

**FIVE MILE LANE IMPROVEMENTS -
ENVIRONMENTAL IMPACT
ASSESSMENT SCOPING REPORT**

Welsh Government

3512646D-HHC

Final

14 00 813 

Five Mile Lane Improvements - Environmental Impact Assessment Scoping Report

3512646D-HHC

Prepared for
Welsh Government
Cathays Park
Cardiff
CF10 3NQ

Llywodraeth Cymru
Parc Cathays
Caerdydd
CF10 3NQ

Prepared by
Parsons Brinckerhoff
29 Cathedral Road
Cardiff
CF11 9HA

29 Ffordd yr Eglwys Gadeiriol
Caerdydd
CF11 9HA

029 2082 7000

www.pbworld.com

Report Title	:	Five Mile Lane Improvements - Environmental Impact Assessment Scoping Report
Report Status	:	Final
Job No	:	3512646D-HHC
Date	:	July 2014

DOCUMENT HISTORY AND STATUS

Document control			
Prepared by	A. Hallam	Checked by <i>(technical)</i>	M. Wood
Approved by	K. Attwood	Checked by <i>(quality assurance)</i>	T. Clancy
Revision details			
Version	Date	Pages affected	Comments
1.0	July 2014	All	-

CONTENTS

	Page
List of Abbreviations	2
Executive Summary	4
1 Introduction	8
2 The Project	13
3 Alternatives Considered	16
4 Consultation	19
5 Air Quality	21
6 Cultural Heritage	24
7 Ecology and Nature Conservation	30
8 Landscape and Visual Effects	36
9 Noise and Vibration	44
10 Community and Private Assets	48
11 Effects on all Travellers	53
12 Road Drainage and the Water Environment	58
13 Geology and Soils	65
14 Materials	74
15 Cumulative Effects	79
Figures	
Site Location & Preferred Route Alignment	83

LIST OF ABBREVIATIONS

A	
APE	Annual Probability Event
AADT	Annual Average Daily Traffic
ALC	Agricultural Land Classification
B	
BAP	Biodiversity Action Plan
C	
CRTN	Calculation of Road Traffic Noise
D	
DMRB	Design Manual for Roads and Bridges
E	
EIA	Environmental Impact Assessment
EU	European Union
ES	Environmental Statement
F	
G	
GQA	General Quality Assessment
H	
HA	Highways Agency
HGV	Heavy Goods Vehicle
I	
IAN	Interim Advice Note
IEEM	Institute of Ecology and Environmental Management
IEMA	Institute of Environmental Management and Assessment
J	
K	
L	
LCA	Landscape Character Area
M	
N	
NRW	Natural Resources Wales
NMU	Non-Motorised User
NSR	Noise Sensitive Receptor
O	

P	
PB	Parsons Brinckerhoff
PRoW	Public Rights of Way
Q	
R	
RIGS	Regionally Important Geological Site
S	
SAC	Special Area of Conservation
SAM	Scheduled Ancient Monument
SEWBRcC	South East Wales Biodiversity Records Centre
SLA	Special Landscape Area
SNCI	Site of Nature Conservation Importance
SSSI	Site of Special Scientific Interest
SPZ	Source Protection Zone
SWMP	Site Waste Management Plan
SPA	Special Protection Area
T	
TNV	Traffic Noise Levels
TAN	Technical Advice Note
TWAO	Transport and Works Act Order
U	
V	
W	
WelTAG	Welsh Transport Planning and Appraisal Guidance
X	
Y	
Z	
ZVI	Zone of Visual Influence

EXECUTIVE SUMMARY

<p>Introduction</p>	<p>This Scoping Report has been prepared by Parsons Brinckerhoff in respect of a proposed scheme to improve the A4226 Five Mile Lane, west of Cardiff and North West of Barry, between Waycock Cross and Sycamore Cross.</p> <p>The existing A4226 is a single carriageway road, in a rural location, varying in width between 6.0 and 7.3m. The proposals include making use of the existing and already upgraded highway immediately off the A48 at Sycamore Cross. The proposed alignment will go offline at a point approximately 1.5km from the Sycamore Cross signalised junction and will follow a southerly course running parallel with the existing A4226. The proposed alignment re-joins the existing A4226 Five Mile Lane just north of the existing River Waycock Bridge.</p>
<p>Air Quality</p>	<p>The study area for the air quality assessment will comprise a 200m width corridor along all roads potentially affected by changes in traffic associated with the proposed scheme. The current air quality experienced on the existing road network varies depending on time of day and year. During the construction phase of the works air quality is likely to temporarily reduce for receptors within close proximity of the works, due to increased emissions associated with traffic and construction dust. During operation the effects of the scheme itself are likely to be limited and will be influenced by changes in traffic speed and an increase in vehicle movements.</p>
<p>Cultural Heritage</p>	<p>The assessment of the significance of the settings of heritage assets to the value of the assets will utilise a 1km study area. The assessment of significance and impact will focus on heritage assets lying within a 200m corridor either side of the scheme. The landscape in general shows a high level of prehistoric sites of a wide variety of types: domestic, defensive, agricultural, subsistence related, and funerary. Many of these sites are well preserved.</p> <p>The heritage assets in close proximity to the road include a pre-historic tomb, Neolithic long barrow, two Bronze Age standing stones and an Iron Age enclosure. There is potential for previously unknown archaeological assets to be impacted upon by the construction works. There is similar potential for a number of low value assets to be affected. It is possible there will be some limited effects on the setting of all of the Scheduled Monuments and for Whitton Lodge Roman Villa in particular.</p>
<p>Ecology and Nature Conservation</p>	<p>For assessing the implications of the scheme on European designated sites, desk study information will be obtained for the scheme's 2km radius. This will be extended to 30 km radius for Special Areas of Conservation where bats are the qualifying interest. Otherwise, the 'study area' will comprise a 1 - 5 km radius, consisting of aerial photograph analysis and collection of historic data on protected or notable sites and species.</p> <p>The scheme is set within an agricultural landscape comprising mostly of improved, sheep-grazed pasture and arable land separated by native hedgerows and scattered trees. Localised standing and open water habitats also occur within the study area.</p> <p>Surveys were undertaken in 2008/09 but are now considered to be out of date and therefore will be repeated including:</p>

