Welsh Government

A40 Llanddewi Velfrey to Penblewin Improvements

Environmental Statement Chapters 19, 20 and 21: Cumulative Effects

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19 Assessment of Cumulative Effects

19.1 Subject Introduction

19.1.1 Cumulative effects result from multiple actions on receptors or resources occurring in combination over time. This chapter explains the two types of cumulative impact and refers the reader to the two chapters 20 and 21 which assess these two types separately:

Type (i) Cumulative Effects from a Single Scheme (Interrelationships): is the assessment of effects on receptors or receptor groups, such as local residents, users of local rights of way or services, which may be affected by different environmental effects generated by the Scheme simultaneously or concurrently. This is sometimes referred to as the 'interrelationships' between different environmental effects. This assessment includes consideration of particular locations where several effects, for example noise, air quality and visual change, may all occur. **Refer to Chapter 20.**

Type (ii) Cumulative Effects from Different Schemes: is the assessment of effects of the Scheme together with other proposed (but not yet built) developments, where there is the potential for impacts to overlap spatially or temporally. **Refer to Chapter 21.**

19.2 Legislation and Policy Context

19.2.1 The EIA Directive requires consideration of cumulative effects and interrelationships. Cumulative impacts can also be considered as: *'...impacts resulting from incremental changes caused by other past, present or reasonably foreseeable actions together with the project.'* (European Commission 1999).

Planning Policy Context

19.2.2 The adopted Local Development Plan (LDP) for Pembrokeshire County Council (2013) makes reference to the importance of cumulative effects. Other references to cumulative effects relate to a requirement for development near existing residential areas to not adversely affect 'local residential amenity, either in its own right or cumulatively with other uses'.

19.2.3 The adopted Pembrokeshire and Carmarthenshire LDPs highlight the importance of ensuring that the cumulative effects of development in Pembrokeshire and adjoining areas do not result in harm to internationally designated nature conservation sites. The LDPs also state that development in neighbourhood centres, new retail and renewable energy schemes will be permitted provided that the development, either individually or cumulatively with other recently proposed development, does not undermine vitality, attractiveness or viability. The adopted LDPs are currently progressing with a statutory review process.

19.2.4 There are no specific local planning policies relating to cumulative effects in relation to new highway development.

19.3 Relevant Guidance for the assessment

19.3.1 There is no single, agreed industry standard method at the time of preparing this ES on Cumulative Effects Assessment (CEA). Relevant guidance for the ES is the following:

a) **HA205/08** Principles of Environmental Assessment – Assessment and Management of Environmental Effects (Highways Agency et al., 2008). The Design Manual for Roads and Bridges (DMRB) guidance set out in HA 205/08 (Highways Agency et al., 2008) stated that there were two types of cumulative effects to be considered in environmental assessment: (i) cumulative effects from a single scheme (referred to as 'interrelationships') and (ii) cumulative effects from different schemes.

b) **Advice Note 17:** Cumulative effects assessment relevant to nationally significant infrastructure projects (Planning Inspectorate, 2015).

c) **Advice Note 9**: Rochdale Envelope (Planning Inspectorate, 2012). Although not specifically designed for highway schemes, the Planning Inspectorate guidance note provides more recent guidance on good practice for the assessment of cumulative effects for major infrastructure schemes.

d) **The Planning Inspectorate** provide guidance on the approach to Type (ii) cumulative assessment and this guidance is referenced in Chapter 21.

19.4 Study Area

19.4.1 The study area for the cumulative and in-combination effects assessment is based on the Zones of Influence[1] (ZoI) of the environmental effects of the Scheme. These are presented in Tables 19.1, 19.2 and shown in Volume 2, Figure 19.1 which includes part of the neighbouring planning authority of Carmarthenshire. The information within this chapter was based on the baseline data and assessments provided in Chapters 7 to 16 of this ES.

19.5 Consultation

19.5.1 The Environmental Liaison Group (ELG) was invited to comments on the ES Scoping Report, but none chose to comment specifically on cumulative effects. Subsequently consultation took place with the Pembrokeshire and Carmarthenshire County Councils to identify a list of proposed other developments for inclusion in the Type (ii) cumulative effects assessment. These potential impacts are assessed in Chapter 21.

19.6 Assessment Criteria and Assignment of Significance

19.6.1 The assessment does not aim to assign significance levels; instead it is used to identify the potential for cumulative effects. A statement is made as to whether the cumulative effect would be more significant than the effects of the Scheme alone and whether this would be adverse or beneficial.

19.7 Limitations of the Assessment

19.7.1 The assessment of cumulative effects depends, to a large degree, on the amount of detail that is available about other proposed developments, and the need to rely on environmental assessments carried out by others. Proposals at an early stage of development, or planning applications for which no EIA has not been undertaken, assessing potential cumulative effects must rely on professional judgements based on and knowledge of the study area.

[1] Zone of Influence is the term used to describe the extent to which a specific potential impact is considered likely to cause an effect.

Table 19.1 Zones of Influence during Construction

Topic	Potential impact	Receptor resource	Zone of Influence (ZoI)
Air Quality	Dust	Humans and designated ecological sites	350m
Cultural Heritage	Indirect non-physical (visual and aural change	Heritage assets and visitors to assets	200m
	Change in the setting of assets	Settings of designated and other heritage sites (HER)	Based on the Zone of Theoretical Visibility
Landscape and visual	Visual change	Humans	5km from the centreline.
	Change to character of landscape	Designated and non-designated landscapes & humans	Based on the Zone of Theoretical Visibility
Ecology and nature conservation	Disturbance, severance, fragmentation, wildlife casualties, barrier effects, lighting, air pollution	Protected species, habitats, ecologically designated sites	Up to 500m for disturbance from noise, visual, lighting. Receptor specific for severance, fragmentation and barrier impacts.
Geology and soils	Creation of pathways for contamination migration	Aquifers and surface waters	Land take. Maintaining stability is an inherent part of highway design. Implementation of the design as approved would mitigate potential effects.
Geology and soils	Exposure to contamination through dermal contact, ingestion and inhalation of contaminated soil/soil derived dust. Exposure to waste/Made Ground with potentially elevated levels of soil contamination and asbestos. Inhalation of ground gases with elevated concentrations	Construction workers and adjacent land users	Land take. Human health would be managed by implementation of appropriate working methods and protocols. Work would be undertaken as described in the Construction Environmental Management Plan (CEMP).

