved public and stakeholder participation in three key phases:

- to help identify all relevant travel-related problems, aims and goals in the M4 Corridor around Newport and to establish if there is a need for a transport intervention;
- to explore a wide range of possible approaches to achieving the goals and aims of the programme; and
- to ensure that Welsh Government benefits from understanding public views, as well as those of key stakeholders, in order to identify measures that represent a better economic, social, environmental and technical solution to problems affecting travel on the M4 corridor between Magor and Castleton.

A comprehensive promotion and publicity campaign was undertaken to make as many people as possible across South Wales aware of the opportunity to engage and comment on the M4 CEM Consultation. The Minister for Local Government and Communities wrote to all AMs and MPs in the South Wales area informing them when the Public Consultation was starting and where they could obtain further information. Emails were also sent to all Local Authorities and Clerks of Community Councils in the Newport area advising them of the consultation. The Welsh Government arranged for adverts to be placed in Newport Matters, Capital Times and the Cardiff and South Wales Advertiser to try to reach as many of the public as possible. In addition, Public Notices about the Consultation were published in local papers including the South Wales Echo, South Wales Argus, Glamorgan Gazette, South Wales Evening Post and Western Mail. There have been adverts on Newport Buses, on the Big Screen in Cardiff, and at Motorway services along the M4 (Magor to Swansea), newsletters were left in a number of public buildings around Newport.

Following feedback from some of the attendees of the original drop-in exhibitions about the failure of some of the original publicity attempts to raise awareness, the Welsh Government arranged for three additional drop-in public exhibitions and the Welsh Government also extended the Consultation period by an additional month. To advertise these exhibitions and the extended period for responses, the Welsh Government arranged for some 80,000 leaflets to be distributed in the Newport area. To further highlight the Public Consultation and the additional exhibitions, a radio advertising campaign was held on Real Radio and Gold Radio.

4.3 Summary of M4 CEM Consultation Responses

After processing, a total of 674 responses to the Consultation Document were received and analysed. Participants included members of the public as well as a range of organisations; some of which represent Welsh communities, economic, environmental and transport interests. 54 of the responses received overall were identical or largely identical responses from a campaign group[10].

The Welsh Government analysed all comments, equally. All participants are listed at the end of the Participation Report.

Whilst a total of 674 responses were made directly to the Consultation Document, more than 2,100 people attended an M4 CEM event and approximately 1,100 people attended external (non-M4 CEM specific) events, at which members of the project team were available to discuss the Programme. Some 11,247 visits were made to the dedicated website www.m4cem.com between March and December 2012, equating to an average of over 1,100 visits per month over this 10 month period.

Most participants provided online responses. Of the participants who responded, most were either daily or weekly users of the M4 around Newport; and used the motorway for leisure or commuting trips.

4.3.1 Problems

The problems, goals and aims of the M4 CEM programme have been the subject of dialogue during earlier stages of the engagement process, with public and stakeholders. 17 problems have been established; encompassing themes of capacity, (network) resilience, safety and sustainable development. Respondents were asked to prioritise up to four problems out of the full list of 17. Although 130 of the 674 respondents did not select any of the problems, all of the problems were selected at least once, suggesting the majority of respondent agree that there is a problem.

Of the 130 who did not select any of the problems, 54 comprised a campaign group response, which argued that existing, planned and proposed improvements to traffic management and sustainable transport will achieve the Welsh Government's aims', whilst 'a new dual carriageway [to the south of Newport] would cause an adverse impact on the unique wildlife and landscape of the Gwent levels and add to climate change'.

Of the other 76 participants who did not select a problem, the majority did not respond directly to the consultation questions at all. This group included Newport City Council, who in their response suggested that there is a need to do something and stated that 'Option A (an additional high quality road to the south of Newport) offers the greatest benefits in terms of the transport efficiency and the economy' and that 'such benefits should assist in making Newport a more accessible location and a more attractive option for investment, with the least amount of disruption for existing routes'. Newport Unlimited, in their response, also suggested that there is a need to do something and stated that 'longer-term plans

[10] 54 responses followed a format that did not directly answer the Consultation questions, co-ordinated by campaign group Campaign against the Levels Motorway (CALM); in all but seven cases of these cases each response is identical. See http://www.savethelevels.org.uk/.

for investment are clearly important, but must not replace the need to make the impact in the short term that businesses tell us they need'. The CBI simply stated that 'the number one infrastructure priority in Wales should be the construction of the M4 Relief Road' and that 'the future security of the Welsh economy requires a speedy solution to this problem.' This view was shared by the South Wales Chamber of Commerce who stated that 'there can be no other option but to bring the M4 relief road back in to the equation and proceed with that as a one of the key priorities of the Welsh Government'.

The following problems were the most selected:

- Problem 1: A greater volume of traffic uses the M4 around Newport than it was designed to accommodate, resulting in regular congestion at peak times over extended periods;
- Problem 5: The 2-lane Brynglas tunnels are a major capacity constraint;
- Problem 7: Difficulties maintaining adequate traffic flows on the M4 and alternative highway routes at times of temporary disruption; alternative routes are not able to cope with M4 traffic;
- Problem 9: When there are problems on the M4, there is severe disruption and congestion on the local and regional highway network.

Key stakeholders are considered to be organisations that have a strategic interest and/or detailed experience of addressing travel related issues in South Wales, and/or represent the environment, community or economy of South Wales. During the Consultation, key stakeholders predominantly prioritised problems 1, 9, 15 and 17 (Problem 15: There is a lack of adequate sustainable integrated transport alternatives for existing road users; Problem 17: The existing transport network acts as a constraint to economic growth and adversely impacts the current economy). This demonstrates that whereas problems of capacity and resilience were prioritised the most by respondents; problems of sustainable development were prioritised to a much greater extent by key stakeholders.

4.3.2 Goals

15 goals have been established during earlier stages of the engagement process with public and stakeholders. Each of the M4 CEM goals aims to address one or more of the problems. Respondents were asked to prioritise up to four goals out of the full list of 15 and the following goals were selected the most times by the 463 respondents who responded to Question 2a (for information, a total of 468 respondents responded to Question 2b):

- Goal 1: Safer, easier and more reliable travel east-west in South Wales;
- Goal 4: Best possible use of the existing M4, local road network and other transport networks;
- Goal 5: More reliable journey times along the M4 Corridor; and
- Goal 7: Improved safety on the M4 Corridor between Magor and Castleton.

However, Goal 6 (increased level of choice for all people making journeys within the transport corridor by all modes between Magor and Castleton, commensurate with demand for alternatives), and Goal 15 (a cultural shift in travel behaviour

towards more sustainable choices), were prioritised above others by key stakeholders.

4.3.3 Public Transport

A series of public transport measures have been developed during the engagement process, supported by a Public Transport Overview report[11]. Respondents were asked to choose from, and comment on, a list of six public transport measures, identifying all those that could make the best contribution to relieving traffic on the M4 between Magor and Castleton.

453 respondents commented on one or more of the public transport measures. Of those 453 respondents; 60 suggested that the public transport measures will be helpful to some extent and a further 65 respondents commented that the public transport measures will help to address the problems to a limited extent, or express support for public transport measures with caveats. 106 of the respondents argue that none of the public transport measures will help to address transport related problems or meet their travel needs.

Of the possible public transport measures selected, the majority of respondents prioritised more park and ride facilities, additional rail services and better modal integration. Additional bus and/or coach services were the least selected options (and not selected at all by key stakeholders).

4.3.4 Highways Infrastructure Options

The options presented within the Consultation Document include:

- Highway Option A: additional high quality road to the south of Newport.
- Highway Option B: at grade junction improvements to the A48 Newport Southern Distributor Road (SDR).
- Highway Option C: grade separated junction improvements to the A48 SDR.
- Highway Option D: online widening on the M4 between Junctions 24 and 29, including an additional tunnel at Brynglas.

Respondents were asked to reflect and comment on how each of the four options might address the problems and goals they had prioritised. Questions 4a, b, c and d attracted 437, 424, 387 and 397 responses respectively.

Highway Infrastructure Option A attracts the most comments as a preferred or supported Option (128), whilst a further 32 respondents provide qualified support for the option. This option is supported by most key stakeholders and members of the public, many citing its possible benefits to transport and the economy. 44 respondents in their comments to question 4a directly state that they challenge or oppose Option A. Concerns expressed about option A predominantly include the potential cost of delivery and the potential adverse environmental effects of its construction on the Gwent Levels.

[11] Public Transport Overview, available to download at http://www.m4cem.com/reports%20and%20newsletters.html

Statements about Highway Infrastructure Option B indicate that its relatively inexpensive cost is attractive, but that there are concerns over its potential adverse impact on local traffic flows. Many compare Option B unfavourably to Option C as a measure that could utilise the SDR to address the problems and goals of the M4 CEM Programme. Whilst some support a variation or element of Option B, many also suggest it could be delivered alongside another Highway Infrastructure Option in order to provide increased resilience on the road network. Option B attracts many comments of opposition and/or challenge (89).

71 respondents offer qualified support or support with a caveat to Highway Infrastructure Option C, favouring its potential to improve resilience but there are concerns about it not increasing road capacity on the highway network. Many consider Option C to be preferable to Option B, although 50 respondents challenge it as a solution or clearly state that they do not believe Option C will address the problems or achieve the goals they have chosen.

Highway Infrastructure Option D is favoured by 42 respondents, supporting it largely on the basis of it being an online solution (making best use of existing infrastructure) and it is thought to effectively address the perceived bottleneck at Brynglas. A significant number of comments express strong concerns about its potential impact on property and land take. It attracts the most comments of opposition and/or challenge (92).

4.3.5 Common Measures

Common measures comprise a mix of network improvements/management, demand management, alternative modes and smarter sustainable choices. They were selected from a long list of more than 100 possible interventions considered likely to be effective in a strategic package of public transport and highway infrastructure measures, to address travel related problems on the M4 Corridor, Magor to Castleton[12]. Respondents were not asked directly to comment on these in the Consultation exercise but some provided comments as part of their answers to one or more of the Consultation questions.

Many respondents demonstrate an appreciation of the important role that the common measures could play in the package to be chosen but that are not considered to be measures that could contribute substantially, particularly in isolation, to resolving transport related problems.

Some responses also propose a range of alternative strategies to the public transport and highway infrastructure options. Many of these suggestions echo elements of the common measures presented in the Consultation Document, though very few responses refer to the common measures explicitly. Examples include better information systems; at-grade junction improvements; changes to junctions and feeder roads; and different policing or traffic management strategies.

[12] Alternatives Considered that were not progressed through the M4 CEM Programme are available to view in the Alternatives Considered Workbook at www.m4cem.com.

4.3.6 Additional Comments

444 responses have been analysed as additional comments (Question 5 in the consultation response form). Of these 444 responses, 381 directly responded to Question 5 of the response form as part of a participant's answer. However, 63 participants provided comments without using the response form provided, using either their own response format or submitting a comment by email. These responses have been analysed as additional comments. Of the 63 responses that provide representations that did not respond to the Consultation questions specifically, 54 comprise a campaign group response.

General comments made on the highways infrastructure options included over 100 concerns over the environmental impact of the options, in particular the detrimental impact that there could be on wildlife and landscape. More than half of these 100 responses, which includes the 54 campaign groups responses and some key stakeholder responses, challenged Highway Option A; primarily on its potential adverse environmental impact on biodiversity.

90 respondents made comments about the data presented in the Consultation Document. Criticisms related to the age of the data used and more than 60 responses, including those 54 from the campaign group who challenge the highway infrastructure options, felt that incorrect assumptions about continuing traffic growth were used. More than 50 responses expressed concerns that the options will negatively impact on recreational activities, tourism and property prices. More than 30 respondents referred to the importance of modal shift and a number of responses highlighted the importance of public transport in addressing local transport problems.

There were also comments that none of the options would be as effective as the proposed M4 relief road and a desire was expressed for it to be reinstated.

4.4 Lessons Learned

The approach and methods deployed during the engagement process have been new and innovative within the context of Welsh Government transport planning and development. In this sense, the participatory approach adopted can be regarded as a pilot. The feedback received from key stakeholders, the public, and the internal M4 CEM team suggest widespread and high levels of satisfaction with working in this way, which are transferable to future work. However, others express concern that the engagement process was not open and inclusive enough. Lessons can be learned from the engagement process and consultation stage, which could potentially translate to resource efficiency and other improvements in subsequent work.

Many stakeholders and members of the public expressed appreciation for the opportunity to participate in a two way dialogue with decision-makers and technical experts, however it is understandable that they are likely to reserve judgement on whether the engagement strategy has been efficient and /or successful until they can assess whether Welsh Government has listened to and taken account of their views.

A review of the process may be undertaken by the Welsh Government for the M4 CEM Programme as a separate exercise.

5 Existing and Future Traffic

5.1 Overview

The SATURN traffic model that had been developed to support the New M4 project was based on traffic observations undertaken in 2005. In view of the age of the data underlying the model, it was considered necessary to update the traffic model using more recent data, in order to continue to provide an adequate means of supporting the development of solutions in the M4 corridor around Newport.

A specifically designed programme of traffic surveys was thus carried out between March and May 2012 in order to update the base year traffic model. The traffic model was then validated to a 2012 base year in accordance with the Department for Transport's WebTAG guidance.

5.2 Traffic Surveys in 2012

For the purpose of the model update, a present-year validation required the projection of the 2005 base travel demand matrices to the current re-based validation year (2012), with the model outputs compared with 2012 traffic count data. Consequently, a programme of new traffic surveys was undertaken to provide the data for this comparison. These surveys comprised:

- Automatic Traffic Counts (ATCs) undertaken by the Welsh Government on the motorway and trunk road network. These comprised conventional ATCs and data derived from the MIDAS (Motorway Incident Detection Automatic Signalling) system. ATCs were also commissioned on a number of strategic routes in Newport.
- Classified turning counts over a 12-hour period at 52 key junctions, supplemented by counts at a further 11 junctions that had been undertaken in 2010.
- Classified link counts on each section of the motorway network (between the Severn crossings and Cardiff).
- Journey time surveys covering 11 routes through the study area. These included the whole of the motorway network in the area, together with key routes on the local highway network.

Full details of the surveys undertaken are given in the Local Model Validation Report[13].