	<ul style="list-style-type: none"> • Amphibian survey (including Great Crested Newts); • Bat activity survey; • Reptile survey; and • Aquatic Invertebrate survey.
Landscape and Visual Effects	<p>The study area for visual effects will extend to the area from which the project could be visible. There are three broad character types within the Vale of Glamorgan in visual terms: the Rural Vale; the South East Developed Vale; and the Coast. The Rural Vale is further divided into the North Rural Vale and the South Rural Vale, divided by the A48 Roman Road. There is the potential for some degree of adverse effect on landscape character and visual amenity as a result of scheme construction although, with appropriate mitigation, these effects could be effectively minimised and, in the long term could lead to an overall benefit for some receptors during operation.</p>
Noise and Vibration	<p>The study area will be 600m from the centre line of the road at either side, including side roads that are likely to be affected by any changes in traffic flows. The current traffic noise and vibration level experienced on the existing road network varies depending on time of time of day and year, and it is likely the trends found in national traffic data would be relevant and applicable on these sections of roads. In places, hedgerows and mature vegetation help to attenuate traffic noise. Following the installation of appropriate mitigation along the route corridor, the scheme is unlikely to produce a significant adverse effect to receptors along its whole length.</p>
Community and Private Assets	<p>The impact of the proposals on the nearby land uses will be considered at two geographic levels; the proposed scheme itself; within a 1km buffer zone from the proposed scheme centre line.</p> <p>Construction of the scheme would involve temporary loss of land for construction compounds, working areas and haul routes. There would be permanent loss of land in some areas occupied by the improvement works to Five Mile Lane during operation. No public rights of way will be affected, although access to them from Five Mile Lane may be altered temporarily during construction and permanently during operation. During operation improvements to the road could make it more 'cyclist-friendly', although there will be no new facilities provided as part of the scheme. There would be no impacts on local communities with regards to access to key facilities.</p>
Effects on all Travellers	<p>The assessment of effects on pedestrians, equestrians and cyclists (known as Non-Motorised Users) will consider the impact of the scheme on local journeys made by people on the local public rights of way network. The effects on vehicle travellers using the local road network will also be assessed. There are two elements to the assessment of vehicle travellers: view from the road; and driver stress. The study area for the assessment of impact on pedestrians, cyclists and equestrians is within 1km of the route corridor.</p> <p>There are currently no cycling facilities or bridleways within the study area. There are a number of public footpaths within the study area, some of which intersect with Five Mile Lane, including Valeways Millennium Heritage Trail. Effects on vehicle travellers predicted during construction may include delays and local diversions, but these would be short-term.</p>
Road Drainage and the Water	<p>The assessment will cover surface water features surrounding the proposed scheme and within 1 km in all directions from the proposed scheme. The</p>

Environment	assessment will also cover potential impacts of flood risk to the scheme and to people and property elsewhere as a result of the scheme. The existing road extends across the Waycock Valley and its associated flood risk areas. Along the route of Five Mile Road the bedrock is primarily classified as Secondary A aquifer with areas of Secondary B aquifer along the alignment of existing watercourses. The scheme has the potential to effect the water environment during construction and operation.
Geology and Soils	This chapter will include a contaminated land assessment and will consider the potential impacts on and off site, within 250m of the carriageway. It is not considered likely that significant environmental effects associated with geology and soils or contamination would arise beyond this distance. There are no geological Sites of Special Scientific Interest, Regionally Important Geological Sites or quarries within the study corridor. Contaminated land is a fairly minor issue in this predominantly rural area.
Materials	Most material resources will originate off site e.g. construction products. Some will arise on site during construction such as excavated soil and rock or recycled elements of existing roads. The scheme will inevitably result in surplus material which will need to be disposed of as waste. This usually arises from two sources: existing site materials e.g. concrete from demolition of an existing structure; and excavation of material from earthworks and materials brought on to the site but not used for its intended purpose e.g. damaged goods. For material resource use, the potential environmental effects will be mainly associated with the extraction and transport of primary raw materials, such as aggregates and the manufacture and transport of products for use in construction.
Cumulative Effects	<p>There are two types of cumulative impact in environmental assessment:</p> <ul style="list-style-type: none"> • Cumulative effects from a single scheme (acknowledging the outcomes of each of the environmental topics assessed for the proposed scheme); and • Cumulative effects from different schemes (assessed in combination with the scheme in question). <p>Overall, cumulative effects are anticipated to diminish in the longer term. As local residents or receptors become accustomed to post-construction conditions the impact may become measurably less significant (for example the recovery of ecological areas after the effects of multiple schemes), or may be perceived to be less significant, for example, acclimatisation to noise levels.</p>