Topic	Potential impact	Receptor resource	Zone of Influence (ZoI)
Materials	Generation of waste from construction	Waste disposal facilities	Land take. Offsite disposal of contaminated (if any) and uncontaminated soils to landfill would be limited through the implementation of the Materials Management Plan and the Site Waste Management Plan. Where practical, all site won materials would be reused or treated and reused in order to minimise disposal.
Noise and vibration	Noise from machinery	Humans	300m
	Vibration from construction activities	Humans and structures	30m
All travellers	Diversions, stopping up, provision of new routes, temporary loss of use, change to operation of public transport services, change in attractiveness or length of journey, change in amenity, community severance.	Users of public highways, public transport, existing and proposed PROW connecting settlements.	Existing and proposed PRoW connecting settlements see Volume 2 Figure 15.1 and 15.2.
Community and Private Assets	Construction traffic/noise affecting amenity, temporary loss of land.	Local communities - Volume 2 Figure 15.1.	As for the noise/traffic/visual/air with account taken of the nearest available community facility where these are not available within these settlements
	Change in the amenity of property along construction corridors/access routes due to construction traffic/noise, temporary loss of land.	Private Assets	All properties and land, including agricultural land, which have the potential to be affected by demolition of property or loss of land (land take) or to experience changes to the amenity of properties or land because of the Scheme.

Topic	Potential impact	Receptor resource	Zone of Influence (ZoI)
Road Drainage and the Water Environment	Generation of silt laden runoff during construction, abstraction and discharge of low-quality groundwater into surface water during dewatering, generation of contaminated leachate during fill, contaminated waters from known areas of contamination, sediment generated during culverting, creation of pathways for contamination, accidental spillage surcharge periods / through infiltration through embankment	Surface water	The principal premise is that surface water and groundwater pollution is managed for this Scheme to prevent deterioration of water status under the Water Framework Directive. This is achieved through risk assessment, use of remedial criteria and via baseline and aftercare monitoring. The baseline water quality will be established prior to construction and take account of non-construction related variation in water quality measured at distant monitoring locations. As such the potential for a cumulative impact on surface water quality was screened out.

Table 19.2 Zones of Influence during Operation

Topic	Potential impact	Receptor resource	Zone of Influence (ZoI)
Air Quality	Change in the level of vehicle emissions	Humans	Up to 200m from traffic
Air Quality and Ecology	Change in the level of vehicle emissions	Ecologically designated sites sensitive to vehicle emissions	Up to 200m from traffic
Cultural Heritage	Indirect non-physical (visual and aural) change, change to the setting of heritage assets.	Heritage assets, visitors to heritage assets	Based on Zone of Theoretical Visibility

Topic	Potential impact	Receptor resource	Zone of Influence (ZoI)
Landscape and Visual	Visual change	Humans	Based on Zone of Theoretical Visibility
Ecology and Nature Conservation	Disturbance, severance, fragmentation, wildlife casualties, disruption to hydrology, polluted run-off into watercourses, barrier effects, lighting, air pollution, traffic spray (de-icing salt).	Protected species, habitats, ecologically designated sites	Wildlife casualties within the highway, up to 500m for traffic spray, disturbance from noise, visual, lighting. Receptor specific for severance, fragmentation and barrier impacts
Geology and Soils	Pollution of soils due to traffic spray/airborne pollutants.	Topsoil and subsoil	New section of trunk road footprint. Committed mitigation would avoid topsoil and subsoil being affected beyond the footprint. The mitigation measures would be implemented via the approved drainage design and landscape planting.
Geology and Soils	Exposure through dermal contact, ingestion and inhalation of Exposure through dermal contact, ingestion and inhalation of contaminated soil derived dusts on end users/maintenance workers. Ground gas migration and inhalation of gases by end users/maintenance workers.	End users / maintenance workers	Land take. Routine maintenance is expected during operation. Working procedures and safe systems of work would be implemented in accordance with existing requirements for highway management to mitigate exposure
Noise and Vibration	Traffic Noise change	End user /maintenance workers	1km either side of the road or extent of the contour plots in the figures for Chapter 13 Air Quality
Noise and Vibration	Traffic Noise change	Residents	1km either side of the road or extent of the contour plots in the figures for Chapter 13 Air Quality.
Noise and Vibration	Vibration	Non-residential noise sensitive receptors (schools, places of worship, care homes)	1km either side of the trunk road edge.

Topic	Potential impact	Receptor resource	Zone of Influence (ZoI)
All travellers	Diversions, provision of new routes; loss of use; change to operation of public transport services; change in attractiveness or length of journey; change in amenity, community severance.	Users of public highways, public transport, existing and proposed PRoW connecting settlements.	Local public highways, local public transport. Existing and proposed Public Rights of Way (PRoWs)
Community and Private Assets	Change in traffic flows on routes which serve the local community; change in amenity of land used by the community due to predicted changes in operational traffic flows.	Communities	The settlements in the surround district with account taken of the nearest available community facility where these are not available within these settlements.
Community and Private Assets	Change in the amenity of properties along the alignment of the new section of road	Private assets	All properties and land, including agricultural land, which have the potential to be affected by demolition of property or loss of land (land take) or to experience changes to the amenity of properties or land as a result of the Scheme.
Road Drainage and Water Environment	Run-off polluting surface water bodies, and groundwater followed by lateral movement to surface waters.	Surface water	The main impact is from traffic use. The assessment has used predicted traffic flows from the traffic forecasting report which included all likely future development to account for cumulative traffic generation
Road Drainage and Water Environment	Generation of contaminated leachate through infiltration through embankment; generation of contaminated groundwater; change to supply, quality, reliability of groundwater dependant features.	Groundwater.	The main impact is from traffic use. The assessment has used predicted traffic flows from the traffic forecasting report which included all likely future development to account for cumulative traffic generation.