Analysis of the traffic survey data has enabled comparisons to be drawn between traffic levels on the motorway around Newport in 2012 and in 2005 when a previous programme of traffic surveys was conducted. These are shown graphically in Figure 5.1

[13] Welsh Government, M4 Corridor, Newport, Local Model Validation Report, Draft 1, Arup, November 2012

Figure 5.1: Comparison of 2005 and 2012 Traffic Data

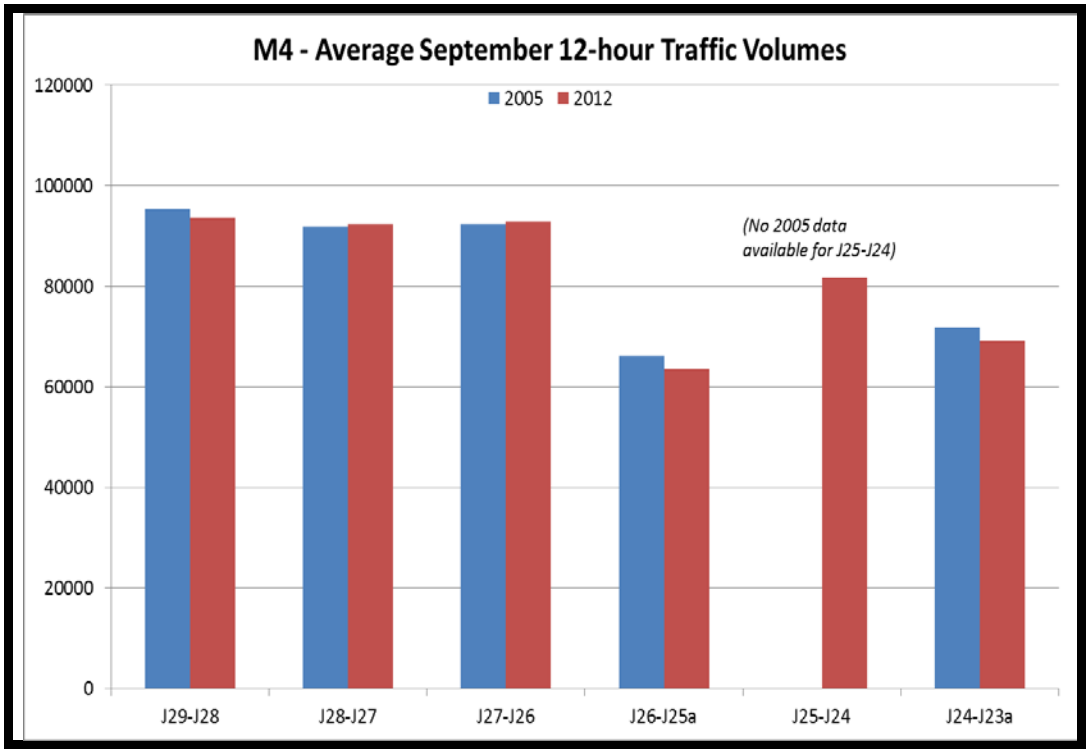


Figure 5.1 shows that traffic levels on the motorway have remained near constant on certain sections over the 7–year period, and on some sections they have marginally declined.

The flows on the M4 sections to the east of the Brynglas Tunnels (Junction 25a) appear to have declined slightly more than those to the west of the tunnels. Owing to bridgeworks there was no or very limited ATC data collected between Junctions 24 and 25 during 2005 and so no comparison on this section can be made.

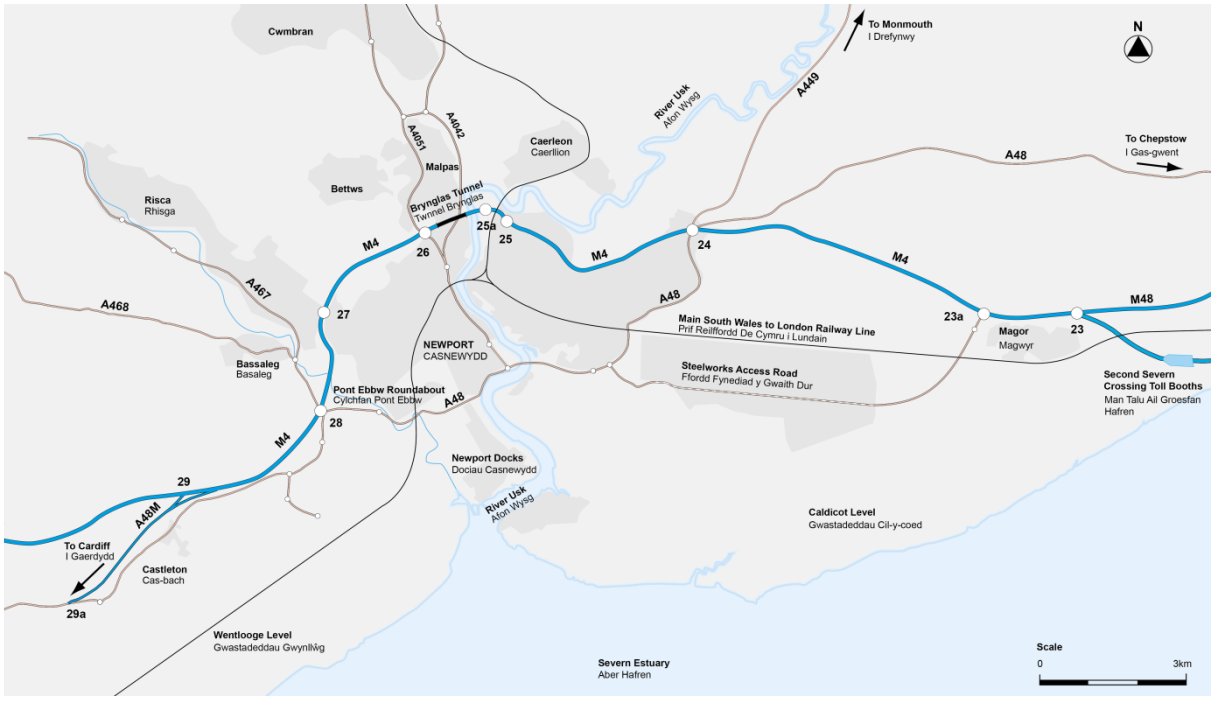
The lack of growth in traffic levels on the M4 around Newport is not unexpected, as traffic growth in the UK generally has been static over the same period as a result of the economic downturn

Notwithstanding the above, traffic volumes on the motorway around Newport were observed to exceed theoretical capacity on some sections during weekday peak periods in September 2012, as Figure 5.2 shows.

Figure 5.2: 2012 Traffic Flows and Urban Motorway Operating Conditions

Location	2012 AADT	DMRB Urban Motorway Capacity[14] Veh/hr	Sept 2012 ~ Highest Peak % Flow to Capacity	
			Average Weekday Peak	Maximum Weekday Peak
J23a to J24	79,300	5600	70.2%	78.3%
J24 to J25	93,400	5600	80.2%	87.2%
Brynglas Tunnels	70,100	4000	85.7%	95.6%
J26 to J27	104,400	5600	86.2%	94.2%
J27 to J28	103,400	5600	96.6%	103.3%
J28 to J29	104,200	5600	92.1%	100.2%

Flow to Capacity	Operational Conditions
< 80%	Operating within capacity
80% to 100%	Operational problems occurring
> 100%	Severe operational problems



[14] DMRB Volume 5, Section 1, Part 3, TA 79/99 Amendment No.1, Traffic Capacity of Urban Roads, Table 2, May 1999

5.3 Traffic Model Validation

The 2005 base traffic model was updated to 2012 to incorporate subsequent changes to the highway network, including the signalisation of the Junction 24 roundabout at the Coldra together with the 'hamburger' layout; traffic management measures in the centre of Newport; and the revised junction layout at Cardiff Road / Commercial Street.

The base year travel demand was also updated to 2012, to incorporate revisions contained in the 2010 Newport traffic model developed by Capita, and additional traffic related to subsequent developments in the area.

The updated 2012 traffic model was validated in accordance with the procedures set down in the Design Manual for Roads and Bridges (DMRB) and the Department for Transport's Transport Analysis Guidance (WebTAG). Validation was carried out on the mainline motorway links between Junction 23a and 29, together with a screenline of links crossing the River Usk in the Newport area.

All of the motorway links, in both directions, met the validation criteria in each of the three modelled time periods. On the Usk screenline, the screenline totals met the validation criteria in both directions in each of the three time periods. All of the individual links also passed the criteria in the AM and interpeak periods, although in the PM peak two of the five links did not meet the criteria (even though the screenline total passed). Of the total number of individual links assessed (24), 100% met the criteria in the AM and Interpeak periods, while 92% passed in the PM period, compared with the pass rate specified in DMRB of 85%.

The average times observed on the 11 journey time routes surveyed in 2012 were also validated in the base model. Each route met the required validation criteria in both directions in all three time periods.

5.4 Traffic Forecasting

Traffic forecasts were prepared for two future years, 2020 and 2035, as documented in the M4 CEM Forecasting and Economic Assessment Report[15], which were assumed to correspond with the opening year and design year respectively for an option. In the case of Option B, however, an earlier opening year of 2017 was modelled. The validated 2012 trip matrices were projected to the forecast years following the recommendations given in the Department for Transport's WebTAG.

Car trips were factored using the Department for Transport's National Trip End Model (NTEM), as set out in the TEMPRO program. Version 6.2 of TEMPRO was used, which was issued in April 2011 and made definitive in July 2011. This takes account of the impact of the current economic downturn on traffic growth.

The growth in goods vehicle trips, both light and heavy vehicles, was based on the forecasts contained in the National Transport Model produced by the Department for Transport. Growth factors for the Wales region were used, and adjusted (as recommended in WebTAG) by the ratio of the growth contained in the NTEM of the study area to the national Wales growth.

[15] Welsh Government, M4 Corridor Enhancement Measures, Forecasting and Economic Assessment Report, Draft 1, Arup, February 2013

Trips generated by likely developments proposed during the forecast period were assessed separately. In accordance with WebTAG, the factored growth of existing trips was reduced by an equivalent amount, so that the overall total number of forecast trips was constrained to that predicted by NTEM and the National Transport Model. This then provides the reference demand for travel in each forecast year.

- The Do-Minimum network used for the traffic forecasts includes those highway schemes that are considered to be committed. These are:
- Steelworks Access Road (Phases 1 and 2);
- Tredegar Park Roundabout (Junction 28), enlarged signalised gyratory;
- A467/A468 Bassaleg Roundabout, signalisation and throughabout;
- A48 Pont Ebbw Roundabout, signalisation and throughabout;
- A465 Heads of the Valleys dualling (Abergavenny to Hirwaun), Sections 2, 3, 5 and 6; and
- Newport Eastern Expansion Area, link connecting the Steelworks Access Road to a signalised junction at A48 / Cot Hill (2035 forecast year only).

Variable demand modelling techniques have been used to produce the model forecasts, in accordance with the WebTAG advice. This adjusts the reference demand to take account of the relative cost of travel between zones, both in terms of trip frequency and trip distribution. Details of this process are given in the Model Update Traffic Forecasting Report.

5.5 Future Traffic Forecasts

The AM Peak, Interpeak and PM Peak hourly future year forecasts obtained from the traffic model are combined and factored to estimated Annual Average Daily Traffic (AADT) forecasts, using factors derived from observed ATCs on the M4. Table 5.1 shows preliminary predictions[16] of AADTs for each option on key links on the M4 and the A48 SDR, together with the crossings along the River Usk screenline.

The results show that Option A has a much greater effect on reducing traffic volumes through the existing Brynglas Tunnels than either of the SDR improvement options, with a reduction of over 50% in the opening year. It also produces the highest total volume of traffic crossing the Usk screenline, suggesting that it offers greater capacity/network resilience than other options. The at-grade improvement to the SDR would have little impact on the tunnel traffic, and slightly reduces the total across the Usk screenline (indicating network disbenefit). The grade-separated improvement to the SDR would reduce traffic through the tunnel by about 9% in the opening year, although by 2035 the tunnel traffic volume would still be over 10% higher than the 2020 Do-Minimum total. Many of the benefits accruing to this option appear to be associated with reduced congestion and increased accessibility onto the SDR for local traffic movements, rather than benefits associated with strategic motorway traffic. This is particularly

[16] It should be noted that traffic forecasts at this strategic stage of option assessment are based on a number of assumptions. More details of such assumptions are documented in the M4 CEM Forecasting and Economic Assessment Report.

the case at 2035, with significant volumes of traffic generated by developments in South East Newport feeding onto the SDR both at Queensway Meadows and Cot Hill.

The online widening Option D would increase the volume of traffic through the tunnels by about 20,000 vehicles per day (20%) in 2035. Under Option D, however, with the pinch-point of the tunnel removed and as traffic flows in the tunnel tend to be lower than elsewhere on the motorway (due to the relief provided by the Malpas Relief Road slip roads), the critical link on the motorway is actually further west, between Junction 26 and Junction 27.

For Option D, Table 5.1 shows that the predicted AADT between Junction 26 and Junction 27 in 2035 is 163,300 veh/day. The traffic model also predicts that the maximum peak flow (PM peak westbound) will be 7,652 veh/hr. The theoretical capacity for this link is 7,200 veh/hr. Thus, under Option D during the PM peak, the section of motorway between Junction 26 and Junction 27 is likely to be operating some 6% above capacity in the westbound direction. This indicates that Option D would be expected to experience capacity problems on the motorway west of the tunnels by the design year, which could result in severe operational problems during peak period.

Table 5.1: CEM Highway Options – AADT Forecasts (vehicles/day)

	2020					2035				
	Do-Min	Option A	Option B (2017)	Option C	Option D	Do-Min	Option A	Option B	Option C	Option D
M4										
J23a to J24	89600	45500	83200	90700	91300	114700	63900	116200	119000	118600
J24 to J25	108400	64400	101800	101400	109800	133600	90000	135500	126100	143100
Brynglas Tunnel	81400	37300	76200	74400	84500	94700	55400	94800	91200	114200
J26 to J27	119300	75400	113200	111600	128700	138900	96000	138800	133300	163300
J27 to J28	118100	76200	112400	111600	126500	137300	97700	137000	131300	159100
J28 to J29	122700	80500	117000	124300	128200	143200	103600	143000	143500	161900
A48 SDR										
Beatty Rd to Cot Hill	14400	15100	11700	24500	14200	23200	23100	25600	41600	22700
Balfe Rd to Queensway	29000	29300	22200	37500	28400	34100	35100	29700	53500	34100
Usk Bridge	41000	37600	37400	52200	39700	47800	44700	41900	69800	46900
East of Docks Way	31900	28100	30400	42700	29900	38000	34100	37500	58900	36300
Pont Ebbw to J28	36700	33400	35300	54400	36800	40200	38000	39500	65900	42800
Usk Screenline										
Malpas Relief Rd slips	38400	37900	36600	37200	39800	47000	45400	48800	44400	44100
M4, J25a to J26	81400	37300	76200	74400	84500	96900	55400	96900	92300	114200
Clarence Place Bridge	28600	28800	28300	28500	29400	32700	30700	33700	31400	31700
George St Bridge	20700	19900	21200	20500	19700	23500	21700	25100	22000	22600
A48 SDR	41000	37600	37400	52200	39700	47800	44700	41900	69800	46900
Route south of Newport	-	55900	-	-	-	-	74900	-	-	-
Screenline Total	*210100*	*217400*	*199700*	*212880*	*213100*	*247900*	*272700*	*246300*	*259900*	*259500*

6 Economic Assessment

6.1 Overview

A preliminary economic assessment of each of the M4 CEM highway options has been carried out in accordance with the advice given in DMRB[17] and WebTAG[18]. Since the assessment of options is at a strategic level, there are limitations regarding the level of detail available. Thus, whilst the assessment includes estimates of user benefits and safety benefits, caution should be exercised in respect of the numeric values of the output of the economic assessment at this strategic level.