SECTION 1

INTRODUCTION

1 INTRODUCTION

1.1 Introduction to the Proposed Scheme

1.1.1 This Scoping Report has been prepared by Parsons Brinckerhoff in respect of a proposed scheme to improve the A4226 Five Mile Lane, west of Cardiff and north west of Barry, between Waycock Cross and Sycamore Cross (see Figure 1).

1.1.2 The route currently fails to meet appropriate highway standards for a 60mph road. In order to meet the aim to create a strategic route to the enterprise zone at St Athan and Cardiff Airport, there is the need to undertake a number of improvements to upgrade the existing highway.

1.2 The Proposed Scheme

1.2.1 The existing A4226 is a single carriageway road, in a rural location, varying in width between 6.0 and 7.3m. The route is classified and maintained as an 'A' road by the local authority.

1.2.2 The proposals include making use of the existing and already upgraded highway immediately off the A48 at Sycamore Cross. The proposed alignment will go offline at a point approximately 1.5km from the Sycamore Cross signalised junction and follows a southerly course running parallel with the existing A4226. The proposed alignment re-joins the existing A4226 Five Mile Lane just north of the existing River Waycock Bridge.

1.3 The Overseeing Organisation

1.3.1 The works will be undertaken by the Vale of Glamorgan Council with Welsh Government funding. Both organisations are committed to improving access to the Cardiff International Airport and the St Athan Enterprise Zone in order to encourage economic development and inward investment. It will also facilitate appropriate access to Cardiff International Airport.

1.4 The Designer

1.4.1 Parsons Brinckerhoff has carried out a WelTAG Assessment of the proposed options to identify a preferred route corridor, including consideration of environmental effects, in association with TACP. This has then been used by PB to design the proposed improvements (see Figure 1).

1.5 Legislation, Guidance and Process

1.5.1 Environmental Impact Assessment (EIA) is governed by the requirements of the EIA Directive (2011/92/EU) and the Town and Country Planning (Environmental Impact Assessment) Regulations 1999. This legislation sets out the criteria which define when EIA is required and what should be assessed.

1.5.2 The results of the EIA will be reported in an Environmental Statement (ES), to be submitted in support of a planning application.

1.6 Screening

1.6.1 A screening exercise in accordance with the Design Manual for Roads and Bridges (DMRB) Volume 11 Environmental Assessment HD47/08¹ has been undertaken. This screening is to identify whether the project falls within Annex I or II of the EIA Directive and establishes (with reference to Annex III) whether the project should be the subject of a statutory EIA.

1.6.2 Projects for which EIA may be required are listed in the EIA Directive (Annex I or II projects); Annex I projects always require an EIA, whilst Annex II projects only require an EIA if it is determined that significant effects are likely to arise.

Key Considerations in determining the need for an EIA

1.6.3 A scheme falls within Annex I where it involves *"Construction of motorways and express roads. Construction of a new road of four or more lanes, or realignment and /or widening of an existing road of two or more lanes, where such new road, or realigned and/ or widened section of road would be 10 km or more in a continuous length."*

1.6.4 The proposed scheme does not fall within Annex I as it does not involve the widening of a new road for more than 10km continuously. The proposals will only result in intermittent changes to the width and alignment of Five Mile Lane.

1.6.5 A scheme falls within Annex II where *"a project for constructing or improving a highway where the area of the completed works together with any area occupied during the period of construction or improvement by requisite apparatus, equipment, machinery, materials, plant, spoil heaps or other such facilities exceeds 1 hectare or where any such area is situated in whole or in part in a sensitive area."*

1.6.6 The proposal has already been the subject of a WelTAG assessment to identify the likely environmental effects in order to inform the decision on the preferred route corridor to be improved. The result of this assessment was the recommended upgrade / offline improvements to Five Mile Lane which this scoping report has been based on. In this assessment, the main sensitive receptors identified along Five Mile Lane include:

- Approximately 90 residential properties within 150m of the road (mainly around Waycock Cross);
- Barry Woodlands SSSI;
- Existing public footpaths which cross the route corridor;
- Scheduled Ancient Monuments (SAMs) and archaeological sites close to the road;
- Grade 2 and 3 agricultural land; and
- Good water quality in nearby watercourses.