Topic	Potential impact	Receptor resource	Zone of Influence (ZoI)
Road Drainage and Water Environment	Changes to flood risk	All resources/receptors sensitive to flooding within the flood risk area of the Scheme	Flood risk assessment and management of all development is undertaken with the philosophy of not increasing flood risk parameters of the land take and third-party land. This also implies cumulative risks from flooding are not possible insofar as all development cannot be permitted if it renders other projects responsible for mitigating any associated adverse effects (detriment) of flooding.

20 Type (i) Cumulative Effects from a Single Scheme

20.1 DMRB guidance for Type (i) cumulative effects

20.1.1 The DMRB states that Type (i) Cumulative Effects from a Single Scheme (Interrelationships) are those that arise from the combined action of several different environmental impacts from a single scheme upon a single receptor/resource. The guidance states that, when considered in isolation, the environmental effects upon any single receptor/resources may not be significant. However, when all effects from a single scheme are considered together, the resulting cumulative effect may be significant.

20.1.2 The guidance sets out factors to be considered in the assessment of:

a) Which receptor/resources are affected?

b) How will the activity or activities affect the condition of the receptor/resource?

c) What are the probabilities of such effects occurring?

d) What ability does the receptor/resource have to absorb further effects before changes become irreversible?

20.2 The Planning Inspectorate Guidance

20.2.1 The Planning Inspectorate's Advice Note Nine (2012) states that for the Type (i) Cumulative Effects from a Single Scheme, '*The interrelationship between aspects of the proposed development should be assessed and careful consideration should be given by the developer to explain how interrelationships have been assessed in order to address the environmental impacts of the proposal. It need not necessarily follow that the maximum adverse impact in terms of any one topic impact would automatically result in the maximum potential impact when several topic impacts are considered collectively. In addition, individual impacts may not be significant but could become significant when their inter-relationship is assessed. It will be for the developer to demonstrate that the likely significant impacts of the project have been properly assessed.*'

20.3 Method of assessment of cumulative effects from a single scheme

20.3.1 This assessment considers receptors or receptor groups, such as residents, users of local rights of way or services that may be affected by different environmental effects generated from the Scheme simultaneously or concurrently. This may include, for example, locations where noise, air quality and visual change may all occur at the same time. The approach to assessing Type 1 effects or interrelationships has followed a four-staged process, as summarised in Table 20.1.

Table 20.1 Approach to Assessment of Interrelated Effects

Stage	Description
1. Which receptors/resources are affected?	Exercise to identify receptor/resource types are not affected by in-combination effects or where these receptor/resource types are assessed wholly in a single EIA topic area.
2. Identify impacts of receptor/resources?	Review of the likely receptor(s)/resource affected by more than one impact through analysis of the assessment of effects sections undertaken for individual EIA topic areas.
3. In-combination effects	Identification of potential in-combination effects on these receptor groups through review of the topic specific assessments in the EIA chapters.
4. What ability does the receptor/resource have to absorb further effects before changes become irreversible?	Assessment undertaken on how individual effects may combine to create interrelated effects on each receptor for: 'Project lifetime effects', i.e., during construction, operational and decommissioning phases; and 'Receptor-led effects', i.e., multiple simultaneous effects on a single receptor/resource.

20.4 Identification of Receptors/ Resources

20.4.1 The EIA topic chapters report on the effects of the Scheme on receptors or receptor groups. Many of the interrelated impacts on those receptors are also considered within the topic chapters. For instance, effects on ecological receptors arising from any combination of land take, noise/visual disturbance, air quality impacts, water quality impacts and potential traffic collision (see Chapter 8 Ecology and Nature Conservation).

20.4.2 This chapter presents those cumulative effects which are not explicitly addressed elsewhere in the ES. The topics where this applies are shown in Table 20.2 below.

Table 20.2 ES Topics excluded from further interrelated effects assessment

Topic receptor/ resource	Rationale for exclusion from further in combination effects
Cultural Heritage	The assessment of effects on historic assets is provided in Chapter 10 Archaeology and Cultural Heritage. This assessment considers all potential impacts on the relevant receptors, namely buried archaeology and historic assets. This topic relies heavily on coordination with other topics to understand the variety of impacts on receptors i.e. interrelationships.
Landscape Resources	The landscape assessment presented in Chapter 9 Landscape and Visual Effects, includes the consideration of all potential impacts on landscape character and landscape quality. Therefore, no additional interrelated effects are considered likely to occur beyond those identified in the specific assessment in Chapter 9 Landscape and Visual Effects
Ecology	The assessment of in combination effects (many impacts on one receptor/resource e.g. disturbance from noise, emissions, land take) is central to the assessment of potential impacts on ecological receptors and the integrity of designated sites and, as such, has already been assessed within 8 Ecology and Nature Conservation. No additional effects are therefore, considered likely to occur beyond those identified in the assessment in Chapter 8. This topic relies heavily on coordination with other topics to understand the variety of impacts on ecological receptors i.e. interrelationships
Geology and soils	All the potential impacts on geological receptors and soils were assessed and reported within Chapter 6 Geology and Soils
Materials	All the potential impacts on materials and waste were assessed and reported in Chapter 16 Materials
Private assets	All the potential impacts on private assets (farm holdings) were assessed and reported within Chapter 12 Community and Private Assets: Agriculture
Road drainage and water	All the potential impacts on road drainage and water were assessed and reported in Chapter 7 Road Drainage and the Water Environment.