The assessments are undertaken for a 60-year period from the scheme opening year. For the purpose of this assessment, all options were assumed to be constructed in one 'hit' rather than phasing the construction. Each option was assumed to have an opening year of 2020, with the exception of Option B (at-grade improvement of the SDR) where the opening year was assumed to be 2017.

6.2 Cost Estimates

The main components of the scheme costs included in this assessment are:

- Construction costs;
- Land and Property costs;
- Preparation and Supervision costs; and
- Traffic-related maintenance costs.

The estimated construction cost associated with each of the CEM options do not include a quantified risk assessment, although they incorporate an adjustment of 44% for optimism bias, as recommended in WebTAG for programme entry schemes.

The cost estimates, which are based on 2010 Quarter 3 prices, are shown in Table 6.1.

Table 6.1: M4 CEM Highway Option High Level Cost Estimates (2010 Q3)

Item	Option A	Option B	Option C	Option D
TOTAL	£825m	£50m	£345m	£580m

[17] Design Manual for Roads and Bridges, Department for Transport/Welsh Government
[18] WebTAG Department for Transport's web-based guidance for transport assessments in particular units 3.1, 3.5, 3.10 and 3.15

6.3 Economic Indicators

In order to assess the costs and benefits that might be associated with each highway infrastructure option, traffic conditions in the year of scheme opening (2020 with the exception of Option B, which is assumed to be 2017) and the design year (2035) are compared for each option with those in the base year (2012). The values of all costs and benefits are converted to the Present Value Year, defined in WebTAG as 2010. They are also discounted from the year in which they occur to 2010, using the discount rates defined in WebTAG, to give the Present Value of Costs (PVC) and the Present Value of Benefits (PVB). The Net Present Value (NPV) is calculated by subtracting the PVC from the PVB, while the Benefit-Cost Ratio (BCR) is calculated by dividing the PVB by the PVC.

The results of the modelling and the economic assessment work indicate that Option A (the construction of a new all-purpose route to the south of Newport) is the CEM highway option that is likely to provide the best value for money and provide the most relief to the existing sections of the M4 motorway around Newport.

Option B (at-grade improvement to junctions on the A48 SDR) would be unlikely to result in benefits.

Option C (grade-separated junction improvement on the A48 SDR) would be likely to result in benefits, but these would not be focused on relief to the motorway. For example, analysis has shown (see Table 5.1) that Option C would reduce traffic through Brynglas tunnels by around 9%in the opening year. However, by 2035, the traffic levels through the tunnels might be expected to have increased to within 4% of the do-minimum scenario with very limited relief on the congested sections of the motorway.

For Option D (on-line widening of the motorway) some benefits are likely to accrue. However, the lack of an alternative route will result in motorway capacity and network resilience issues, not to mention major disruption due to on-line construction.

7 Environmental Assessment

Strategic Environmental Assessment (SEA) is a process that provides for the high level protection of the environment, by ensuring the integration of environmental considerations into the preparation of strategies and plans and by contributing to the promotion of sustainable development and environmental protection.

Under the SEA Directive (2001/42/EC), SEA is a legal requirement for certain plans and programmes. In Wales, this is implemented through the Environmental Assessment of Plans and Programmes (Wales) Regulations 2004 (referred to as the SEA Regulations in this report).

The SEA process requires the Welsh Government to:

- Scope and prepare an Environmental Report on the likely significant effects of the proposed draft Plan for the M4 CEM Programme;
- Consult on the M4 CEM Programme' draft Plan and the Environmental Report;
- Take into account the findings of the Environmental Report and the consultation feedback in decision-making; and
- When the preferred strategy for M4 CEM Programme is adopted, provide information to show how the results of the SEA have been taken into account.

Environmental assessment information (as required by the SEA Regulations in preparation of a draft Plan) had been included in a consultation document (5 November 2012), which invited comment from the public and statutory environmental stakeholders on the environmental assessment on the individual measures. This assessment was referred to as an SEA; however a full SEA can only be carried out on a draft Plan, which comprises a preferred strategy, which has yet to be identified for the M4 CEM Programme. This confusion led to a potential legal challenge from two members of the campaign group CALM; Friends of the Earth and Gwent Wildlife Trust. Welsh Government, after taking legal advice, responded stating that the challenge was premature. The position is that the Welsh Ministers are in the process of preparing a draft Plan for the M4 area around Newport and Welsh Government has consulted upon possible options and assessed those options. The Welsh Ministers will now need to decide whether to formulate a draft Plan, and, if so, which options to include within that draft Plan.

An Environmental Report will, on announcement of any draft Plan, be prepared. Any draft plan setting out the proposed measures for the M4 around Newport, and the consequential Environmental Report, will be published and will be the subject of consultation with statutory and public consultees in accordance with the relevant regulations. Following any such consultation, the Welsh Ministers would determine whether or not to adopt the published draft Plan with or without amendments.

A summary of the likely significant environmental effects of implementing the measures in the M4 CEM Programme is provided below (without mitigation measures). These were subject to consultation in November 2012 and the results of that consultation have informed the Stage 1 Appraisal at Section 9. The scale of significance used in the assessment is as follows:

Significance of Effect		Description of Effect
2	Major Positive	Likely to benefit a large part of the M4 CEM Programme area or a large number of people and receptors. The effects are likely to be direct and permanent and the magnitude will be major.
1	Minor Positive	The extent of predicted beneficial effects is likely to be limited to small areas within M4 CEM Programme area or small groups of people and receptors. The effects can be direct or indirect, temporary or reversible. The magnitude of the predicted effects will be minor.
0	Neutral	Neutral effects are predicted where the option being assessed is unlikely to alter the present or future baseline situation.
-1	Minor Negative	Minor negative effects are likely to be limited to small areas within the M4 CEM Programme area, or limited to small groups of people and receptors. The effects can be direct or indirect, temporary or reversible. The importance of the receptor that is effect is likely to be minor as is the magnitude of the predicted effect.
- 2	Major Negative	Likely to affect the whole, or large part of the M4 CEM Programme area. Also applies to effects on nationally or internationally important assets. The effects are likely to be direct, irreversible and permanent. The magnitude of the predicted effects will also be major.
?	Unknown	This significance criterion is applied to effects where there is insufficient information to make a robust assessment. It is also applied to the assessment of options that can have both positive and negative effects and it is not clear whether the positive or negative effects outweigh each other.
N/A	Not Applicable	This is applied to objectives that are clearly not affected by the option or project being assessed.

Full details of the environmental assessment are provided in the M4 CEM Environmental Report[19], which was prepared and consulted on in preparation of a draft Plan. The results have been reflected in the Appraisal Summary Tables for each option.

The comments received with regard to the consultation on the SEA Environmental Report during November/December 2012 have been given full consideration. This leads to actions that would be considered further should the Welsh Government progress the M4 CEM Programme and produce and consult on a draft Plan and associated SEA. These include:

- *Consideration of a Do-Nothing option:* In response to the consultation feedback, Welsh Government may consider a "do-nothing" option in the SEA Environmental Statement.
- *Mitigation:* Welsh Government does not have sufficient detailed information at this stage to formulate mitigation measures specific to the M4 CEM Programme. Such measures would be considered at project level, through Environmental Impact Assessment(s), as required. The SEA will inform more detailed Environmental Impact Assessment(s), as required for any major projects that maybe taken forward through the M4 CEM Programme.

[19] M4 CEM Environmental Report (2012) available at www.m4cem.com

Table 7.1: Preliminary Environmental Assessment of Significant Effects Summary

SEA Indicator	Appraisal of CEM Measures					
	Public Transport Measures	Highway Infrastructure Option A	Highway Infrastructure Option B	Highway Infrastructure Option C	Highway Infrastructure Option D	Common Measures
Air Quality	1	?	?	?	?	1
Climatic Factors - Greenhouse Gas Reduction	0	?	?	?	?	0
Climatic Factors - Adaption Measures	0	2	1	1	1	0
Noise	0	?	?	?	-1	0
Biodiversity	-1	-2	-1	-1	-1	0
Population	1	1	-1	0	0	0
Human Health	1	1	0	0	?	1
Soil	0	-2	0	-1	-1	0
Water	-1	-2	-1	-1	0	0
Material Assets	-1	-2	-1	-1	-2	-1
Cultural Heritage	0	-2	-1	-1	-2	0
Landscape and Townscape	0	-2	-1	-2	-2	0

8 Health Impact Assessment

A preliminary Health Impact Assessment (HIA)[20] for the transport measures has been undertaken for the M4 CEM Programme options. The completion of an HIA is a mandatory requirement of WelTAG.

The Wales Health Impact Assessment Support Unit (WHIASU) was consulted on the proposed scope of the HIA and provided comments and advice on the preparation of the HIA. The HIA has been prepared in accordance with new guidance on the HIA process that has recently been prepared by WHIASU in conjunction with Public Health Wales and Cardiff University entitled, "Health Impact Assessment: A Practical Guide."

WelTAG states that HIA is a mandatory requirement of transport appraisal. As a result, the Welsh Government acknowledges that HIA is required for the M4 CEM strategy. A scoping report for the HIA has been prepared and was issued to WHIASU for comment on 20 September 2012. WHIASU provided comments on the proposed scope for the HIA on 4 October 2012.

The HIA has been developed to be proportionate to the M4 CEM Programme. In accordance with the guidance issued by WHIASU, this preliminary report is considered to be a "Prospective HIA", that is it is being undertaken at the start of the M4 CEM proposal, and has been undertaken as a "Desktop HIA" exercise. The geographical extent of the HIA specifically refers to the M4 CEM measures along the M4 corridor at Newport between Magor and Castleton.

The impact of possible M4 CEM measures on health and well-being has been considered with reference to relevant WelTAG criteria. A substantial evidence base has been prepared as part of the preliminary WelTAG appraisal of the M4 CEM programme. It provides a summary of baseline conditions as well as an appraisal of social, economic and environmental criteria. This evidence base has informed the preparation of the initial HIA.

In preparing the HIA, a consideration of the following potential impacts has been undertaken in accordance with WHIASU best practice:

1. What do you consider to be the potential health impacts and will the impact be positive or negative?
2. Is the likelihood of the impact of the proposal definite, probable or speculative?
3. What do you consider to be the scale of the impact and what proportion of the population is likely to be affected?
4. What do you consider to be the timing of these impacts and will the impact be in weeks, months or years?
5. What will the distribution of the effects be and will the proposal affect different groups of people in different ways?
6. Are there any opportunities to maximise the potential improvements in health and to minimise the potential risks to health?

[20] Health Impact Assessment (2012) available at www.m4cem.com

During the engagement process, the Welsh Government and its project team has conducted dialogue and deliberative sessions both with internal and external specialists and expert stakeholders, encompassing local health boards, local authorities and other organisations with an interest in the likely health and community impacts of transport measures. This input has helped shape the M4 CEM Programme and influenced the technical appraisal process. Further information about the M4 CEM engagement and consultation process is available at www.m4cem.com.

Specifically to this HIA, the Welsh Government consulted with the Wales Health Impact Assessment Support Unit (WHIASU) on its approach to assessment and reporting. Following WHIASU advice and guidance, telephone interviews on the potential health effects of the M4 CEM measures have been undertaken with health professionals and other local stakeholders. Stakeholders have been identified with the assistance of WHIASU.

The consultees contacted for interview included:

Organisation
Aneurin Bevan Health Board
Countryside Council for Wales
House of Commons
National Assembly for Wales
Newport Council
Newport Local Public Health Team
Newport, Gwent Association of Voluntary Organisations (GAVO)
Public Health Wales
Wales Health Impact Assessment Support Unit (WHIASU)

A number of the identified stakeholders (above) declined to take part or were unavailable for the telephone interviews during the preparation of this HIA. In total three telephone interviews were undertaken, including:

- Health and Wellbeing representative from the Countryside Council for Wales;
- MP for Newport West; and
- Public health consultant representing both Public Health Wales and the Aneurin Bevan Health Board.

A summary of stakeholder responses is provided below:

Topic	Summary of responses
Public Transport Measures	Will create positive health impacts, encouraging physical activity, a potential reduction in emissions and social connectivity. Getting people to use public transport is challenging. Changing people's behaviour is vital, which may take a long time and so there may need to be some sort of intervention to make people use public transport. Benefits are likely to be long term but the impact limited and mainly to those without access to a car. Systematic promotion of public transport to increase awareness would increase the benefits. Clean technology for buses would also help to reduce pollution.

Topic	Summary of responses
Highway Option A: Additional high quality road to the south of Newport	It is the favoured option. It would only impact on a small population, so it would be the least polluting option. It directs traffic away from the most populated areas of Newport; the winds blow from west to east and the pollution from this option will spread over the channel and not the local population. A sizable population (the Duffryn area) will experience positive benefits; the negative impacts will be experienced by the least number of people in comparison to the other options. There is the potential that it could bring congestion and pollution to new areas. There may be negative impacts during construction (noise, air quality, visual impact). Although the frequency of accidents may be reduced the increased road space may mean that accidents are more serious. It may widen the gap in health inequality between the north and south of Newport. The impact will be limited but long term and the most affected will be people with vehicles and people who will occupy the new housing at the steelworks. In the long term it could affect larger proportion if flood mitigation measures are not implemented. This option has been designed in a positive way, it avoids nature reservations etc. but the damage to the landscape has to be managed; there is a lot that can be done to minimise the damage.
Highway Option B: **At grade junction improvements to the A48 Newport Southern Distributor Road (SDR)**	It is an unfavourable option. It would direct traffic nearer to the local population. The road borders some of the most deprived areas so negative health impacts will have a disproportionate effect. As a through route it is very polluting. There might be impacts with regards to taking traffic away from the M4 but there wouldn't be a significant health difference. There would be negative impacts during construction. Driver stress is likely to be adversely affected. There may be increased potential for collisions with the changed junctions when people are not used to them. If the junctions change, and people are not used to it, the changes could actually cause issues. There is potential for more severe accidents and increased frequency of accidents. It may reduce the amount of walking and cycling that people do. It would affect a moderate proportion of the population and have a long term impact. For the cost, disruption and negative impacts, it should not be taken forward. If it did progress as a project, Welsh Government should ensure that there is awareness among the users, and give people an idea of the length of time that people will be inconvenienced by the changes that could be put in place.