1.6.7 The potential impacts on these receptors resulting from construction and operation could be significant due to their high value, leading the applicant to conclude that EIA is required. These impacts are likely to include increased noise and emissions from

¹ Screening of Projects for EIA

vehicles, as the speed limit will be raised and the traffic flows will also increase. This may have an effect on residential properties and the SSSI at Waycock roundabout in particular.

- 1.6.8 Although the proposed improvements will be implemented using existing highway land where possible, some agricultural land will be required resulting in a permanent loss which will have a limited impact on farm businesses. These effects are less likely to be significant due to the amount of land required.
- 1.6.9 The EIA would also consider the impacts on the setting of the SAMs. These effects have the potential to be significant due to the high value of the SAMs.
- 1.6.10 No Public Rights of Way (PRoW) will be affected by the scheme.
- 1.6.11 Water quality in nearby watercourses is known to be good at present. This should be maintained through the implementation of appropriate mitigation measures. However, the potential effects without mitigation may be potentially significant.
- 1.6.12 It is therefore considered that an EIA is required under the terms of Annex II. This conclusion was subsequently confirmed by the Vale of Glamorgan Development Services department on 6th June 2014.

1.7 Screening for Appropriate Assessment

- 1.7.1 A preliminary screening exercise has been undertaken to determine whether there is a likely requirement for an Appropriate Assessment to be undertaken in order to identify whether the proposed scheme is likely to have any significant effect on a Ramsar or Natura 2000 site. There are no internationally designated sites within 2km of the scheme (or sites within 30km where bats are a qualifying feature) and therefore it has been determined that Appropriate Assessment is not required.

1.8 Scoping

- 1.8.1 Scoping is a precursor to EIA to facilitate the process that will lead to the preparation of a comprehensive EIA as reported in an ES. The ES will record all significant beneficial and adverse, direct, indirect and cumulative environmental effects of the preferred option for the proposed scheme including effective and sustainable mitigation measures and identification of residual effects.
- 1.8.2 Objectives of this Scoping Report are to:
- Review existing data, identify sensitive resources and receptors, and scope the work required for an EIA; and
 - Determine the appropriate level of effort that should be applied to the various environmental topics, namely whether a Simple or Detailed assessment as defined in DMRB Vol. 11, Part 4, HA204/08 (Scoping of Environmental Impact Assessments) is required.
- 1.8.3 The Scoping Report allows the 'scoping out' of environmental topics where little or no change to the existing situation will occur, thus leading to the preparation of a concise ES.

1.9 Scoping Report Structure

- 1.9.1 Section 2 of the Scoping Report describes the proposed scheme; Section 3 describes the proposed scheme options considered. Section 4 describes the information consultation undertaken on the scope of the EIA prior to the submission of the Scoping Report. Sections 5 to 15 identify key issues (including Cumulative Effects) relating to each of the environmental assessment topics; summarise work undertaken to date; and present the proposed methodologies for the assessment of potential effects in the EIA.

SECTION 2

THE PROJECT

2 THE PROJECT**2.1 Background to the Project**

2.1.1 The Vale of Glamorgan is working with the Welsh Government to improve links from Cardiff to Cardiff International Airport and the St Athan Enterprise Zone.

2.2 Project History

2.2.1 Five Mile Lane has been a hot spot location for road accidents over the years in a fairly even distribution along its length. There have been 65 accidents between the years 1994 to 2007, of which 11 were fatal. In the same period there have been 16 accidents at the Sycamore Cross junction and three slight accidents at Waycock Cross.

2.2.2 Vale of Glamorgan Council has endeavoured to improve safety on the road through the introduction of speed limits, which the Safety Camera Partnership enforce with a static camera, re-surfacing, improved signage, lighting, and solar powered LED cats eyes. However, the road still contains a number of sharp bends, has substandard forward visibility and is too narrow in places for two large vehicles such as farm traffic, lorries or buses to pass. Along most of its length the speed limit is 40 miles per hour and overtaking is not permitted.

2.2.3 Pedestrians, cyclists and equestrians are not catered for in the main. Those who do use the route are effectively doing so at considerable risk to themselves and others.

2.2.4 In March 2012, Arup published an Interim scheme Assessment Report on behalf of the Vale of Glamorgan Council which examined the potential to improve Five Mile Lane in detail. It considered five route options which are described in Section 3 of this Report.

2.2.5 Subsequently, Parsons Brinckerhoff has developed these options further in order to identify a preferred option along Five Mile Lane which is also described in the following Section of this Report.

2.3 Project Objectives

2.3.1 The objectives of the scheme are as follows;

- Objective 1: Improve Network Resilience across Study Area;
- Objective 2: Reduce Journey Time variability from Culverhouse Cross interchange to Cardiff Airport Enterprise Zone;
- Objective 3: Reduce Journey Time variability from Culverhouse Cross interchange to St Athan Enterprise Zone;
- Objective 4: Discourage strategic traffic for utilising inappropriate routes to gain access to St Athan and Cardiff Airport Enterprise Zones;
- Objective 5: Maintain access to local amenities and reduce community severance; and

- Objective 6: Improve access to St Athan and Cardiff Airport Enterprise Zones for Public Transport and Non Motorised Users

2.4 Project Programme

- 2.4.1 Construction is due to commence in January 2016 and will take approximately 12-18 months to complete.