20.4.3 Potential interrelated effects of the Scheme with other developments can only occur in the Zones of Influence (ZoI) presented in Tables 19.1 and 19.2. The receptors identified as likely to experience interrelated effects are people living in or using the area near the Scheme who could be affected by combinations of air quality, noise and visual impacts. Based on the ZoI, a core study area for the assessment of these effects of 350m from construction activities has been adopted. The in-combination

effects would only occur where there is the influence of more than one effect. For example, while a visual impact such as a view of the road, or a traffic noise impact, could be experienced at a far greater or far lesser distance than 350m, an air quality effect would only influence receptors up to 200m from the source. Determining where the in-combination effects would occur would vary through the study area depending upon where multiple effects combine.

20.4.4 There are broadly two receptor groups:

Closest long-term receptors: people living at dwellings within 350m of construction activities and within 1km of the Scheme / or the limits of the noise effects shown on the noise contour plots.

Closest intermittent receptors: people using PRoWs (and other linear routes) within 350m of construction activities and within 1km of the Scheme / or the limits of the noise effects shown on noise contour plots.

20.5 Identification of Potential Effects

20.5.1 For each receptor group, Table 20.3 lists the potential effects.

Table 20.3 Potential effects for each receptor group

Receptor Group	Potential Impacts
Closest long-term receptors - people living at dwellings within 350m of construction activities and within 1km of the Scheme / or the limits of the noise effects shown on the noise contour plots.	a) Potential impacts from dust soiling surfaces, particularly window sills, cars and laundry b) change to the level of traffic emissions (adverse or beneficial); changes to the noise environment and vibration (adverse or beneficial); and c) changes to views
Closest intermittent receptors - people using PRoWs (and other linear routes) within 350m of construction activities and within 1km of the Scheme / or the limits of the noise effects shown on the noise contour plots.	a) Changes to the PRoW network and other linear routes; b) change to the level of traffic emissions (adverse or beneficial); c) changes to the noise environment (adverse or beneficial); and d) changes to views.

20.5.2 Tables 20.4 and 20.5 list the interrelated effects that are predicted to arise during construction and operation of the Scheme. The tables present the Scheme lifetime interrelated effects and the text beneath each table describes the simultaneous interrelated effects. The effects are adverse and beneficial.

Table 20.4 Potential Type (i) Cumulative (Interrelated) Effects for People Living Near the Scheme

Receptor:	**Closest long-term receptors – people living within 350m of construction activities and within 1km of the Scheme alignment**				
Phase:	**Construction phase**		**Operational and maintenance phase**		**Project lifetime Cumulative Effects**
Impact type	**Source of impact**	**Significance of individual effect with mitigation**	**Source of impact**	**Significance of individual effect with mitigation**	
Dust soiling surfaces, particularly window sills, cars and laundry.	Dust generating construction activities such as excavating and moving earth.	A temporary, short/medium term effect which would be a negligible effect and not significant	Not applicable	Not applicable	Through the project lifetime, the receptors living closest to the existing A40 would experience limited construction related effects (construction noise, dust) followed by a reduction in traffic noise and traffic related emissions once traffic starts using the new road and limited change in views. Through the project lifetime, the people living closest to the new section of road may experience noise and dust during construction alongside changes in views (both day and night). This would be followed by increased traffic noise and traffic-related emissions once traffic starts using the new road as well as changes in views (both day and night). This assumes that the same people (receptors) would remain in the same properties from the start of Scheme construction through to operation.
Air Quality	Exhaust emission impacts from construction traffic on human health.	A temporary, short/medium term effect which would not be significant. Traffic emission impacts on human health.	Traffic emission impacts on human health.	Major beneficial effects (improvements in human health) for the receptors along the existing A40 that will benefit from reduced traffic. The modelling results indicate that there is not a risk of environmental standards for NO2 or PM10 being breached in the Scheme opening year (2021) or future year (2050). There are no large increases in pollutant concentrations as a result of the Scheme. The maximum increase in annual mean NO2 concentrations is classified as a minor adverse impact according to the criteria and not significant. Refer to Chapter 13 Air Quality for the Air Quality Assessment.	
Noise change	Noise generating construction activities such as excavation activities, piling, working machinery, construction traffic, etc.	A temporary, short/medium term effect, which would be: a significant 'moderate' or 'major' beneficial effect for 66 residential noise sensitive receptors, with 70 that would be minor or negligible. a significant moderate or major adverse effect for 7 residential noise sensitive receptors, with 35 that would be minor.	Noise from traffic on the new road	In the medium to long term (2022-2037) there would be a significant moderate or major adverse effect for five residential noise receptors; while there would be a significant moderate or major beneficial effect for 43 residential noise receptors. Refer to Chapter 14 Noise and Vibration for the Noise and Vibration Impact Assessment.	
Vibration	Vibration generating construction activities such as blasting or piling.	A temporary, short/medium term adverse effect which would be neutral or slight and would not be significant.	Vibration generated from traffic moving on the new road	A neutral effect (not significant) and scoped out of the noise and vibration assessment as a result.	
Changes to views	Visibility of the construction activities.	A temporary, short/medium term neutral to very large adverse effect, which would be significant	Visibility of the new road	Slight beneficial to very large adverse (significant) effect at year one and neutral to very large adverse (significant) effect at Year 15 after opening.	

Table 20.5 Potential Type (i) Cumulative (Interrelated) Effects for People using the PRoW network.