Topic	Summary of responses
Highway Option C: Grade separated junction improvements to the A48 Strategic Distributor Road	This option is unfavourable. It would cause severe negative impacts. In particular, Junction 28 is already at maximum capacity at peak times and this problem would be exacerbated. The option should not be progressed. It could cause increased potential for collisions with the modified junctions. Positive impacts could include improved access, reduction of noise levels on the M4. Negative impacts could include increased noise levels on the SDR. It is preferable to Option B but will still cause negative impacts on health. Increased potential for community severance. The impacts will be moderate, long term and will affect the general population, but mainly those living around the SDR – therefore it will affect more deprived areas most. Should the option be progressed, Welsh Government should ensure that there is awareness among the users, and give people an idea of the length of time that people will be inconvenienced by the changes that could be put in place.
Highway Infrastructure Option D: **Online Widening of the M4 between Junctions 24 and 29, including an additional tunnel at Brynglas**	This is the most challenged option Health impacts will be large and negative. It will direct additional traffic and associated pollution into the heart of the city. This is the most disruptive option to the local area and there would be fierce public opposition. This will have a discernible and measurable negative effect on the health. During construction, it would cause issues with regards to reduced access, and increased traffic issues – leading to additional stress and noise pollution. Once it is completed, then potentially it could reduce congestion, so potentially it could reduce driver stress. Positive impacts from reduced congestion are only likely to be short term as it attracts increased usage over time. It will affect a large proportion of residents of Newport and impacts will be long term. The most affected will be communities around the M4 corridor and those living in the least deprived areas. If this option is progressed, consultation should be undertaken with the users of the route and the communities that could be affected.

Topic	Summary of responses
Common Measures	Common measures are supported. Positive impacts could be realised from noise pollution reduction measures and improved incident management and event management. All common measures are desirable and could have positive impacts. In particular, walking and cycling infrastructure will potentially have a positive effect on physical activity levels, and alternative route promotion could be beneficial with regards to access to services. There is also potential for a reduction in noise and an improvement in local air quality. Common measures would affect the general population and benefits would be realised over the long term. The measures might exclude young and elderly people as it may be more challenging for them to utilise public transport, walking and cycling options. A well planned and tested series of interventions to encourage the use of alternative methods of transport would be needed. Changes should take into account local consultation to ensure limited disruption and maximum benefit of any measures that could be progressed further.

Comments made by the stakeholders have been reflected in the Appraisal Summary Tables for each option.

A full account of responses and associated appraisal is provided in the full preliminary HIA report, available at www.m4cem.com.

For any options that are progressed as part of a preferred M4 CEM strategy (Draft Plan), further Health Impact Assessment and consultation with WHIASU (and other bodies identified by WHIASU) would be considered by the Welsh Government.

9 Equality Impact Assessment

A preliminary Equality Impact Assessment (EqIA) has been undertaken for the M4 CEM Programme options. WelTAG requires that the assessment of transport measures should include an appraisal of equality, diversity and human rights.

The Equality and Human Rights Division of the Welsh Government was consulted on the proposed scope of the EqIA. However, a formal response to the scoping request has not been received to date. As a result, the preliminary EqIA has been prepared with due regard to the guidance provided in WelTAG, the National Transport Plan Equality Impact Assessment (February 2010)[21], the Wales Transport Strategy Equality Impact Assessment (2008)[22] and Working for Equality in Wales (May 2010)[23].

A summary of each of the proposed transport measures is provided in the full EqIA report[24] and is accompanied by a qualitative assessment of potential impacts on equality. The table below provides an overview of potential actions that the Welsh Government may consider as part of any Preferred M4 CEM Strategy. The actions suggested below aim to enhance the possible beneficial impacts and/or mitigate against the possible adverse impacts on equality areas.

Actions to be considered	Rationale	Who will benefit
Ensure ergonomically designed public transport that facilitates use for all.	The design of buses should cater for all needs and mobility issues.	Women with children Older people
Provide training for all bus/train operators to raise awareness of the special needs of passengers and appropriate behaviour.	To encourage use of public transport by those who may be deterred by drivers' behaviour.	Older people Disabled people
Plan appropriate public transport routes and conveniently located bus stops, discussed in partnership with community groups and operators. Design-out crime at public transport interchanges.	To improve personal security and encourage use of public transport.	Younger people Older people Ethnic groups LGB/T
Ensure clear and appropriate signage and information services are displayed at public transport interchanges and along road routes.	Effective signage and information supports access to transport services and aids mobility.	Younger people Older people Ethnic groups
Ensure inclusive design principles are incorporated into the design of new junctions to accommodate non-motorised users.	To ensure inclusive access to those not travelling by car.	Older people Disabled people

[21] National Transport Plan Equality Impact Assessment and Equality Action Plan, February 2010
[22] Wales Transport Strategy Equality Impact Assessment, 2008
[23] Working for Equality in Wales. Inclusive Policy Making. Second Edition Guidance, May 2010, Welsh Assembly Government
[24] Equality Impact Assessment (2012) available at www.m4cem.com

Actions to be considered	Rationale	Who will benefit
Offer appropriate compensation for properties requiring demolition, including replacement of any community facilities.	To ensure certain community groups are not disproportionately affected by demolition and/or construction works.	Lower socio-economic groups Older people Ethnic groups

The preliminary EqIA results have been reflected in the Appraisal Summary Tables for each measure.

10 Stage 1 Appraisal

Paragraph 5.3.1 of the WelTAG guidance states that the Stage 1 appraisal is intended to screen and test options against the Transport Planning Objectives (TPOs) and the Welsh Impact Areas of Economy, Environment and Society, as well as more detailed tests for deliverability, risks and the degree of support from the public and other stakeholders. In accordance with WelTAG, the Stage 1 appraisal has comprised a qualitative review of each of the transport options.

10.1 Scoping Appraisal

Early engagement with a stakeholder group[25] helped assess possible solutions to the problems associated with the M4 CEM Programme. This involved testing Appraisal Summary Tables (ASTs) through a series of workshops for highway infrastructure, traffic management, public transport and smarter sustainable solutions. The project team undertook the initial appraisal and the stakeholder group provided comments[26], which were then considered by the project team in the development of possible options.

10.2 Preliminary Appraisal

Early engagement with stakeholders led to a re-appraisal of possible solutions against WelTAG criteria and the goals of the M4 CEM Programme. Comments from the stakeholder workshops largely focused on concerns on how an additional high quality road to the south of Newport might impact on the environment. As such, the significance of impact on the environment (in particular on biodiversity) was up-scaled in line with comments made by representatives of RSPB and others. Revised ASTs were then included within the M4 CEM Consultation Document[27], which consulted with the public and stakeholders on the problems, goals and possible solutions of the M4 CEM Programme between March and July 2012.

10.3 WelTAG Stage 1 Appraisal (strategy level)

A WelTAG Stage 1 Appraisal (strategy level) of the M4 CEM Programme options has been informed by preparatory assessment work on transport, health, equality and the environment. Supporting the engagement and consultation process associated with the M4 CEM Programme, a preliminary Health Impact Assessment, Equality Impact Assessment, Strategic Environmental Assessment, Habitats Regulations Assessment and an Economics Assessment have been undertaken. These assessments have informed an appraisal that builds upon and updates the initial appraisal presented within the M4 CEM Consultation Document, of the likely impacts of the different options on WelTAG criteria and the goals of the M4 CEM Programme.

[25] A Stakeholder Forum was created by the Welsh Government that comprised an expert group of people with both a strategic interest and detailed experience of addressing travel related issues in South Wales.
[26] Comments recorded during stakeholder workshops can be found in transcript and summary workshop reports, available at www.m4cem.com
[27] M4 CEM Consultation Document (March 2012) available at www.m4cem.com

10.4 Scoping Appraisal Stage

Early engagement with a stakeholder forum group helped assess possible solutions to the problems associated with the M4 CEM Programme. An initial appraisal was undertaken by the project team, which then invited comments during stakeholder workshop exercises. A full appraisal, including qualitative comments of the likely impacts of individual measures, is provided within the following documents[28]:

- M4 CEM Package 1 Workbook;
- M4 CEM Package 2 Workbook;
- M4 CEM Package 3 Workbook;
- M4 CEM Package 4 Workbook;
- M4 CEM Alternatives Considered Workbook;
- Second Stakeholder Meeting Report;
- Stage 2 Appraisal Summary Workbook; and
- First Stakeholder Meeting Report.

At this early stage of the M4 CEM Programme, an approach to developing a possible package of measures comprised four possible packages as overarching options:

Package 1 – Some public transport, common measures and a core highway infrastructure measure involving an additional high quality road to the south of Newport;

Package 2 - Some public transport, common measures and a core highway infrastructure measure involving at-grade junction improvements to the Newport A48 Southern Distributor Road (SDR);

Package 3 - Some public transport, common measures and a core highway infrastructure measure involving on-line improvements to the existing M4 route including a new tunnel bore at Brynglas; and

Package 4 - Some public transport and common measures, focused on developing the public transport system and prioritising the M4 for long distance travel.

[28] All available documents can be found at www.m4cem.com. These represent a previous stage in the M4 CEM Programme's development. This stage of the Programme involved appraising a long list of potential solutions to the travel problems identified on the M4 Corridor, and developing packages of a shortlist of potential measures, aimed at addressing the goals of the M4 CEM Programme.

The outcomes of the WelTAG Stage 1 Appraisal for the Public Transport Measures, Highway Options A-D and the Common Measures are summarised in Tables 10.1 to 10.6. Mitigatory measures to minimise adverse impacts have yet to be considered for any of the options at this strategic level of appraisal.

In order to help make the appraisal information easier to understand, each measure in the above table has been assessed using a 7-scale colour coding system, as follows:

Large Beneficial (Positive Impact)	(+++)
Moderate Beneficial (Positive Impact)	(++)
Slight Beneficial (Positive Impact)	(+)
No (or Minimal) Impact	(N)
Slight Adverse (Negative Impact)	(-)
Moderate Adverse (Negative Impact)	(--)
Large Adverse (Negative Impact)	(---)

Table 10.1: Assessment of M4 CEM Public Transport Measures against WelTAG Criteria and TPOs

Criteria	Assessment	Distribution	Significance
Transport Economic Efficiency (TEE)	Public transport measures aim to encourage modal shift onto public transport and ultimately improve journey times and journey time reliability through reducing general traffic congestion levels. Whilst it is likely that the benefits may increase over time as the cultural shift in travel behaviour moves towards sustainable choices, the investment and revenue costs needed to deliver and operate public transport services may require public subsidy, which could be a significant on-going revenue cost.	Public transport users	(-)
Economic Activity and Location Impact (EALI)	The public transport measures may have a positive impact on the local and regional economy as local accessibility within Newport is enhanced, together with improvements being made to longer distance travel by public transport.	Public transport users	(+)
Noise	New or improved public transport services are likely to have only minimal impact with respect to reducing traffic on the M4; therefore the associated change in noise along the motorway is also likely to be minimal.	Properties along public transport routes	(N)
Local Air Quality	As modal shift trends are realised, air pollution could reduce along the M4 and local road network, leading to improvement in air quality in the Air Quality Management Areas in particular.	Properties along roads impacted by modal shift	(+)
Greenhouse Gas Emissions	The public transport measures may help to reduce congestion, which could have some benefit in reducing vehicle emissions, although the impact is likely to be negligible.	No significant distributional impacts	(N)
Landscape and townscape	As public transport measures are at a strategy level, the full extent of the impact is unclear. However, it is likely that the schemes may require limited land take and thus the impact may be negligible.	No significant landscape impacts	(N)

Criteria	Assessment	Distribution	Significance
Biodiversity	Transport infrastructure, such as more stations with park and ride facilities, will require land take, although the extent of this is not known at this time. New infrastructure located close to the River Usk SAC and SSSI could have a negative impact and may therefore create adverse effects.	Potential impact on River Usk SAC and SSSI	(-)
Heritage	Transport infrastructure, such as more stations with park and ride facilities, may have a negative impact on cultural and historical assets. As new stations, however, are likely to require a limited land take, the impact will be minimal.	Distribution assessment not required (Para. 7.10.7 of WelTAG June 2008)	(N)
Water environment	New stations are likely to be close to the River Usk SAC and SSSI, there may be negative impact.	Potential impact on River Usk SAC and SSSI	(-)
Soils	It is likely that the schemes may require limited land take and thus that the impact may be negligible.	No significant distributional impacts	(N)
Transport safety	The public transport measures could improve road safety should modal shift result in reduced general traffic levels.	Public transport users	(+)
Personal security	The public transport measures are not be expected to impact on personal security.	Public transport users	(N)
Permeability	Movement by walking and cycling could benefit.	Public transport users	(+)
Physical fitness	Public transport enhancements should encourage modal shift which could primarily have a positive effect on human health, as trips by public transport often include a walk or cycle to or from the public transport start and end points.	Public transport users	(+)
Social inclusion	Minority LGB/T, low income, ethnic and faith communities are frequently dependent on public transport and will, therefore, benefit from improvements to modal integration, walking and cycling facilities – particularly in accessing key facilities and employment opportunities	Public transport users	(++)
Equality, Diversity & Human Rights	The public transport measures aim to meet the needs of all groups of people.	Public transport users	(+)
TPOs			
1	Additional and improved services by all modes will help to improve safer, easier and more reliable travel along east-west corridors.	Public transport users	(+)
2	Public transport measures specifically target journeys made between Magor and Castleton, and as such the impact is likely to be negligible. However, it is acknowledged that regional benefits to public transport use could be realised.	No significant impacts	(N)
3	Measures will provide more effective and integrated alternative modes of travel.	Public transport	(+)

Criteria	Assessment	Distribution	Significance
		users	
4	Measures will seek to enhance the existing public transport network.	Public transport users	(+)
5	The impact on travel along the M4 Corridor is likely to be negligible.	No significant impacts	(N)
6	Public transport measures will increase the level of choice.	Public transport users	(++)
7	The impact on travel safety is likely to be negligible.	No significant impacts	(N)
8	Increasing modal shift will benefit air quality around Newport.	Properties along roads impacted by modal shift	(+)
9	The impact on noise along the M4 Corridor is likely to be negligible	No significant impacts	(N)
10	The public transport measures could have some benefit in reducing vehicle emissions, although the impact is likely to be negligible.	No significant impacts	(N)
11	The impact on travel experience is likely to be negligible.	No significant impacts	(N)
12	Public transport could help to reduce local journeys made by car and help prioritise the M4 for strategic journeys.	All groups	(+)
13	No impact is expected on traffic management.	No significant impacts	(N)
14	Public transport improvements could benefit local access to key services and residential and commercial centres.	Public transport users	(+)
15	Measures will help to improve access to alternative modes and encourage modal shift, to help change travel behaviours.	Public transport users	(++)
Public acceptability	The promotion of public transport use is likely to be greeted positively by communities in Newport and surrounding areas.		
Acceptability to other stakeholders	Investment in public transport is likely to be supported by environmental, business and mobility groups in particular.		
Technical and operational feasibility	The measures considered at a strategy level and therefore the technical and operational feasibility risks are unknown.		
Financial affordability and deliverability	A phased approach to delivery could improve affordability and deliverability. Delivery is likely to require partnership with Sewta and public transport operators. Revenue costs should be considered in addition to capital costs of projects. Subsidies for public transport may also require consideration by the Welsh Government as part of any future assessment of costs to benefits.		
Risks	Significant investment in public transport could require political commitment at a local, regional and national level. Partnerships with other stakeholders could need to be effective in order to deliver public transport measures. The South East Wales Integrated Transport Task Force might offer a useful delivery body for public transport measures in South Wales.		