SECTION 3

ALTERNATIVES CONSIDERED

3 ALTERNATIVES CONSIDERED

3.1 Options Considered

3.1.1 The previous WelTAG Assessment (Arup, March 2012) identified five routes to be considered – red, green, purple, blue and orange routes. The assessment identified the following conclusions:

- Blue Route – Impacts on noise, air quality and social aspects would be beneficial or moderate beneficial. Impacts on heritage would be moderate adverse due to effects around Whitton Lodge. Impacts on the Transport Planning Objectives and vehicle travellers would be moderate beneficial.
- Purple Route (A&B) – Similar to the Blue Route but with a moderate beneficial effect on air quality only.
- Red Route – Similar to Purple Route but with no moderate beneficial effects.
- Orange Route – Similar to Blue Route but with a significant beneficial effect on noise and vibration and a neutral effect on air quality.
- Green Route – Similar to Red Route, but with a significant adverse impact on the water environment.

3.1.2 All of the route options were assessed to have beneficial effects on vehicle travellers and the transport planning objectives of the proposals, as well as noise and local air quality. All of the route options would have a moderate adverse effect on cultural heritage.

3.1.3 The assessment concluded that the Orange and Blue Route was the best option overall. The Orange and Blue route options are essentially the current preferred option, albeit with a few minor amendments that have/are being incorporated as a result of consultations with the highway authorities.

3.2 Preferred Option

3.2.1 The current proposals developed by Parsons Brinckerhoff in 2014 include making use of the existing and already upgraded highway immediately off the A48 at Sycamore Cross. The proposed alignment will go offline at a point approximately 1.5km from the Sycamore Cross signalised junction and follows a southerly course running parallel with the existing A4226.

3.2.2 The proposed alignment will be constructed on a combination of earthworks and 'in cutting'. It will be single carriageway with 1m hardstrips (making the total carriageway 9.3 metres wide) with the exception of the carriageway section approaching Waycock Cross which will be 7.3m wide due to the absence of hardstrips. In order to facilitate access to the farms and properties located on the eastern side of the proposed alignment, underpasses or overbridges may be provided. Access to those plots to the west of the existing A4226 will likely be maintained by retaining the existing A4226 alignment as a side road for access and connective purposes. There will likely be a minimum of two connecting junctions between the old and new alignments.

3.2.3 The proposals will include drainage improvement works, which will require attenuation of water on land adjacent to the new alignment. The proposed alignment re-joins the existing A4226 Five Mile Lane just north of the existing River Waycock bridge. Where the alignment re-joins the A4226 mainline, it ascends at an existing gradient of 8% through Barry Woodlands Site of Special Scientific Interest (SSSI). There are no

proposals to undertake wholesale amendments to the alignment through this final section into the existing Waycock Cross Roundabout. There will, however, be the need to undertake works to improve the drainage for the existing carriageway and potentially to re-route some statutory undertakers apparatus which is currently located on the western side of the A4226, flanking the SSSI.

- 3.2.4 At the time of submitting this EIA Scoping document, the exact route alignment is in development. The main considerations are being given to the location and form of junctions. A separate technical note, which will include consideration of junction strategy along the route, is being prepared and will be submitted in due course.

SECTION 4

CONSULTATION

4 CONSULTATION**4.1 Informal Consultation**

4.1.1 Consultation has been carried out with the Planning Department within Vale of Glamorgan Council to identify what a planning application for the improvements to Five Mile Lane should include.

4.2 Proposed EIA Consultation

4.2.1 The Scoping Report will be submitted to Vale of Glamorgan Council to request a Scoping Opinion. The following consultees will also be consulted regarding the EIA:

- Natural Resources Wales (NRW);
- Glamorgan Gwent Archaeological Trust (GGAT);
- Vale of Glamorgan Council (planning, environmental health, highways, ecology, drainage, landscape);
- Cadw; and
- South Wales Trunk Road Agent (SWTRA).

SECTION 5

AIR QUALITY

5 AIR QUALITY**5.1 Introduction**

5.1.1 The assessment of air quality and climate will be based on Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 1 (HA 207/07).

5.2 Study Area

5.2.1 The study area for the air quality assessment will comprise a 200m width corridor measured 100m either side of the centre of the proposed scheme, or series of buffer zones, along all roads potentially affected by changes in traffic associated with the proposed scheme.

5.2.2 For local air quality impacts, DMRB (HA207/07) provides the following guideline criteria for defining roads affected by a scheme:

- A change in road alignment of $\geq 5\text{m}$; or
- Change in daily traffic flows of ≥ 1000 Annual Average Daily Traffic (AADT); or
- Change in Heavy Duty Vehicle (HDV) flows of ≥ 200 AADT; or
- Change in daily average speed of ≥ 10 km/hr; or
- Change in peak hour speed of ≥ 20 km/hr.