Receptor:	**Closest long-term receptors – people living within 350m of construction activities and within 1km of the Scheme alignment**				
Phase:	**Construction phase**		**Operational and maintenance phase**		**Project lifetime Cumulative Effects**
Impact type:	**Source of impact**	**Significance of individual effect with mitigation**	**Source of impact**	**Significance of individual effect with mitigation**	
Changes to PRoWs Network	Temporary stopping up and diversions: temporary stopping up affecting routes. Temporary effects on ability to access local routes: resulting in effects on route integrity.	The predicted effects arising from the temporary stopping up of PRoWs during construction were assessed to be temporary and medium term and of slight adverse significance in relation to local routes.	The introduction of new section of road close to existing routes. Permanent diversions and new cycle routes created.	The predicted environmental land take effects arising from the permanent stopping up and diversion of local PRoWs, and the provision of new routes are assessed as permanent and of slight beneficial significance.	Project lifetime cumulative effects could only be experienced by regular users of the routes affected by the Scheme and the combination of types of impacts and levels of effects would be highly variable depending on the route itself.
Changes to the Public Highways, public transport, Driver stress.	Stopping up and diversion, resulting in temporary change in length of route. Temporary loss of access across existing structures impacting local journeys.	The effect arising during the construction of the new trunk road were assessed to be permanent and of neutral to slight significance.	Creation of new section of road and change in amenity of existing routes. Change in traffic flows and journey experience. No effect on public transport during operation	The two bus stops within the village of Llanddewi Velfrey (one westbound, one eastbound) would be bypassed as part of the Scheme. As the bus stops would need to divert from A40 trunk road and negotiate the junctions when entering and exiting the village, some journey time would be added to the bus route, but this was deemed to be negligible.	
Noise change	Noise generating construction activities such as excavation activities, piling, working machinery, construction traffic, etc.	A temporary, short term effect is expected for users of PRoWs in the vicinity of construction activities.	Noise from traffic on the new section of road	There would be marked changes to the amenity of the existing footpaths/ and the bridleway, and other routes that currently run through areas immediately to the north of the existing A40. During the operation of the new road, local routes for NMUs will operate. Whilst these will be close to the road, they will be separated from the carriageway. Other non-motorised users would also have a different experience to that presently enjoyed.	
Changes to views	Visibility of construction activities	Short / medium term slight to very large significant adverse effects.	Visibility of the new section of road	Slight adverse effects at Year 1 (2021) and slight beneficial to very large adverse significant adverse effects at Year 15 (2036)	

20.6 Summary of Type (i) Cumulative Effects from the Scheme on People Living Locally

20.6.1 The Scheme would cause a range of cumulative effects for properties in the surrounding area. The Scheme would carry traffic to the north of the more densely populated residential area of Llanddewi Velfrey thus moving traffic-related effects to this less populous area with the general result that. From Ffynnon to Penblewin roundabout the Scheme would carry traffic slightly further north and away from properties along the existing road. Despite the lower density of dwellings near the Scheme, there would be new receptors affected and there would be changes to effects on existing receptors:

a) Some people living near the existing A40 trunk road would see beneficial changes of varying significance with reduced traffic noise, better views and improved air quality;

b) People across the study area would experience a combination of beneficial and adverse effects of varying significance.

c) People living close to the Scheme and its traffic could experience the adverse effects of increased visual intrusion, traffic noise and a reduction in air quality.

20.6.2 Taking the three main interrelated effects set out in Table 20.4 for the operational phase of the proposed road (noise (Chapter 14), changes to views (Chapter 9), air quality (Chapter 13)) it can be seen that some residential properties could experience a cumulative impact of two or more beneficial or adverse effects, which could potentially be more significant than the individual effects of the Scheme. Table 20.6 has been compiled to illustrate this potential for some of the closest properties to the existing and proposed trunk road in the Design Year (2035). The table does not attempt to quantify or qualify the impacts, but states whether the effects are predicted in the separate topic assessments to be generally Beneficial (B), Adverse (A) or Neutral (O). Reference to the relevant topic chapter will provide more detail on the predicted effects.

Table 20.6 Examples illustrating how the beneficial and adverse cumulative impacts set out in Table 20.4 can combine for receptors

Location	Nº of properties affected	Air Quality	Traffic Noise	Views
Preseli Terrace / Glan Preseli properties	**Over 20**	**B**	**B**	O
Llandaff Row and Maes Y Dderwen	**Over 30**	**B**	**B**	**B**
Properties around Bethel Chapel	**3**	O	**B**	O
Tir-bach	**1**	O	**B**	**A**
Castell	**1**	O	**A**	**A**
Properties on the A40 between Londis and Awelfa	**Approx. 15**	**B**	**B**	**B**
Blaen-pen-troydin	**1**	O	O	O
Pen-troydin-fawr	**1**	**A**	**A**	**A**
Pen-troydin-fach	**1**	**A**	**A**	**A**
Properties beside old A40 west of Llanfallteg Road	**15**	**B**	**B**	**B**
Maes-y-Ffynnon, Maes-y-Rhos	**2**	**A**	**B**	**A**
Parc y Delyn	**1**	O	O	O
Ffynnon (several properties)	**5**	**B**	**B**	O
Brominau	**1**	O	**B**	**A**
Henllan Lodge	**1**	O	O	**A**
Trefangor Farm	**1**	**B**	**B**	**A**
Ca'rmaenau-fach	**1**	**B**	**B**	**A**
Grosvenor Court and Bounty Farm	**2**	O	**B**	O

Location	Nº of properties affected	Air Quality	Traffic Noise	Views
Ca'rmaenau-fawr	**1**	O	**B**	O
Pen-blewin	**1**	**B**	**B**	**A**
Blackmoor Hill	**1**	O	**B**	O

20.7 Summary of Type (i) Cumulative (Interrelated) Effects from the Scheme on People Using Public Rights of Way

20.7.1 Users of PRoWs and other routes near the Scheme during construction may be simultaneously affected by the dust and noise generated during construction activities as well as the visual effects (change in views). Users could also experience a temporary diversion or closure of a route (shown on Volume 2 Figures 15.1 to 15.4). Such effects would only combine where users of PRoWs are in close proximity to the Scheme's construction activities. The receptors are transient through the landscape along the paths or routes and would not experience a long-term effect unless out of choice. Nevertheless, the cumulative adverse effects have the potential to be more significant than the individual effects of the Scheme.