Table 10.2: Assessment of M4 CEM Common Measures against WelTAG Criteria and TPOs

Criteria	Assessment	Distribution	Significance
Transport Economic Efficiency (TEE)	The common measures seek to make better use of existing transport infrastructure. In combination, the common measures are expected to improve journey times and journey time reliability though, given the scale of the measures proposed, the impacts overall impacts are likely to be minor positive.	All road users	(+)
Economic Activity and Location Impact (EALI)	The common measures may have a positive impact on the local and regional economy as the measures seek to improve the efficiency of the existing transport infrastructure, benefiting access to local residential and commercial centres.	All road users	(+)
Noise	Reduced congestion as well as modal shift towards more sustainable modes of transport arising from the common measures may reduce noise nuisance along the M4 and local road network.	Properties near improved junctions	(+)
Local Air Quality	The combination of highway measures and demand management will improve the efficiency of the motorway, reducing congestion, resultant emissions and thereby improving air quality.	Areas near improved junctions.	(+)
Greenhouse Gas Emissions	The combination of highway measures and demand management will improve the efficiency of the motorway, reducing congestion and the associated greenhouse gas emissions. It is likely, however, that the nature of the measures will result in a negligible impact.	No significant distributional impacts	(N)
Landscape and townscape	As the common measures are at a strategy level, the full extent of the impact is unclear. However, given the relatively small magnitude of the measures proposed, the schemes may require limited land take and thus the impact may be negligible.	No significant landscape impacts	(N)
Biodiversity	The common measures are expected to require minimal land take outside of current highway boundaries and away from areas of significant biodiversity value; thus the impact is expected to be negligible.	No significant biodiversity impacts	(N)
Heritage	It is likely that the common measures may require limited land take and thus the impact is likely to be negligible.	No significant heritage impacts	(N)
Water environment	The highway measures would require additional highway drainage in some cases, however the significance of effect would be negligible.	No significant water impacts	(N)
Soils	It is likely that the common measures may require limited land take and thus the impact is likely to be negligible.	No significant soils impacts	(N)
Transport safety	The common measures may improve road safety, particularly through junction improvements.	All road users	(+)
Personal security	The common measures are not expected to impact on personal security.	No significant personal security impacts	(N)
Permeability	The cycling and walking infrastructure improvements as part of the common measures are expected to improve permeability within Newport.	No significant permeability impacts	(+)
Physical fitness	The Common Measures include the provision of walking and cycling infrastructure and improved integration between sustainable transport modes. These measures should increase	No significant physical fitness	(+)

Criteria	Assessment	Distribution	Significance
	physical activity and fitness. Improved traffic management, junction improvements and the promotion of alternative routes to the M4 may help to improve local accessibility to health, care, training and education services.	impacts	
Social inclusion	Better transport integration could benefit those without access to a vehicle.	All groups	(+)
Equality, Diversity & Human Rights	Improved traffic management, junction improvements and the promotion of alternative routes to the M4 may help to improve local accessibility to community services for all groups.	No significant equality impacts	(+)
TPOs			
1	Making better use of the existing transport infrastructure, particularly junction improvements, will help to improve safer, easier and more reliable travel along east-west corridors.	All road users	(+)
2	The common measures do not focus on longer distance travel and thus the impact is likely to be negligible.	No significant impact	(N)
3	The common measures seek to promote the A465 Heads of Valleys road as an alternative to the M4.	All road users	(+)
4	The common measures seek to make the best use of the existing transport network.	All road users	(+)
5	The common measures should improve the operation of the M4 corridor, particularly at junctions, and thus may improve journey time reliability.	All road users	(+)
6	The overall impact of the common measures in terms of increased level of choice is considered negligible.	No significant impact	(N)
7	The common measures are likely to improve travel safety.	All road users	(+)
8	The combination of highway measures and demand management will improve the efficiency of the motorway, reducing congestion, resultant emissions and thereby improving air quality.	Areas near improved junctions.	(+)
9	Reduced congestion as well as modal shift towards more sustainable modes of transport arising from the common measures may reduce noise nuisance along the M4 and local road network.	Properties near improved junctions.	(+)
10	The common measures could have some benefit in reducing vehicle emissions, although the impact is likely to be negligible.	No significant impact	(N)
11	The common measures may improve the efficiency of transport network in the M4 corridor and improve the travel experience.	All road users	(+)
12	The impact on local traffic using the M4 is likely to be negligible.	No significant impact	(N)
13	The common measures are expected to have a positive impact on traffic management.	All road users	(+)
14	Improved traffic management, junction improvements and the promotion of alternative routes to the M4 may help to improve local accessibility to residential and community services.	No significant impact	(+)
15	Overall the common measures are expected to have a negligible impact on a modal shift in transport usage.	No significant impact	(N)
Public acceptability	The common measures are likely to be greeted positively by communities in Newport and surrounding areas.		
Acceptability to other stakeholders	Investment in public transport is likely to be supported by business groups in particular.		

Criteria	Assessment	Distribution	Significance
Technical and operational feasibility	The measures considered at a strategy level and therefore the technical and operational feasibility risks are unknown.		
Financial affordability and deliverability	A phased approach to delivery could improve affordability and deliverability.		
Risks	Given the relatively small magnitude of the individual common measures, the risks of implementation are likely to be low to medium.		

Table 10.3: Assessment of M4 CEM Option A against WelTAG Criteria and TPOs

Criteria	Assessment	Distribution	Significance
Transport Economic Efficiency (TEE)	The new road could help reduce problems of congestion on the highway network, thus leading to journey time savings and improved journey time reliability. The new road could also provide significant resilience to the network in times of maintenance on the existing M4. It could be delivered in phases that would achieve cumulative benefits and spread the investment costs.	All road users	(+++)
Economic Activity and Location Impact (EALI)	The construction of a new high quality road to the south of Newport would aim to support regional economic development, through enhancing accessibility to employment centres and improving the movement of people and freight.	All road users	(+++)
Noise	Noise impacts would be reduced along the route of the existing M4, which would reduce the noise nuisance to nearby residential properties. New noise impacts would arise along the new road route, although in an area where there are few receptors.	Properties along the M4 and SDR	(+)
Local Air Quality	A new route to the south of Newport would help reduce air pollution along the route of the current M4, improving conditions in the Air Quality Management Areas. However air quality would be expected to deteriorate in the area around the new road, although in an area where there are few receptors.	Properties along the M4 and SDR	(+)
Greenhouse Gas Emissions	The new road will help to reduce congestion, which should have some benefit in reducing vehicle emissions; however it is not clear whether the additional road capacity would lead to an overall increase in emissions in the longer term.	No significant distributional impacts	(N)
Landscape and townscape	A new high quality road to the south of Newport would cross the River Usk and the Gwent Levels and introduce significant new infrastructure into the landscape/townscape.	Local landscape impacts	(--)
Biodiversity	The new road to the south of Newport would cross the River Usk SAC and SSSI, which is an important wildlife corridor, an essential migration route and key breeding area for many nationally and internationally important species. The new road would also cross the Gwent Levels SSSIs.	Potential impact on River Usk SAC and SSSI	(---)
Heritage	A new high quality road to the south of Newport would cross the Gwent Levels Historic Landscape and affect land with significant archaeological sensitivity.	Distribution assessment not required (Para. 7.10.7 of WelTAG	(--)

Criteria	Assessment	Distribution	Significance
		June 2008)	
Water environment	A new high quality road to the south of Newport could lead to adverse effects on water quality, hydrological regimes, flood plains and areas of flood risk. Possible adverse effects on water resources could include changes to the water table, increase flood risk due to run off, pollution due to accidental spillages and changes to the existing hydrology of the catchments through which the road passes.	No significant distributional impacts	(--)
Soils	The new road would run through three distinctive topographical, geological and hydrogeological environments, including potentially contaminated sites within the central area of the scheme.	No significant distributional impacts	(--)
Transport safety	The new road would help improve road safety by reducing congestion levels, improving traffic flows, enhancing motorway junctions. On completion of the new road, it is likely that the total number of accidents on major roads in Newport would fall.	All road users	(++)
Personal security	The new road would be of a high quality and is likely to benefit the perception of personal security.	All road users	(+)
Permeability	The new road would help reduce congestion on the existing motorway and local road network, to benefit severance issues around Newport. The facility may also provide scope for incorporation of pedestrian/cycling facilities.	All road users	(+)
Physical fitness	The new road to the south of Newport could reduce congestion on the existing M4 motorway, thereby helping to reduce noise nuisance and air pollution. The new road could also reduce severance along the existing route, which could encourage the use of alternative modes such as walking, cycling and public transport. The new facility may also provide scope for incorporation of pedestrian/cycling facilities, which will help promote healthy lifestyles.	Car users	(+)
Social inclusion	This option would be expected to have a negligible effect on social inclusion.	Distribution assessment not required (Para. 8.6.31 of WelTAG June 2008)	(N)
Equality, Diversity & Human Rights	A new road could improve access to key facilities and employment opportunities for all groups. However, issues of safety and personal security will be considered at the detailed design stage.	All road users	(+)
TPOs			
1	An additional high quality road is likely to create a significantly safer, easier and more reliable transport link along the M4 between Magor and Castleton.	All	(+++)
2	The new road will form part of the European transport network and provide increased accessibility along the M4.	All	(++)
3	The new road will provide an alternative route to the M4 with capacity to reduce congestion along the existing route and provide increased resilience on the network.	All	(++)
4	A new road could improve traffic conditions on the existing network.	All	(+)
5	A new road would provide increased network resilience and could significantly improve journey time reliability.	All	(+++)

Criteria	Assessment	Distribution	Significance
6	The new road would provide an additional route between Magor and Castleton.	All	(+)
7	A new road could improve traffic conditions on the existing network and provide a safe alternative route.	All	(++)
8	A new route to the south of Newport would help reduce air pollution along the route of the current M4, improving conditions in the Air Quality Management Areas.	All	(+)
9	Noise impacts would be reduced along the route of the existing M4, which would reduce the noise nuisance to nearby residential properties.	All	(+)
10	The new road will help to reduce congestion and vehicle emissions; however it is not clear whether the additional road capacity would lead to an overall increase in emissions in the longer term.	All	(N)
11	A new road could provide a high quality and free flowing highway route to the south of Newport.	All	(++)
12	A new road could provide a high quality route for strategic journeys.	All	(+++)
13	A new road could improve traffic conditions on the existing network.	All	(++)
14	A new road could improve access to key facilities and employment opportunities.	All	(++)
15	A new road would not support a behavioural change towards more sustainable modes but may encourage additional car use on a free flowing route.	All	(--)
Public acceptability	The new road could create economic and social benefits. However, the environmental impact of the new road to the south of Newport is likely to attract opposition from those who prioritise a need to protect the environment over the possible economic benefits of the scheme.		
Acceptability to other stakeholders	The new road could help address many of the problems caused by congestion on the M4 in a phased and affordable manner, thus could attract support and be acceptable to other stakeholders, particularly business groups. However, possible adverse impacts on the environment could attract opposition from environmental groups and the wider public who prioritise a need to protect the environment over the possible economic benefits of the scheme. Further engagement is likely to be needed with specific land owners who may be affected directly by the scheme, including ABP.		
Technical and operational feasibility	The option is at a strategy level and therefore the technical and operational feasibility risks require further exploration. The new road could include a crossing of the River Usk and could also pass through the Docks Way landfill site. This will require consideration of suitable structures and land contamination issues.		
Financial affordability and deliverability	The construction of the new road could be delivered in phases, which could improve affordability.		
Risks	The option is at a strategy level and therefore the risks require further exploration. The new route could need to negotiate a landfill site requiring legal processes to be successfully considered. Challenge from public and/or stakeholders who may oppose the scheme on grounds of likely environmental impact may also require consideration.		