5.2.3 Based on the available traffic information, the study area is proposed to be limited to the 200m corridor along the proposed scheme itself. Any subsequent revisions to the traffic data may necessitate a re-evaluation of the extent of the study area. The exact extent of the study area will be determined in consultation with the relevant organisations when an up to date traffic model is available for analysis.

5.3 Existing Baseline Knowledge

5.3.1 The current air quality experienced on the existing road network varies depending on time of day and year and it is likely the trends found in national traffic data would be relevant and applicable on these sections of roads.

5.3.2 The road surface is generally in good condition and the speed limit is 40mph. Farm traffic and the road geometry serves to slow traffic below the speed limit at points along Five Mile Lane.

5.3.3 Generally, it is predicted the national increase in motorist numbers would increase TNV levels on existing A4226 with or without a scheme implementation. This increase would have the greatest effect at the northern Sycamore Cross junction (recently upgraded) and at the southern Waycock Cross roundabout (extent of improvements at this location subject to results of traffic model) as motorists not intending to use Five Mile Lane will use the improved junctions.

5.3.4 Air quality monitoring will be undertaken to ensure that current air quality levels are assessed.

5.4 Value of Environmental Receptors and Resources

- 5.4.1 Residential properties with a frontage on to the road are considered to be highly sensitive receptors. Businesses and designated sites i.e. Barry Woodlands SSSI, within the study area will also be assessed.

5.5 Potential Effects

- 5.5.1 During the construction phase of the works air quality is likely to temporarily deteriorate for receptors within close proximity of the works, due to associated traffic and construction dust.
- 5.5.2 During operation the effects of the scheme itself are likely to be limited and will be influenced by changes in traffic speed and an increase in vehicle movements.

5.6 Proposed Methodology including Significance Criteria

- 5.6.1 The methodology used to assess the impacts on Local Air Quality as a result of the proposed scheme follows current 'best practice' DMRB guidance published by the Highways Agency as specified in Section 5.1.
- 5.6.2 The process adopts the standard approach using baseline desktop studies to identify potential sensitive receptors likely to be significantly affected by the proposed scheme and the potential effects brought about by the proposed development. The chapter will then judge the magnitude of effects and undertake a qualitative assessment of their significance following implementation.
- 5.6.3 Impacts will be assessed against the baseline (Do Minimum), 1st Year Do Something (worst case scenario) and 15 Year Do Something for each receptor.
- 5.6.4 A description of the mitigation techniques will also be provided.

SECTION 6

CULTURAL HERITAGE

6 CULTURAL HERITAGE**6.1 Introduction**

6.1.1 The aims of this section are to define the study corridor, survey extent and the scope of the assessment of baseline cultural heritage conditions. The scope of survey work and the proposed assessment methodology have been based upon guidance within DMRB Volume 11, Section 3, Part 2 (HA 208/07). Reference will also be made to the Institute for Archaeologists (IfA) guidance for historic environment desk-based assessment (updated 2012). In the absence of any current guidance from Cadw the assessment of the significance of setting on the value of the assets will be undertaken to English Heritage guidelines (2011). Professional judgement will be used at all times.

6.2 Study Area

6.2.1 For the purposes of assessing the implications of the scheme on known and potential cultural heritage assets information from the study area will be assessed.

6.2.2 The assessment of the significance of the settings of heritage assets to the value of the assets will utilise a 1km study area. The assessment of significance and impact will focus on heritage assets lying within a 200m corridor either side of the proposed scheme.

6.2.3 Field testing of computer generated mapping, informing the assessment of visual impact on the settings of more distant heritage assets will be carried out at selected locations within 1km of the scheme.

6.3 Existing Baseline Knowledge

6.3.1 The following baseline condition has been taken from the Cardiff International Airport and Culverhouse Cross Access Improvements DMRB Stage 2 EIA report Vols 1 to 3 (Arup 2009). This included a data search of the National Monuments Record and the Glamorgan and Gwent Sites and Monuments Record.

6.3.2 The landscape covered by the Access Option in general shows high level of prehistoric activity (500,000BC to 10,000BC) of a wide variety of types: domestic, defensive, agricultural, subsistence related, and funerary. Many of these sites are well preserved.

6.3.3 Heritage assets of this date within close proximity to the proposed option include a prehistoric tomb (PRN 275858) which has statutory designation as a Scheduled Monument (SM GM116) and has High value. Similar assets (non-designated) include a Neolithic period (3500BC to 2200BC) long barrow (PRN 00369), two Bronze Age (2200BC to 700BC) standing stones (PRN 00370 and 00372), and an Iron Age (700 to AD 43) enclosure (PRN 03121).

6.3.4 The Roman campaign against the Welsh tribes began in 48 AD and was completed by 79 AD. Roman presence is well evidenced in the general region. The A48 follows the line of a Roman road which connected the forts at Caerleon and Neath. Varying levels of Romanisation are evident, from villas to enclosure sites that are influenced by Iron Age settlement. Site types include inhumations, quarrying, cropmarks and scatters of artefacts such as coin hoards and pottery sherds.