20.7.2 During operation, users of PRoWs and other routes may be simultaneously affected by changes in the amount of traffic noise and air quality from the new section of road as well as the visual effects (change in views). Users could also experience a permanent diversion or closure of a route (shown on Volume 2 Figures 15.1 to 15.4). Such effects would only combine where users of PRoWs are near the Scheme. The receptors are transient through the landscape along the paths or routes and would not experience a long-term effect unless out of choice. Effects are more likely to be felt intermittently. Nevertheless, the cumulative adverse effects have the potential to be more significant than the individual effects of the Scheme.

20.7.3 Taking the three main interrelated effects set out in Table 20.5 for the operational phase of the proposed road (noise (Chapter 14), changes to views (Chapter 9), air quality (Chapter 13)) it can be seen that some PRoWs could experience a cumulative impact of two or more beneficial or adverse effects, which could potentially be more significant than the

individual effects of the Scheme. Table 20.6 has been compiled to illustrate this potential for some of the closest routes to the existing and proposed trunk road in the Design Year (2035). The table states whether there are changes proposed to the route but does not attempt to quantify or qualify the impacts pf the Scheme, but states whether the effects, are predicted in the separate topic assessments to be generally Beneficial (B), Adverse (A) or Neutral (O). Reference to the relevant topic chapter will provide more detail on the predicted effects.

Table 20.7 Examples illustrating how the beneficial and adverse cumulative impacts set out in Table 20.4 can combine for receptors

PRoW close to the Scheme	**Changes to route?**	**Air Quality**	**Traffic Noise**	**Views**
SP27/1/1 (west of Penblewin)	None	O	**A**	O
SP19/32/1 & 2 (near Bounty Farm)	None	O	**A**	O
SP19/31/3 (near Bounty Farm)	Diverted	O	**A**	**A**
SP19/34/2, 3 & 4. Bridleway near Trefangor Burial Ground	New link & new underpass on Scheme	O	**B**	O
SP19/36/1 &2 & 3 with SP19/37/1 & 2. (around Pen-ca'rmaenau and Ffynnon)	New links & underpass at Ffynnon	O	**B**	**A**
SP19/38/1 & 2 (Pen-troydin)	Diverted and underpass provided	**A**	**A**	**A**
SP19/1 & SP19/2 & SP 19/3 & SP19/4 (Llanddewi Velfrey, Blaen-pen-troydin and Castell)	Diversions and underpass provided	O	**A**	**A**
SP19/4 & SP19/5 (Bethel and Gwyndy Fach)	Diverted	O	**B**	**A**
SP19/6 (Castell Gwyndy and Pencwmmau)	None	O	**B**	O

PRoW close to the Scheme	Changes to route?	Air Quality	Traffic Noise	Views
SP19/29/1 & 2 & 3 (Bridleway from Stoneyford Farm to Henllan	None	O	**B**	O
SP 19/28/1 & SP19/27/1 (Henllan)	None	O	**B**	O
SP 19/30/1 Ffynnon to Stepin	Underpass provided and new link	O	**B**	**A**
SP19/39/1 (Bridleway south from Stepin)	None	O	**B**	O
SP19/21/1, 21/2, /22/2, & 23/1 (Llanddewi Gaer)	None	O	**B**	O
SP19/20/7 (Llanddewi Church to Llanddewi Velfrey)	None	O	**B**	O
SP19/19 & SP19/18 (Llanddewi Velfrey and Pant Teg)	None	O	**B**	**A**
SP19/17 (south from Bethel)	North link diverted	O	**B**	**B**
SP19/16 (South from Bryncoed)	None	O	**B**	O

20.8 Mitigation and Monitoring

20.8.1 Mitigation is proposed for each environmental topic to reduce or remove the adverse effects of the Scheme. Each environmental topic chapter sets out any mitigation that is proposed. Those topics discussed in this chapter are listed in Table 20.8 with the approach to mitigation described.

Table 20.8 Mitigation approach for environmental topics with cumulative effects

Relevant environmental topic chapter	Approach to mitigation
Chapter 9 Landscape and Visual Effects	*Changes to views* would be addressed by the introduction of measures to integrate the new earthworks and carriageway Scheme with the landscape and to provide a visual screen to adverse views of the carriageway and vehicles. Views are often screened by the landform if the Scheme is in cutting. Planting of trees and shrubs and hedges will provide visual screening where landform does not. Chapter 9 describes mitigation and indicates how effective it will be when the Scheme is first completed and in the Design Year 15 years after completion, when planted screens have grown sufficiently.
Chapter 13 Air Quality	*Dust associated with construction*; is produced by excavation, haulage, processing and storage of soils. Mitigation includes best practice construction measures to avoid producing dust and limiting the opportunity for dust to be raised into the air. Chapter 13 describes these and Chapter 22 describes how mitigation during construction is managed. *Air Quality:* there is no mitigation provided for air quality, although selection of the Preferred Route took account of the implications for air quality with the objective of reducing traffic pollution by moving the A40 away from the main centre of population.
Chapter 14 Noise and Vibration	*Noise* was considered in the selection of the Preferred Route. Increasing the distance between source and receptor is an effective way to reduce the impact of traffic noise. Planners took account of this objective by moving the A40 away from the main centre of population. The assessment demonstrated that the Preferred Route does not increase traffic noise at effected receptors sufficiently to require mitigation.
Chapter 15 All Travellers	*Changes to the PRoWs network* occur where the Scheme crosses an existing route. Mitigation has included closures and diversions to discourage users from crossing the road but guiding them towards one or other of the three proposed underpasses which allow them to cross in greater safety.

Relevant environmental topic chapter	Approach to mitigation
	Some additional routes have been provided to create a series of looped routes for cyclists and pedestrians. *Public transport* will be beneficially affected by the Scheme, and so no mitigation is required. *Driver stress* will be reduced by the Scheme by reducing congestion, delays and local traffic from the A40. No further mitigation is required.

20.8.2 The location and extent of permanent mitigation measures are set out in the Environmental Masterplan (see Appendix 2.5) and are recorded in the Register of Environmental Actions and commitments (REAC) in Appendix 2.3.