Table 10.4: Assessment of M4 CEM Option B against WelTAG Criteria and TPOs

Criteria	Assessment	Distribution	Significance
Transport Economic Efficiency (TEE)	At-grade junction improvements to the SDR could improve operating conditions and attract some traffic from the M4. Whilst this would improve network resilience, the prioritisation of east-west movements along the SDR could cause delays on the local road network. On-line improvements to the SDR would lead to disruption during construction.	All road users	(-)
Economic Activity and Location Impact (EALI)	This measure may disrupt local traffic movements, potentially affecting access to employment opportunities on the local road network to a limited extent. However, this option could improve network resilience and is assessed as having a neutral impact on economic activity and location.	All road users	(N)
Noise	At grade junction improvements to prioritise east-west movements along the SDR would improve the mainline flow of traffic along it and potentially reduce local traffic on the current M4. However, as a result, delays on the local road network could occur. Dependent on the net impact, there may or may not be an improvement to the noise nuisance to nearby residential properties.	Properties along the M4 and SDR	(N)
Local Air Quality	At grade junction improvements to prioritise east-west movements along the SDR would improve the mainline flow of traffic along it and potentially reduce local traffic using the current M4. However, it could cause delays on the local road network. Dependent on the net impact, there may or may not be an improvement to the current Air Quality Management Areas.	Properties along the M4 and SDR	(N)
Greenhouse Gas Emissions	The improvements to the SDR will have a negligible impact on congestion, and therefore on greenhouse gas emissions.	No significant distributional impacts	(N)
Landscape and townscape	At grade junction improvements to the SDR could result in minor and very local adverse visual impacts, including some within a Historic Landscape Area and Green Wedge.	Local landscape impacts	(-)
Biodiversity	At grade junction improvements to the A48 would require the realignment of the SDR at Church Street which crosses the River Usk SAC and SSSI. This could lead to direct and indirect adverse effects on biodiversity – including from direct physical impacts on habitats, hydromorphology and flow in the river and construction effects on species features of the European Site.	Potential impact on River Usk SAC and SSSI	(-)
Heritage	At grade junction improvements to the SDR could have an adverse effects on some Grade II Listed Buildings in the vicinity. This option could also affect the Castell Glas Scheduled Monument if the improvements were to take place outside the existing highway footprint.	Distribution assessment not required (Para. 7.10.7 of WelTAG June 2008)	(-)
Water environment	At grade junction improvements to the SDR are located within TAN15 Flood Zones and could lead to adverse effects on water quality, flood plain connectivity and areas of flood risk. Some junctions of the SDR run close to the Ebbw River therefore improvements could cause adverse effects such as increased flood risk due to run off and pollution due to accidental spillages.	No significant distributional impacts	(-)
Soils	Some additional land would be required but generally there is likely to be a negligible impact.	No significant distributional impacts	(N)

Criteria	Assessment	Distribution	Significance
Transport safety	At grade junction improvements to the A48 could reduce congestion on the existing M4 motorway, leading to journey time savings and improved journey time reliability. This has the potential to improve the driver experience and reduce driver stress. At grade junction improvements to the A48 will help improve road safety, as on completion, it is forecast that the total number of accidents on major roads in Newport would fall as a result of these improvements.	All road users	(+)
Personal security	At-grade improvements would prioritise east-west movement, which may have a beneficial effect on the perception of driver safety. However, delays on the local road network and possible local severance by greater east-west traffic flows along the SDR could have a negative effect on the perception of personal security.	All road users	(+)
Permeability	At-grade junction improvements along the SDR could cause severance with greater east-west traffic flows along the SDR. This may adversely impact on local journeys and thus have a negative impact on local accessibility.	All road users	(-)
Physical fitness	At-grade junction improvements along the SDR could cause severance with greater east-west traffic flows along the SDR. This may adversely impact on local journeys.	Car users	(-)
Social inclusion	Improved resilience and journey time reliability will benefit all users travelling east-west to access facilities, services and employment opportunities, with access to a car. Local trips and local public transport movements may be disrupted and so the measure is unlikely to benefit those without access to a car.	Distribution assessment not required (Para. 8.6.31 of WelTAG June 2008)	(N)
Equality, Diversity & Human Rights	The prioritisation of east-west movements along the SDR could potentially cause delays on the local road network and disrupt local public transport services (of which minority groups are largely dependent). Although public transport services operating along the SDR will benefit from prioritised signalling, the measure is unlikely to benefit those without access to a car.	All road users	(N)
TPOs			
1	At-grade junction improvements to the SDR could improve operating conditions and attract some traffic from the M4. Improvements to the SDR would also prioritise east-west routes.	All	(+)
2	Improved operation conditions on the M4 and the SDR could improve east-west traffic flows, but the overall impact on international connectivity would be neutral.	All	(N)
3	Improved travel conditions along the SDR could provide network resilience during incidents and delays on the M4.	All	(+)
4	At grade junction improvements to the SDR could reduce congestion on the existing M4 motorway and would prioritise east-west flows along the SDR.	All	(+)
5	At grade junction improvements to the SDR could reduce congestion on the existing M4 motorway, leading to journey time savings and improved journey time reliability.	All	(+)
6	Improved travel conditions on the SDR could provide an alternative route for road users between Magor and Castleton.	All	(+)
7	At grade junction improvements to the SDR could reduce congestion on the existing M4 motorway, leading to journey time savings and improved journey time reliability. This has the	All	(+)

Criteria	Assessment	Distribution	Significance
	potential to improve the driver experience and reduce driver stress.		
8	At grade junction improvements to prioritise east-west movements along the SDR would improve the mainline flow of traffic along it and potentially reduce local traffic using the current M4. However, it could cause delays on the local road network. Dependent on the net impact, there may or may not be an improvement to the current Air Quality Management Areas.	All	(N)
9	At grade junction improvements to prioritise east-west movements along the SDR would improve the mainline flow of traffic along it and potentially reduce local traffic on the current M4. However, as a result, delays on the local road network could occur. Dependent on the net impact, there may or may not be an improvement to the noise nuisance to nearby residential properties, although the overall impact is likely to be minor positive.	All	(+)
10	Improvements to the SDR would have a negligible impact on congestion and on greenhouse gas emissions.	All	(N)
11	At grade junction improvements to the SDR could reduce congestion on the existing M4 motorway. This has the potential to improve the driver experience and reduce driver stress, leading to an improved travel experience into South Wales along the M4 corridor.	All	(+)
12	At grade junction improvements to the SDR could reduce congestion on the existing M4 motorway, but would not discourage local traffic use of the motorway.	All	(N)
13	Improved travel conditions on the SDR could provide better strategic traffic management in and around Newport.	All	(+)
14	Improved east-west travel on the SDR could enhance access to facilities, services and employment opportunities, for those people with access to a car. However, local trips are likely to be disrupted with increase severance.	All	(-)
15	Improved east-west travel on the SDR could benefit public transport services that use the route. However, the measure would not promote a cultural shift in travel behaviour to more sustainable choices.	All	(N)
Public acceptability	Improved operating conditions along the SDR could provide network resilience during incidents and delays on the M4, which is likely to be welcomed by the public. However, there is likely to be opposition from some members of the public in light that at-grade junction improvements could adversely affect local traffic conditions and increase severance problems.		
Acceptability to other stakeholders	Improved resilience on the network could be supported by business groups, whilst additional impacts on local mobility and the environment may be met with opposition.		
Technical and operational feasibility	The option is at a strategy level and therefore the technical and operational feasibility risks require further exploration. Any works to the SDR would require contractual negotiations with the SDR concessionaire.		
Financial affordability and	Construction of the works could be delivered in phases, which could improve affordability.		

Criteria	Assessment	Distribution	Significance
deliverability			
Risks	The option is at a strategy level and therefore the risks require further exploration. Any works to the SDR would require contractual negotiations with the SDR concessionaire.		

Table 10.5: Assessment of M4 CEM Option C against WelTAG Criteria and TPOs

Criteria	Assessment	Distribution	Significance
Transport Economic Efficiency (TEE)	Once complete, grade separation of the SDR will improve network resilience without disrupting local traffic. Journey time reliability will be improved and there would be journey time savings along the SDR. Improvements could be delivered in phases that could spread investment costs.	All road users	(+)
Economic Activity and Location Impact (EALI)	Providing additional network resilience will help reduce the negative economic impact caused by disruption during incidents and delays on the M4. There would be improvements to accessibility in southern Newport, benefiting the movement of people and freight to key employment areas and services.	All road users	(+)
Noise	Grade separated junction improvements to the A48 would aim to provide free flowing east-west traffic movements and potentially reduce local traffic on the current M4. If the changes to the SDR made driving a more attractive option, however, an increase in the number of cars on the roads could be a possibility. Dependent on the net impact, there may or may not be an improvement to the noise nuisance to nearby residential properties.	Properties along the M4 and SDR	(N)
Local Air Quality	Grade separated junction improvements to the A48 would aim to provide free flowing east-west traffic movements and potentially reduce local traffic on the current M4. If the changes to the SDR made driving a more attractive option, however, an increase in the number of cars on the roads could be a possibility. Dependent on the net impact, there is likely to be a minor positive impact current Air Quality Management Areas.	Properties along the M4 and SDR	(+)
Greenhouse Gas Emissions	Grade separated junction improvements to the A48 would aim to provide free flowing east-west traffic movements and potentially reduce local traffic on the current M4. If the changes to the SDR made driving a more attractive option, however, an increase in the number of cars on the roads could be a possibility. Dependent on the net impact, there may or may not be an improvement to the long term emissions of greenhouse gases	No significant distributional impacts	(N)
Landscape and townscape	Grade separated junction improvements to the A48 would result in adverse visual impacts, including some within a Historic Landscape Area, Green Wedge and the Tredegar House Historic Park and Garden. It is possible that some properties may need to be demolished to accommodate grade separation at some junctions.	Local landscape impacts	(--)
Biodiversity	Junction improvements to the A48 would require additional land take and the realignment of the SDR at Church Street which crosses the River Usk SAC and SSSI. This could lead to direct and indirect adverse effects on biodiversity – including from direct physical impacts on habitats, hydromorphology and flow in the river and construction effects on species features of the European Site.	Potential impact on River Usk SAC and SSSI	(--)
Heritage	Assuming that the improvements are outside of the Tredegar House Historic Park and Garden, Grade 1 Listed Building and Conservation Area, the works may still have an adverse effect on the setting of the area. The works could also affect Grade II Listed	Distribution assessment not required	(-)

Criteria	Assessment	Distribution	Significance
	Buildings along the route. This option could also affect the Castell Glas Scheduled Monument if the improvements were to take place outside the existing highway footprint.	(Para. 7.10.7 of WelTAG June 2008)	
Water environment	Grade separated junction improvements to the A48 are located within TAN15 Flood Zones and could lead to adverse effects on water quality, flood plain connectivity and areas of flood risk. Some junctions of the SDR run close to the Ebbw River. Therefore, improvements could cause adverse effects such as increased flood risk due to run off and pollution due to accidental spillages.	No significant distributional impacts	(-)
Soils	Grade separated junction improvements to the A48 would require additional land take.	No significant distributional impacts	(-)
Transport safety	Grade separated junction improvements to the A48 could reduce congestion on the existing M4 motorway, leading to journey time savings and improved journey time reliability. This has the potential to improve the driver experience and reduce driver stress. The junction improvements would help to improve road safety, as it is forecast that, on completion, the total number of accidents on major roads in Newport would fall as a result of these improvements.	All road users	(+)
Personal security	Grade separated junction improvements would improve east-west traffic flows along the SDR without disrupting local traffic movements. This could have the effect of improving the perception of personal security for drivers and other road users.	All road users	(+)
Permeability	Grade separated junction improvements would improve east-west traffic flows along the SDR without disrupting local traffic movements. This measure could therefore improve access to local health, care, training and education services.	All road users	(N)
Physical fitness	Grade separated junction improvements would improve east-west traffic flows along the SDR without disrupting local traffic movements. This measure could have a neutral impact on physical fitness.	Car users	(N)
Social inclusion	Once complete, grade separation of the SDR will improve network resilience without disrupting local traffic. Access to essential services would be maintained.	Distribution assessment not required (Para. 8.6.31 of WelTAG June 2008)	(-)
Equality, Diversity & Human Rights	Reduced traffic congestion, improved resilience and journey time reliability will benefit those users with access to a car making both local and long distance trips. The measure will also benefit the movement of local public transport trips using the road network. However, some property demolition is required, which will significantly impact on local communities. As such, the overall impact is likely to be minor negative.	All road users	(-)
TPOs			
1	Grade separation of the SDR would improve network resilience and would provide more reliable east-west travel in South Wales.	All	(++)
2	Grade separation of the SDR would provide more reliable east-west travel, which could benefit improved international transport links.	All	(+)
3	Grade separation of the SDR would improve network resilience	All	(++)

Criteria	Assessment	Distribution	Significance
	and would provide an alternative route to the M4 for longer distance journeys around Newport.		
4	Grade separation of the SDR could reduce congestion on the existing M4 and improve east-west travel on the SDR.	All	(++)
5	Grade separated junction improvements to the SDR could reduce congestion on the existing M4 motorway, leading to journey time savings and improved journey time reliability.	All	(+)
6	Improved travel conditions on the SDR could provide an alternative route for road users between Magor and Castleton.	All	(+)
7	Grade separated junction improvements to the SDR could reduce congestion on the existing M4 motorway, leading to journey time savings and improved journey time reliability. This has the potential to improve the driver experience and reduce driver stress.	All	(+)
8	Grade separated junction improvements to the A48 would aim to provide free flowing east-west traffic movements and potentially reduce local traffic on the current M4. If the changes to the SDR made driving a more attractive option, however, an increase in the number of cars on the roads could be a possibility. Dependent on the net impact, there is likely to be a minor positive impact current Air Quality Management Areas.	All	(+)
9	Grade separated junction improvements to the A48 would aim to provide free flowing east-west traffic movements and potentially reduce local traffic on the current M4. If the changes to the SDR made driving a more attractive option, however, an increase in the number of cars on the roads could be a possibility. Dependent on the net impact, there may or may not be an improvement to the noise nuisance to nearby residential properties.	All	(N)
10	Improvements to the SDR would have a negligible impact on congestion and on greenhouse gas emissions.	All	(N)
11	Grade separated junction improvements to the SDR could reduce congestion on the existing M4 motorway. This has the potential to improve the driver experience and reduce driver stress, leading to an improved travel experience into South Wales along the M4 corridor.	All	(+)
12	Grade separated junction improvements to the SDR could reduce congestion on the existing M4 motorway making it more attractive for longer distance journeys.	All	(+)
13	Improved travel conditions on the SDR could provide better strategic traffic management in and around Newport.	All	(+)
14	Once complete, grade separation of the SDR will improve network resilience without disrupting local traffic. Access to essential services would be maintained.	All	(N)
15	Improved east-west travel on the SDR could benefit public transport services that use the route but is likely to increase traffic use of the SDR. The measure would not promote a cultural shift in travel behaviour to more sustainable choices.	All	(-)
Public acceptability	Improved operating conditions along the SDR could provide network resilience, which could be supported by the public. Closure of some existing junctions could be detrimental to local travel patterns, whilst demolition of properties is an emotive issue and could attract significant		

Criteria	Assessment	Distribution	Significance
	public opposition.		
Acceptability to other stakeholders	Improved resilience and accessibility on the network could be supported by business groups, whilst adverse impacts on local communities and the environment may be met with opposition from stakeholder groups.		
Technical and operational feasibility	The option is at a strategy level and therefore the technical and operational feasibility risks require further exploration. The existing roundabouts are closely spaced and to comply with highway design standards, some of these roundabout junctions could require full or partial closure. Any works to the SDR would require contractual negotiations with the SDR concessionaire.		
Financial affordability and deliverability	Construction of the works could be delivered in phases, which could improve affordability.		
Risks	The option is at a strategy level and therefore the risks require further exploration. Any works to the SDR would require contractual negotiations with the SDR concessionaire.		