- 6.3.5 Heritage Assets dating to this period lying in close proximity to the scheme include the site of a Roman Villa (PRN 307678) which has statutory designation as a Scheduled Monument (SM GM253). This is a complex site that is present over an extensive area and is considered to be of High Value. Other non-designated assets in the Whitton Lodge area include a hearth (PRN 01434), pottery sherds (PRN 03039) and a silver coin and bones (PRN 03040). These are all suggestive of settlement.
- 6.3.6 The early medieval period (400BC to 1066) is not strongly represented throughout Wales in general, although later in the period the Norman influence was felt strongly. The late medieval (1066 to 1540) was a period of conflict with the English. Generally, the medieval period landscape evidence indicates growth and expansion of the population. Typical features include motte and bailey castles and field systems.
- 6.3.7 Only two heritage assets within close proximity to the scheme date to the medieval periods with these being a defended enclosure (PRN 301256) which is a Scheduled Monument (SM GM 117) and non-designated grange (PRN 03717).
- 6.3.8 The Post-medieval landscape (1540 to 1750) of the Vale of Glamorgan is currently very much still in evidence. The villages and rural landscape of the vale contain a diversity of upstanding structures including farmhouses, churches and inns. The Post-medieval landscape is increasingly industrialised.
- 6.3.9 Assets dating to this period include a quarry (PRN 03952), several limekilns (PRNs 039521, 03051, 02626, 02629 and 02624), a pond (03872), a garden terrace (PRN 03875) and several buildings (PRNs 03870, 41541, 18064). None of these have statutory designation.
- 6.3.10 Although the Industrial period (1750 to 1901) brought about great changes in South East Wales such as the extraction of iron ore and coal, and the increasing expansion of settlements and the growth of transportation networks, there are no assets from this period within close proximity to the proposed scheme. This does not suggest a lack of growth in the local area but rather the crossover of dating from the post-medieval period and into the modern period.
- 6.3.11 Similarly, further impacts on the landscape and growth continued into the modern period (post 1901) including the Cardiff international Airport and the M4 motorway. This was a major period of eradication and endangerment of the historic environment.
- 6.3.12 Although there is not a significant number of isolated Listed Buildings within the general area of the proposed scheme, there are a number of clusters of Listed buildings with these being focused in and around Duffryn (including Duffryn House), St Nicholas, Bonvilston and Walterston.
- 6.3.13 One historic landscape area has been identified in the study area, the east extent of the Llancarfan Character Area. This area comprises the historic landscape area of Bonvilston amalgamated fieldscape, designated by Cadw and the Countryside Council for Wales. It represents an area of land that is largely a Post-medieval agricultural landscape, with some agri-industrial features (limekilns etc), located within the historic parish of Bonvilston. Roads bound the character area to the east, where the A4226 runs north to south from the A48, and to the west, where a more minor road runs north to southwest from the A48 down to the junction at Pancross.

6.4 Value of Environmental Receptors and Resources

6.4.1 Cottrell Park Standing Stone, Whitton Lodge Roman Villa and the medieval defended enclosure are the only features considered to be of High value.

6.4.2 Several inhumation burials have been discovered in the Whitton Lodge area and are considered to be of Medium value as they may indicate the location of more extensive cemetery sites. The remaining non-designated assets are of Low to Negligible value. The potential for previously unknown buried archaeological remains to be present is High.

6.4.3 The Listed Buildings are considered to have High value. The non-designated historic buildings are considered to have low to negligible value.

6.5 Potential Effects

6.5.1 During construction It is possible there will be some limited effects on the setting of all of the Scheduled Monuments and for Whitton Lodge Roman Villa in particular. Similarly, it is possible there will be some limited effects on the setting of all of the clusters of Listed Buildings. The Historic Landscape Character may also be affected.

6.5.2 There is potential for previously unknown archaeological assets to be impacted upon by the construction works. There is similar potential for a number of Low value assets to be affected.

6.5.3 It is possible there will be some limited effects on the setting of all of the Scheduled Monuments and for Whitton Lodge Roman Villa in particular during operation. Similarly, it is possible there will be some limited effects on the setting of all of the clusters of Listed Buildings. The Historic Landscape Character may also be affected. Mitigation through design could potentially reduce the significance of any potential effects during the operation phase.

6.6 Proposed Methodology including Significance Criteria

6.6.1 The potential for effects on archaeological remains, the built heritage and the historic environment are assessed on the criteria outlined in the tables below (with reference to DMRB (HA 208/07)).

6.6.2 Initially, the significance of the Heritage Assets is judged in a neighbourhood (Negligible), local (Low), regional (Medium), national and international context (High), which results in the cultural sensitivity of the asset being determined along with the appropriate form of mitigation (Table 6.1, below). Once the *value is established* then the archaeological, historic, architectural and aesthetic interests are discussed.

Table 6.1 Criteria for Evaluating Importance of Archaeological Sites and Monuments (i.e. the Importance of the Receptor).

Importance of Receptor	Equivalent to:
High	Sites of National Importance, Scheduled Monuments, Grade I and II* Listed Buildings, World Heritage Sites
Medium	Cadw Registered Parks and Gardens, Conservation Areas, Historic or Archaeological sites of Regional or County Importance, Grade II Listed Buildings and locally designated buildings of historical importance, sites of high archaeological importance.