20.8.3 Environmental effects from the construction of the Scheme would be mitigated and monitored through the Construction Environmental Management Plan (CEMP). A Pre-CEMP is provided at Volume 3 Appendix 2.2 of this ES.

Monitoring

20.8.4 Operational environmental effects from the Scheme would be mitigated and monitored as set out in this ES, including the Register of Environmental Actions and Commitments (REAC) included in Volume 3 Appendix 2.3. Specific measures for monitoring the Scheme and mitigation is set out in the relevant environmental topic chapter as set out in Table 20.9.

Table 20.9 Chapters where monitoring relevant to cumulative effects is proposed

Topic	**Monitoring requirements**
Chapter 9 Landscape and Visual Effects	Chapter 9 Section 9.9 Sets out how the development of the proposed landscape measures will be monitored to ensure that the objectives of mitigation are achieved in the required timescale.

Topic	Monitoring requirements
Chapter 13 Air Quality	Chapter 13 Section 13.11 Sets out a range of measures to monitor the effectiveness of the contractor's air quality/dust control during construction.
Chapter 14 Noise and Vibration	Chapter 14 Section 14.7 Sets out Welsh Government duty to assess noise levels following the opening up of the scheme to traffic.
Chapter 15 All Travellers	There is no proposal for monitoring of measures proposed for in this topic chapter beyond the routines on highway maintenance.
Chapter 22 Management of Environmental Effects	The chapter is included to set out how the construction works will be controlled and managed to minimise or avoid adverse effects. Roles and responsibilities are set out, the control mechanisms described and the REAC and Environmental Masterplan cross referenced. This chapter includes Section 22.8 which sets out the scope of aftercare and associated monitoring

21 Type (ii) Cumulative Effects of Different Schemes

21.1 DMRB guidance for Type (ii) cumulative effects

21.1.1 Type (ii) effects arise from two or more proposed or reasonably foreseeable developments upon the same receptor/resource.

21.1.2 The DMRB guidance defines 'reasonably foreseeable' to mean other proposed developments that are committed. It states that these should include (but not necessarily be limited to) trunk road and road schemes which have been confirmed (gone through the statutory process) and development projects with valid planning permissions, as granted by the local planning authority, and for which formal EIA is a requirement or for which a non-statutory environmental impact assessment was undertaken.

21.2 Planning Inspectorate Guidance

21.2.1 Planning Inspectorate Advice Note 17 (Planning Inspectorate, 2015) provides a clear and systematic approach to type (ii) cumulative effects assessment. This guidance identifies a wider range of other proposed developments to be considered:

a) Under construction.

e) Permitted applications not yet implemented.

f) Submitted applications not yet determined.

g) Planning applications where a scoping report was submitted.

h) Projects on the planning register where a scoping report was submitted.

i) Sites identified in the relevant LDPs (and emerging LDPs – with appropriate weight being given as they move closer to adoption).

j) Other plans and programmes (as appropriate) which set the framework for future development consent/approval, where such development is reasonably likely to come forward.

21.3 Assessment Method Adopted Approach to Type (ii) Cumulative Effects from Different Schemes

21.3.1 The approach taken for the assessment of type (ii) effects follows the guidance published by the Planning Inspectorate (2015) and centres on screening other proposed developments within the Zone of Influence (ZoI) of the Scheme using a using matrices to clearly present the four-stage approach and findings:

Stage One: Establish the Zone of Influence and Identify Long List of 'Other Developments'

a) Establish the ZoI of the Scheme.

b) Identify a long list of 'other development' and show in a matrix with key information (Table 21.1).

c) Assign to tiers 1, 2 or 3 for the level of certainty in Table 21.1.

d) Consult planning authorities and statutory consultees regarding 'Other Development'.

Table 21.1 Tiers for 'Other Development' for inclusion in CEA

Tier	Description	
1	Under construction but not considered as part of the baseline.	Decreased level of detail likely to be available ↓
	Permitted Applications not yet implemented.	
	Submitted applications but not yet determined.	
2	Planning applications where only a scoping report has not been submitted.	
3	Projects on the planning register where a scoping report has not been submitted.	
	Sites identified in the relevant LDPs with appropriate weight being given to emerging plans.	
	Other plans and programmes which set the framework for future development where development is reasonably likely to come forward.	

21.3.2 Pembrokeshire County Council and Carmarthenshire County Council were requested to provide planning application details including minerals applications for the time period of 2010-2018. The review included a total of 675 planning applications within the 5km ZoL. From

these a long list of 23 developments were identified as relevant to the Scheme.

Stage Two: Identify Shortlist of 'Other Development' for Cumulative Effects Assessment (CEA)

a) Shortlist 'Other Development' by applying inclusion/exclusion criteria to the Stage One list.

k) Consider inclusion/exclusion threshold criteria based on the potential for significant cumulative effects by virtue of overlaps in temporal scope, the scale and nature of the 'other development' or other factors.

Stage Three: Information Gathering

a) Gather information regarding the shortlisted 'other development' to inform the CEA and document in a second matrix.

Stage Four: Assessment

a) Review shortlisted 'other development' to assess whether cumulative effects may arise (see Table 21.1).

b) Identify mitigation in relation to adverse cumulative effects and document the means of delivering the mitigation.

c) Consider the apportionment of effect between the Scheme and the 'other development' e.g. the contribution to the effect demonstrably related to one development or is there an equal contribution from either development. However, the Scheme is a larger scale than all the other developments and therefore, the focus for this chapter was to describe the mitigation that would be put in place for the Scheme itself.

21.4 Assessment of Type (ii) Cumulative Effects from the Scheme and Other Proposed Development

21.4.1 'Other Developments' were identified and are shown on Volume 2 Figure 19.1. These are listed in Tables 20.4 and 20.5.

21.4.2 For the Cumulative Effects Assessment (CEA) of this Scheme, the Temporal Limit[2] is defined by the potential timeframe during which the scheme could affect Other Developments, either from the construction stage or following completion.