Table 10.6: Assessment of M4 CEM Option D against WelTAG Criteria and TPOs

Criteria	Assessment	Distribution	Significance
Transport Economic Efficiency (TEE)	Once complete, the widening of the M4 increases capacity and could help reduce congestion on the highways network, thus leading to journey time savings and improved journey time reliability. Disruption to motorway users would be expected throughout the construction period. On-line widening does not improve the resilience of the network in the event of disruption on the M4.	All road users	(+)
Economic Activity and Location Impact (EALI)	Once complete, the M4 would be more attractive for strategic long distance users and improved traffic flows and accessibility would have significant positive economic impacts for South East Wales. Delays will have a negative impact on economic activity in South East Wales during construction works.	All road users	(++)
Noise	Reduced congestion could reduce noise impacts along the M4 and nearby residential properties. The new capacity may attract additional vehicles, leading to additional noise. Noise levels affecting residential properties will increase during construction works.	Properties along the M4 and SDR	(--)
Local Air Quality	On-line widening of the M4 could improve the efficiency of the motorway, reducing congestion and improving air quality. Should on-line widening attract additional vehicles, however, it is likely that emissions may increase, reducing air quality. On balance, the net impact is expected to be negligible.	Properties along the M4 and SDR	(N)
Greenhouse Gas Emissions	On-line widening of the M4 would improve the efficiency of the motorway, reducing congestion and reducing vehicle emissions. Should on-line widening attract additional vehicles on the network, it is likely that emissions may increase in the longer term. On balance, the net impact is expected to be negligible.	No significant distributional impacts	(N)
Landscape and townscape	On-line widening of the M4 would increase the existing adverse visual effect on the local rural landscape and urban areas that run alongside the motorway, including in particular Tredegar House and Beechwood Park. The visual impact of the motorway and the impact on properties through the built up area of Newport would	Local landscape impacts	(--)

Criteria	Assessment	Distribution	Significance
	be substantially increased. The widening may require some properties to be demolished on the Brynglas Ridge to accommodate the new tunnel.		
Biodiversity	On-line widening of the M4 would entail additional land take which would directly contribute to habitat loss and degradation. The widening has the potential to adversely affect the River Usk SAC and SSSI, along with the Monmouthshire and Brecon Canal (Junctions 26 - 27) and the Allt-yr-Yn Local Nature Reserve (Junctions 26 -27). These locations may contain protected species which would lead to an adverse effect on biodiversity. There may be loss of road verge habitat loss from on-line widening.	Potential impact on River Usk SAC and SSSI	(--)
Heritage	On-line widening of the M4 would occur close to a number of sites of historic and archaeological interest and has the potential to affect Scheduled Ancient Monuments and a number of listed buildings.	Distribution assessment not required (Para. 7.10.7 of WelTAG June 2008)	(--)
Water environment	On-line widening of the M4 could provide the opportunity to improve existing highway drainage and in turn improve the quality of run-off to receiving watercourses. If the existing drainage measures were just extended, the significance of effect would be negligible.	No significant distributional impacts	(N)
Soils	On-line widening of the M4 could entail additional land take which would directly contribute to adverse impacts on soil, including erosion, contamination, degradation, compaction, sealing and loss. Along rural sections of the route, the works would impact on adjoining agricultural land. The additional tunnel at Brynglas would require the extraction of a large volume of material and affect local soils.	No significant distributional impacts	(--)
Transport safety	On-line widening will help improve road safety by improving operational efficiency of the motorway and enhancing motorway junctions.	All road users	(++)
Personal security	On-line widening would improve the quality of the M4 and is likely to benefit the perception of personal security.	All road users	(+)
Permeability	On-line widening would increase severance between local communities.	All road users	(-)
Physical fitness	On-line widening would be expected to have a negligible impact on physical fitness.	Car users	(N)
Social inclusion	On-line widening may require the demolition of properties and thus may have a negative impact on social inclusion.	Distribution assessment not required (Para. 8.6.31 of WelTAG June 2008)	(--)
Equality, Diversity & Human Rights	On-line widening could improve access to key facilities and employment opportunities for all groups. However, issues of safety and personal security will be considered at the detailed design stage.	All road users	(--)
TPOs			
1	On-line widening of the M4 will improve safer, easier and more	All	(++)

Criteria	Assessment	Distribution	Significance
	reliable travel along the east-west M4 corridor.		
2	On-line widening of the M4 will improve the M4 corridor for strategic users.	All	(++)
3	On-line widening does not create an alternative route.	All	(N)
4	On-line widening makes best possible use of the existing highway network.	All	(++)
5	Increased capacity by on-line widening is expected to significantly improve journey time reliability. However, the option would not provide significant increased resilience.	All	(++)
6	On-line widening of the M4 would make it a more attractive option for east-west journeys.	All	(+)
7	On-line widening of the M4 will help reduce congestion and thus improve road safety.	All	(++)
8	The net impact of on-line widening of the M4 is expected to be negligible.	All	(N)
9	The new capacity resulting from the on-line widening may attract additional vehicles, leading to additional noise. Noise levels affecting residential properties will increase during construction works.	All	(--)
10	The net impact of on-line widening of the M4 is expected to be negligible.	All	(N)
11	On-line widening could improve the quality of the M4 around Newport.	All	(+)
12	On-line widening would reinforce the M4 as a strategic route.	All	(++)
13	On-line widening could improve traffic conditions in and around Newport.	All	(+)
14	On-line widening may have a negative impact on access to key facilities and employment opportunities.	All	(-)
15	On-line widening would not support a behavioural change towards more sustainable modes.	All	(--)
Public acceptability	Once complete, improved traffic conditions on the motorway could attract public support. However, disruption to traffic flows during construction is likely to attract significant public opposition. Demolition of properties is an emotive issue and is likely to attract significant public opposition.		
Acceptability to other stakeholders	Improving operational efficiency on the M4 could attract support from businesses and safety groups. However, adverse impacts on the environment and economy, particularly during construction could attract significant opposition from stakeholder groups.		
Technical and operational feasibility	On-line widening could require technically complex engineering works, in particular works to the Brynglas tunnels could face significant geotechnical challenges including unstable ground.		
Financial affordability and deliverability	On-line widening works could be delivered in phases, which could improve affordability.		
Risks	The scheme is likely to have significant adverse economic, social and environmental impacts during construction. Property demolition is likely to attract significant challenge from local communities.		

10.5 Evolution of the Significance Assessment of Options

The M4 CEM Programme has included the following stages:

- Scoping Stage; this is the results of the initial appraisal work which was presented to Stakeholder Forum members for discussion at workshops;
- Preliminary Stage; this is the output of the Stakeholder Forum discussions at the workshops which in some instances led to their reappraisal; and
- WelTAG Stage 1; this takes into account all of the supporting preliminary assessment work on transport, economics, health, equality, environment and the responses from the consultation.

As the assessment of options has been developed through the stages of the M4 CEM Programme, changes have occurred in the significance assessment for each of the options. These changes are summarised in Tables 10.7 to 10.12.

Table 10.7: Assessment of M4 CEM Public Transport Measures against WelTAG Criteria

Criteria	Scoping Stage	Preliminary Stage	WelTAG Stage 1
Economy			
Transport Economic Efficiency (TEE)	N/A	(-)	(-)
Economic Activity and Location Impact (EALI)	N/A	(+)	(+)
Environment			
Noise	N/A	(+)	(N)
Local Air Quality	N/A	(+)	(+)
Greenhouse Gas Emissions	N/A	(+)	(N)
Landscape and townscape	N/A	(N)	(N)
Biodiversity	N/A	(-)	(-)
Heritage	N/A	(N)	(N)
Water environment	N/A	(-)	(-)
Soils	N/A	(N)	(N)
Social			
Transport safety	N/A	(+)	(+)
Personal security	N/A	(N)	(N)
Permeability	N/A	(+)	(+)
Physical fitness	N/A	(+)	(+)
Social inclusion	N/A	(++)	(++)
Equality, Diversity & Human Rights	N/A	(N)	(+)

Table 10.8: Assessment of M4 CEM Common Measures against WelTAG Criteria

Criteria	Scoping Stage	Preliminary Stage	WelTAG Stage 1
Economy			
Transport Economic Efficiency (TEE)	N/A	(+)	(+)
Economic Activity and Location Impact (EALI)	N/A	(+)	(+)
Environment			
Noise	N/A	(+)	(+)
Local Air Quality	N/A	(+)	(+)
Greenhouse Gas Emissions	N/A	(+)	(N)
Landscape and townscape	N/A	(N)	(N)
Biodiversity	N/A	(N)	(N)
Heritage	N/A	(N)	(N)
Water environment	N/A	(N)	(N)
Soils	N/A	(N)	(N)
Social			
Transport safety	N/A	(+)	(+)
Personal security	N/A	(N)	(N)
Permeability	N/A	(N)	(+)
Physical fitness	N/A	(N)	(+)
Social inclusion	N/A	(+)	(+)
Equality, Diversity & Human Rights	N/A	(N)	(+)

Table 10.9: Assessment of M4 CEM Highway Infrastructure Option A against WelTAG Criteria

Criteria	Scoping Stage	Preliminary Stage	WelTAG Stage 1
Economy			
Transport Economic Efficiency (TEE)	(+++)	(+++)	(+++)
Economic Activity and Location Impact (EALI)	(+++)	(+++)	(+++)
Noise			
Noise	(N)	(++)	(+)
Local Air Quality	(+)	(+)	(+)
Greenhouse Gas Emissions	(N)	(N)	(N)
Landscape and townscape	(--)	(--)	(--)
Biodiversity	(--)	(---)	(---)
Heritage	(--)	(--)	(--)
Water environment	(--)	(--)	(--)
Soils	(-)	(-)	(--)
Social			
Transport safety	(++)	(++)	(++)
Personal security	(N)	(+)	(+)
Permeability	(-)	(+)	(+)
Physical fitness	(N)	(+)	(+)
Social inclusion	(N)	(N)	(N)
Equality, Diversity & Human Rights	(N)	(N)	(N)

Table 10.10: Assessment of M4 CEM Highway Infrastructure Option B against WelTAG Criteria

Criteria	Scoping Stage	Preliminary Stage	WelTAG Stage 1
Economy			
Transport Economic Efficiency (TEE)	(N)	(-)	(-)
Economic Activity and Location Impact (EALI)	(N)	(N)	(N)
Environment			
Noise	(N)	(+)	(N)
Local Air Quality	(N)	(N)	(N)
Greenhouse Gas Emissions	(N)	(N)	(N)
Landscape and townscape	(--)	(-)	(-)
Biodiversity	(-)	(-)	(-)
Heritage	(--)	(-)	(-)
Water environment	(N)	(-)	(-)
Soils	(N)	(N)	(N)
Social			
Transport safety	(+)	(+)	(+)
Personal security	(N)	(+)	(+)
Permeability	(-)	(+)	(-)
Physical fitness	(N)	(+)	(-)
Social inclusion	(--)	(N)	(N)
Equality, Diversity & Human Rights	(N)	(N)	(N)

Table 10:11 Assessment of M4 CEM Highway Infrastructure Option C against WelTAG Criteria

Criteria	Scoping Stage	Preliminary Stage	WelTAG Stage 1
Economy			
Transport Economic Efficiency (TEE)	(N)	(+)	(+)
Economic Activity and Location Impact (EALI)	(N)	(+)	(+)
Environment			
Noise	(N)	(+)	(N)
Local Air Quality	(N)	(+)	(+)
Greenhouse Gas Emissions	(N)	(N)	(N)
Landscape and townscape	(--)	(--)	(--)
Biodiversity	(-)	(--)	(--)
Heritage	(--)	(-)	(-)
Water environment	(N)	(-)	(-)
Soils	(N)	(N)	(-)
Social			
Transport safety	(+)	(+)	(+)
Personal security	(N)	(+)	(+)
Permeability	(-)	(+)	(N)
Physical fitness	(N)	(+)	(N)
Social inclusion	(--)	(N)	(-)
Equality, Diversity & Human Rights	(N)	(N)	(-)

Table 10:12: Assessment of M4 CEM Highway Infrastructure Option D against WelTAG Criteria

Criteria	Scoping Stage	Preliminary Stage	WelTAG Stage 1
Economy			
Transport Economic Efficiency (TEE)	(+)	(+)	(+)
Economic Activity and Location Impact (EALI)	(++)	(++)	(++)
Environment			
Noise	(--)	(-)	(--)
Local Air Quality	(--)	(N)	(N)
Greenhouse Gas Emissions	(-)	(N)	(N)
Landscape and townscape	(---)	(-)	(--)
Biodiversity	(--)	(-)	(--)
Heritage	(--)	(--)	(--)
Water environment	(N)	(N)	(N)
Soils	(---)	(--)	(--)
Social			
Transport safety	(++)	(++)	(++)
Personal security	(N)	(+)	(+)
Permeability	(N)	(+)	(-)
Physical fitness	(N)	(+)	(N)
Social inclusion	(+)	(-)	(--)
Equality, Diversity & Human Rights	(N)	(-)	(--)

10.6 Comparative Performance of Options

The relative performance of options against WelTAG criteria and M4 CEM goals is summarised in Tables 10.13 and 10.14 respectively.

Table 10.13: Comparative Performance of M4 CEM Options against WelTAG Criteria

Criteria	Public Transport	Common Measures	Option A Additional high quality road to the south of Newport	Option B At grade junction improvement to the A48 SDR	Option C Grade separated junction improvement to the A48 SDR	Option D Online widening of the M4 between J24-29, including an additional tunnel at Brynglas
Economy						
Transport Economic Efficiency (TEE)	(-)	(+)	(+++)	(-)	(+)	(+)
Economic Activity and Location Impact (EALI)	(+)	(+)	(+++)	(N)	(+)	(++)
Environment						
Noise	(N)	(+)	(+)	(N)	(N)	(--)
Local Air Quality	(+)	(+)	(+)	(N)	(+)	(N)
Greenhouse Gas Emissions	(N)	(N)	(N)	(N)	(N)	(N)
Landscape and townscape	(N)	(N)	(--)	(-)	(--)	(--)
Biodiversity	(-)	(N)	(---)	(-)	(--)	(--)
Heritage	(N)	(N)	(--)	(-)	(-)	(--)
Water environment	(-)	(N)	(--)	(-)	(N)	(N)
Soils	(N)	(N)	(--)	(N)	(-)	(--)
Social						
Transport safety	(+)	(+)	(++)	(+)	(+)	(++)
Personal security	(N)	(N)	(+)	(+)	(+)	(+)
Permeability	(+)	(+)	(+)	(-)	(N)	(-)
Physical fitness	(+)	(+)	(+)	(-)	(N)	(+)
Social inclusion	(++)	(+)	(N)	(N)	(-)	(--)
Equality, Diversity & Human Rights	(+)	(+)	(N)	(N)	(-)	(--)

Table 10.14: Comparative Performance of Options against M4 CEM Goals

Goal	Public Transport	Common Measures	Option A Additional high quality road to the south of Newport	Option B At grade junction improvement to the A48 SDR	Option C Grade separated junction improvement to the A48 SDR	Option D Online widening of the M4 between J24-29, including an additional tunnel at Brynglas
1	(+)	(+)	(+++)	(+)	(++)	(++)
2	(N)	(N)	(++)	(N)	(+)	(++)
3	(+)	(+)	(++)	(+)	(++)	(N)
4	(+)	(+)	(+)	(+)	(++)	(++)
5	(N)	(+)	(+++)	(+)	(+)	(++)
6	(++)	(N)	(+)	(+)	(+)	(+)
7	(N)	(+)	(++)	(+)	(+)	(++)
8	(+)	(+)	(+)	(N)	(+)	(N)
9	(N)	(+)	(+)	(+)	(N)	(--)
10	(N)	(N)	(N)	(N)	(N)	(N)
11	(N)	(+)	(++)	(+)	(+)	(+)
12	(+)	(N)	(+++)	(N)	(+)	(++)
13	(N)	(+)	(++)	(+)	(+)	(+)
14	(+)	(+)	(++)	(-)	(N)	(-)
15	(++)	(N)	(--)	(N)	(-)	(--)
Public acceptability	The promotion of public transport use is likely to be greeted positively by communities in Newport and surrounding areas.	The common measures are likely to be greeted positively by communities in Newport and surrounding areas.	The new road could create economic and social benefits. However, the environmental impact of the new road to the south of Newport is likely to attract opposition from those who prioritise a need to protect the environment over the possible economic benefits of the scheme.	Improved operating conditions along the SDR could provide network resilience during incidents and delays on the M4, which is likely to be welcomed by the public. However, there is likely to be opposition from some members of the public in light that at-grade junction	Improved operating conditions along the SDR could provide network resilience, which could be supported by the public. Closure of some existing junctions could be detrimental to local travel patterns, whilst demolition of properties is an emotive issue and could attract	Once complete, improved traffic conditions on the motorway could attract public support. However, disruption to traffic flows during construction is likely to attract significant public opposition. Demolition of properties is an emotive issue and is likely to

				improvements could adversely affect local traffic conditions and increase severance problems.	significant public opposition.	attract significant public opposition.
Acceptability to other stakeholders	Investment in public transport is likely to be supported by environmental, business and mobility groups in particular.	Investment in public transport is likely to be supported by business groups in particular.	The new road could help address many of the problems caused by congestion on the M4 in a phased and affordable manner, thus could attract support and be acceptable to other stakeholders, particularly business groups. However, possible adverse impacts on the environment could attract opposition from environmental groups and the wider public who prioritise a need to protect the environment over the possible economic benefits of the scheme. Further engagement	Improved resilience on the network could be supported by business groups, whilst additional impacts on local mobility and the environment may be met with opposition.	Improved resilience and accessibility on the network could be supported by business groups, whilst adverse impacts on local communities and the environment may be met with opposition from stakeholder groups.	Improving operational efficiency on the M4 could attract support from businesses and safety groups. However, adverse impacts on the environment and economy, particularly during construction could attract significant opposition from stakeholder groups.

			is likely to be needed with specific land owners who may be affected directly by the scheme, including ABP.			
Technical and operational feasibility	The measures considered at a strategy level and therefore the technical and operational feasibility risks are unknown.	The measures considered at a strategy level and therefore the technical and operational feasibility risks are unknown.	The option is at a strategy level and therefore the technical and operational feasibility risks require further exploration. The new road could include a crossing of the River Usk and could also pass through the Docks Way landfill site. This will require consideration of suitable structures and land contaminatio n issues.	The option is at a strategy level and therefore the technical and operational feasibility risks require further exploration. Any works to the SDR would require contractual negotiations with the SDR concessionair e.	The option is at a strategy level and therefore the technical and operational feasibility risks require further exploration. The existing roundabouts are closely spaced and to comply with highway design standards, some of these roundabout junctions could require full or partial closure. Any works to the SDR would require contractual negotiations with the SDR concessionair e.	On-line widening could require technically complex engineering works, in particular works to the Brynglas tunnels could face significant geotechnical challenges including unstable ground.
Financial affordability and deliverability	A phased approach to delivery could improve affordability and deliverability. Delivery is likely to	A phased approach to delivery could improve affordability and deliverability.	The construction of the new road could be delivered in phases, which could improve affordability.	Construction of the works could be delivered in phases, which could improve affordability.	Construction of the works could be delivered in phases, which could improve affordability.	On-line widening works could be delivered in phases, which could improve affordability.

	require partnership with Sewta and public transport operators. Revenue costs should be considered in addition to capital costs of projects. Subsidies for public transport may also require consideration by the Welsh Government as part of any future assessment of costs to benefits.					
Risks	Significant investment in public transport could require political commitment at a local, regional and national level. Partnerships with other stakeholders could need to be effective in order to deliver public transport measures. The South East Wales Integrated Transport Task Force might offer a useful delivery body for public	Given the relatively small magnitude of the individual common measures, the risks of implementation are likely to be low to medium.	The option is at a strategy level and therefore the risks require further exploration. The new route could need to negotiate a landfill site requiring legal processes to be successfully considered. Challenge from public and/or stakeholders who may oppose the scheme on grounds of likely environmenta	The option is at a strategy level and therefore the risks require further exploration. Any works to the SDR would require contractual negotiations with the SDR concessionaire.	The option is at a strategy level and therefore the risks require further exploration. Any works to the SDR would require contractual negotiations with the SDR concessionaire.	The scheme is likely to have significant adverse economic, social and environmental impacts during construction. Property demolition is likely to attract significant challenge from local communities.

	transport measures in South Wales.		l impact may also require consideration.			

11 Summary of Assessment of Options

11.1 Highway Infrastructure

Of the highway infrastructure options appraised, Option A has been shown to offer the best value for money and provide the most relief to the existing sections of the motorway around Newport.

Option A would involve the construction of an additional high quality road to the south of Newport. The additional road would provide significant increased capacity in the highway network around Newport. It would also relieve traffic on the existing M4 motorway by offering an alternative route for longer distance journeys, especially those using the Severn Crossings, thereby improving the resilience of the highways network.

A route to the south of Newport aims to minimise negative impacts on local communities and the environment, whilst seeking to support economic development in South East Wales. This road could be delivered in phases, both to meet (and respond to) demand and availability of funding.

As a result of the participation process undertaken on the options; Option A is supported by most key stakeholders and members of the public on its possible benefits to transport and the economy, but with concerns over cost and on the potential adverse environmental impact of its construction on the Gwent Levels. It attracts the most comments as a preferred or supported Option. However, responses co-ordinated by a campaign group[29] oppose Option A on the grounds that it would have a detrimental impact upon the natural environment. As part of the consultation process, some respondents compare Option A to the New M4/M4 Relief Road proposal, either calling for the reinstatement of plans for a motorway, or supporting a motorway as a preferred alternative.

Of the four highway options appraised, Option A provides the strongest fit with the Welsh Impact Areas and with the M4 CEM Transport Planning Objectives. **It is thus recommended that Option A be taken forward for more detailed WelTAG Appraisal.**

During the engagement process, Option D attracted most comments of opposition and/or challenge, closely followed by Option B, which performs poorly against TPOs and WelTAG criteria compared to other options.

Environmental conditions on the motorway are likely to deteriorate under Option B. For example, for Option B, it is forecast that the traffic volumes in 2035 on the motorway east of the Brynglas Tunnels will be greater than in the Do-Minimum scenario. West of the tunnels, the traffic volumes are forecast to be similar to the Do-Minimum. Thus no relief is likely to be provided to motorway congestion under Option B.

Option B should not be taken forward for further appraisal.

The preliminary assessment of Option D indicates that it would have a significant impact on the local community and the users of the motorway during both construction and in use. Some 200 – 300 homes and businesses could be directly

[29] Campaign Against Levels Motorway http://www.freewebs.com/savethelevels/calm.htm

affected, including the cemetery at Christchurch. A number of properties will require demolition but the exact numbers will depend on the final layout selected.

During the construction phase local communities are likely to experience considerable disturbance over long periods due to additional noise and air pollution and periodic night-time working. Local accessibility would also be affected by road closures whilst existing overbridges were replaced to allow for the widened carriageways to be constructed.

For Option D, the feasibility of an additional tunnel was challenged by respondents to the M4 CEM consultation because of the problems experienced back in the 1960s when the original tunnels were constructed. Concerns were also expressed about the impact on nearby property and road users during construction. A local community group, the New Life Trust, which has been based at Christchurch since 1998, considers it would have serious adverse impact on local communities and facilities. There was also a Facebook page "Campaign Against Additional Tunnel" and a petition website "Newport Oppose £550m Plans of New Brynglas Tunnel and demolition of Homes", which contained 165 names. Both were set up in opposition to Option D, on the grounds that it would require property demolition and/or would adversely impact on the quality of life for residents of Brynglas.

Alongside the motorway at Newport there are "Noise Action Planning Areas (NAPPAs)" and "Air Quality Management Areas (AQMAs)" which need to be addressed. Widening the motorway would reduce congestion thereby giving a slight beneficial impact on vehicle pollution and emissions but this could be offset in the longer term as traffic volumes continue to increase. The widened motorway would also be closer to some properties which could have a detrimental impact on local air quality. For example for Option D, by 2035, daily traffic volumes between Junction 26 and Junction 27 on the motorway are forecast to increase to over 163,000 vehicles per day AADT. This is compared with less than 139,000 vehicles per day AADT in the Do-Minimum and 96,000 vehicles per day AADT for Option A.

Traffic forecasts for Option D have indicated that, by the design year (2035), the section of motorway between Junction 26 and Junction 27 is likely to be operating some 6% above capacity in the westbound direction during the weekday PM peak. This would be likely to result in severe operational problems. The lack of an alternative route will thus result in motorway capacity problems and network resilience issues.

Widening the existing sub-standard M4 would not provide long term resilience to the motorway and trunk road network in south east Wales. It would also not contribute towards addressing the existing NAPPA and AQAMA issues alongside the motorway in Newport. It is therefore recommended that Option D Widening of the M4 between Junctions 24 and 29 and additional tunnel at Brynglas is discounted from any future M4 CEM draft Plans. The discounting of this option will also reduce the amount of uncertainty and anxiety for some residents and businesses in the Newport area.

Option D should not be taken forward for further appraisal.

Some 50 respondents challenged Option C as a solution or clearly stated that, in their opinion; Option C would not address the problems or achieve the goals chosen. This view has been borne out by the transport modelling, which indicated very little relief to motorway congestion as a result of Option C. Whilst Option C would be likely to result in benefits, these would not be focused on relief to the motorway. By the design year (2035), analysis has shown that the traffic levels through the Brynglas tunnels under Option C would be reduced by only some 4% compared to a do-minimum scenario.

Option C should not be taken forward for further appraisal.

11.2 Public Transport

The Welsh Government has undertaken a Public Transport Overview Study, which presents a number of public transport options that specifically aim to address problems of capacity, resilience, safety and sustainability on the M4 corridor between Magor and Castleton. The study was prepared based on the assumption that neither public transport nor highway infrastructure measures alone can achieve all the goals of the M4 CEM Programme, but that improving public transport could form part of a long term strategy for transport in South Wales.

Studies show that new or improved public transport services are likely to have only minimal impact with respect to reducing traffic on the M4. Generally, investment in public transport measures is more likely to be aimed at achieving wider benefits than relieving motorway traffic. For the Newport area, an approximate 50% increase in the use of public transport, with an increased mode-share of approximately 11% (compared to a present-day mode-share of around 7%) could see a reduction of less than 3% of traffic volumes on M4 around Newport.

Public transport investment should encourage modal shift and reduce the reliance on the private vehicle in the Newport area, by increasing choice. The Welsh Government's key public transport objective is rail electrification of the Great Western Main Line to Swansea and the Valley Lines network. Furthermore, the Welsh Government has established a task group to consider developing an integrated transport system in south-east Wales, which could utilise rail electrification to improve connectivity by public transport. The possible impact of a regional public transport network has been considered. These transport interventions may be considered as part of the plans for public transport measures as part of the M4 CEM Programme.

The Public Transport Overview supported the information presented within the M4 CEM Consultation Document, in which respondents were asked to choose from a list of six high level public transport measures, identifying and commenting on all those that could make the best contribution to relieving traffic on the M4 between Magor and Castleton. The most selected public transport measures included:

- More stations with park and ride facilities;
- Additional train services on local routes;
- More bus/train connecting services; and

- Additional mainline train services between Swansea, Cardiff, Newport and Bristol.

Whilst a high level assessment suggests that public transport enhancements will not address the problems of the M4 CEM Programme, it is acknowledged that public transport enhancement will contribute to the goals of the M4 CEM Programme. Outline appraisal demonstrates that public transport improvements should continue to be developed and/or promoted, as supported by the public and stakeholder engagement process.

The South East Wales Integrated Transport Task Force might offer a useful body to continue the development and promotion of the public transport measures supported by the public and stakeholders.

11.3 Common Measures

The appraisal/engagement processes have shown that there are additional measures to support the public transport and highway infrastructure measures in addressing travel related problems within the M4 Corridor between Magor and Castleton. These are referred to as Common Measures. They comprise a mix of network improvements/management, demand management, alternative modes and smarter sustainable choices. The common measures that attract support and can be delivered by the Welsh Government as part of the M4 CEM Programme are listed as follows:

- Provide cycle friendly infrastructures;
- Provide walking friendly infrastructure;
- Promote A465 Heads of the Valleys road as an alternative route to the M4;
- Junction 23a improvements; and
- Junction 27 safety improvements.

Further consideration should be given to the above common measures during the more detailed WelTAG Appraisal.

12 Concluding Remarks

This WelTAG Stage 1 Appraisal has shown that, should the Welsh Government progress the M4 CEM Programme, the following measures are worthy of further consideration and more detailed appraisal:

- Highway Infrastructure Option A;
- Public Transport Enhancement; and
- Common Measures.