[2] Temporal Limit the term used in guidance on CEA to explain the duration of potential influence of a scheme.

21.4.3 The Spatial Limit[3] CEA was based on the same study areas as the individual topic assessments reported in Chapters 6 onwards in this EIA. Volume 2 Figure 19.1, the CEA map shows the overall cumulative effects, using the respective topic assessments overlaid on one map, the CEA. The full extent of this map includes a 5km zone along the length of the proposed Scheme.

21.4.4 Whist the map in Volume 2 Figure 19.1 provided a focus for the CEA, the effects of a limited number of developments were identified on the periphery of the Spatial Limit. This measure was necessary so that additional or new receptors for visual and transport effects for large scale or major developments could be considered at the onset.

21.5 Zones of Influence (ZoI)[4] for land take

21.5.1 The land and buildings will be taken permanently to construct the scheme at the commencement of construction. The consequences of land take are not expected to have any effects that extends beyond the ZoI, as shown in Table 21.2 below. Land take impacts cause a cumulative effect in combination with 'Other Developments' affected by the footprint of the Scheme.

Table 21.2 Zones of Influence (ZoI) for land take effects

Topic	Potential impact	Receptor / resource	Zone of Influence (see Volume 2 Figure 16.2 & 16.2)
Cultural Heritage	Loss and direct physical change	Buried archaeology, designated heritage assets	Land take
Ecology and Nature Conservation	Loss of habitats, loss of ecologically designated land.	Habitats, ecologically designated sites	Land take
Geology and Soils	Geological exposure, loss of seedbank	Solid geology, superficial geology, geological designations and the seedbank	Land take
Materials	Sterilisation of mineral resources	Mineral resource	Land take
Community and Private Assets	Loss of land and properties	Users of land, users of community facilities, landowners	Land take

[3] Spatial Limit is the term used in guidance on CEA to explain the geographical potential influence of a scheme on an area.
[4] Zone of Influence is the term used to describe the extent to which a specific potential impact is considered likely to cause an effect.

21.5.2 The ZoI for construction effects are relevant to the Scheme and to any other developments undergoing construction at the same time. This could lead to cumulative effects arising as a result of construction activities (see Table 19.2). For this reason, the ZoI for 'other developments' remains flexible. As construction takes place over a limited period, the potential impacts from 'other developments' should not be disregarded so that mitigation can be considered.

Relevant town planning projects

21.5.3 Early identification of relevant town planning LDPs and permissions included a review of the LDP maps and indexes; various planning permissions and Local Planning Authority annual monitoring records. Where relevant and information was available, developments which could potentially reach completion stage before the commencement of the Scheme are noted.

21.5.4 Through consultation with the Planning Services of Carmarthenshire and Pembrokeshire County Councils, the initial long list of planning applications focused on those submitted and determined within a five-year period up to the end of December 2017. For the land situated within the boundaries of Pembrokeshire County, a total of just under 660 planning applications required an initial brief review for further refinement as either 'major' developments; EIA developments and/or those with sensitive receptors or unique matters relevant to the Scheme. Those that were limited to the Carmarthenshire County were significantly less in overall total numbers. The review of these first list of planning applications, together with LDP allocations, provided a 'long list' of 23 town planning 'developments' included in Volume 3 Appendix 19.1.

21.5.5 Applying the Planning Inspectorate Advice Note 17 (2015), a further scoping process refined this 'long list' into a 'short list' of 11 sites, the majority of which lie within the administrative boundaries of Pembrokeshire Council. Those projects included on the 'short list' are included in the matrix in Volume 3 Appendix 19.2.

21.5.6 The 2015 Advice Note 17 identifies three tiers as part of the CEA process, from 'Tier 1' the most certain of projects, to the least certain level, Tier 3.

21.5.7 Twelve 'long list' sites were 'scoped out' from the Second Stage, in the given variables:

a) level 3 details only;

l) limited scale of development;

m) works completed, sufficient distance away from the Scheme.

21.5.8 Of the remaining eleven 'short list' projects, five are 'greenfield' sites with 'major' housing levels/numbers approved.

21.5.9 The Development Matrix in Volume 3 Appendices 19.1 shows the 'long list' identified in the area that require assessment.

21.6 Summary of Cumulative Effects from the Scheme and other proposed developments

21.6.1 There are several types of cumulative effects likely to occur during the lifetime of the Scheme, including loss of land to farm businesses; loss of terrestrial habitat for dormice, bats and other protected species. Most potential cumulative impacts would arise as a result of proposed housing developments in the vicinity of the Scheme.

21.6.2 The proposed development would add to urbanisation in some certain Landscape Character Areas but would not result in a significant cumulative effect on landscape. Similarly, for views, the introduction of more development in some areas would not present a noticeable cumulative visual effect, while in other locations, where development represents a more noticeable change, there may be an increase in adverse visual effect on residential receptors, users of PRoWs and roads.

21.6.3 Of the remaining eleven 'short list' projects, five are 'greenfield' sites with housing approved. Undeniably, the CEA identifies changes in the future for both the current environmental baseline and provides additional receptors for the effects of the Scheme. Although unlikely to incur a significant negative impact, it is possible that noise and dust mitigation, discouraging light pollution and diversion routes on local roads are identified as suitable mitigation and included in the Register of Environmental Actions and Commitments (REAC).

21.6.4 Overall, the combined effect of either a limited number or all these future projects concurrently (at construction or completed stage) could

have a limited effect on the Scheme, at construction and post-construction stage.

21.7 Mitigation and Monitoring

21.7.1 Mitigation measures are proposed as part of the Scheme. Construction environmental effects would be mitigated and monitored through the Construction Environmental Management Plan (CEMP). A Pre-CEMP is provided at Volume 3 Appendix 2.2 of this ES.

21.7.2 Operational environmental effects from the Scheme would be mitigated and monitored as set out in this ES, including the REAC set out at Volume 3 Appendix 2.3.