Importance of Receptor	Equivalent to:
Low	Locally Important Historic or Archaeological Sites, Sites with a local value for education or cultural appreciation, Sites which are so badly damaged that too little remains to justify inclusion into a higher grade, sites of medium archaeological importance.
Negligible	Sites or features with no significant value or interest, Sites which are so badly damaged that too little remains to justify inclusion into a higher grade, sites of low archaeological importance.

6.6.3 Table 6.1 is a general guide to the attributes of Heritage Assets and it should be noted that not all the qualities listed need be present in every case and professional judgement is used in balancing the different criteria.

6.6.4 Harm to significance is the basis of assessing impact. In order to assess the level of harm or potential impact of any future development on built heritage or buried archaeological remains, consideration must be afforded to:

- Assessing in detail any impact and the significance of the effects arising from any future development of the Application Area;
- Reviewing the evidence for past impacts that may have affected the archaeological sites of interest identified during the desk-based assessment; and
- Outlining suitable mitigation measures, where possible at this stage, to avoid, reduce, or remedy adverse impacts.

6.6.5 Key impacts are those that would potentially harm the significance of the heritage asset. Each potential impact will be determined as the predicted deviation from the baseline conditions, in accordance with current knowledge of the site and the proposed development. Although the impact is assessed in terms of the sensitivity of the asset to the magnitude of change or potential scale of harm during the proposed development, consideration is afforded to the heritage values of the assets. The magnitude, or scale of impact on the significance is often difficult to define, but will be termed as large harm, medium harm, small, or negligible, as shown in Table 6. 2, below

Table 6.2: Magnitude of Impact

Magnitude of Impact	Description of Change
Large	Complete destruction or change to the site or feature resulting in a fundamental change in our ability to understand and appreciate the resource and its historical context and setting
Medium	Change to the site or feature resulting in an appreciable change in our ability to understand and appreciate the resource and its historical context and setting
Small	Change to the site or feature resulting in a small change in our ability to understand and appreciate the resource and its historical context and setting
Negligible	Negligible or no material changes to the site or feature. No real change in our ability to understand and appreciate the resource and its historical context and setting

6.6.6 The interaction of the potential scale of impact (Table 6.2) and the sensitivity of the Heritage Asset (Table 6.1) produce the impact significance. This may be calculated by using the matrix shown in Table 6.3, which is included to allow an objective assessment to be presented.

Table 6.3: Significance of Environmental Effect

Magnitude of Impact	Importance of Receptor			
	High	Medium	Low	Negligible
Large	Very Significant	Significant	Moderate/Slight	Slight
Medium	Significant	Moderate	Slight	Slight/Neutral
Small	Moderate/Slight	Slight	Slight/Neutral	Slight/Neutral
Negligible	Slight	Slight/Neutral	Slight/Neutral	Neutral

6.6.7 Once the contribution of the setting has been determined and the potential attributes of the proposed development upon it have been identified, the contribution needs to be evaluated in order to determine the magnitude of the potential impact. This is undertaken using the definitions presented in Table 6.3 above, and through site visits.

SECTION 7

ECOLOGY AND NATURE CONSERVATION

7 ECOLOGY AND NATURE CONSERVATION

7.1 Introduction

7.1.1 The aims of this section are to define the study corridor, survey extent and the scope of the assessment of baseline ecological conditions. The scope of survey work and the proposed assessment methodology has been based upon guidance within DMRB Volume 11, Section 2; DMRB Volume 11, Section 3, Part 4; DMRB Volume 11, Section 4, Part 1; and supplemented by Interim Advice Note (IAN) 130/10 (not adopted in Wales).

7.2 Study Area

7.2.1 For the purposes of assessing the implications of the scheme on European designated sites, desk study information will be obtained for the scheme's 2km radius. This will be extended to 30 km radius for Special Areas of Conservation (SACs) where bats are the qualifying interest. Otherwise, the 'study area' will comprise a 1 - 5 km radius, consisting of aerial photograph analysis and collection of historic data on protected or notable sites and species.

7.2.2 The size of the 'survey area' will be based upon the scheme's anticipated zone of influence and the nature of the surrounding habitats. A survey corridor is proposed either side of the centre line of the scheme, expanding where appropriate to investigate features of particular interest particular to the habitats and species being surveyed for.

7.3 Existing Baseline Knowledge

7.3.1 The scheme is set within an agricultural landscape comprising mostly of improved, sheep-grazed pasture and arable land separated by well managed native hedgerows and scattered trees. There are a number of broad-leaved woodland blocks along the route corridor which link up with the hedgerow network. Few standing and open water habitats also occur within the study area. Between the River Waycock and Waycock Cross are several woodland blocks which fall within the Barry Woodlands SSSI. The existing A4226 alignment bisects two such blocks.

7.3.2 Surveys were undertaken in 2008/09 but are now considered to be out of date and therefore will be reviewed and where appropriate updated. Further surveys may be required following on from discussions with statutory bodies and the undertaking of a desk study. It is recognised that there is potential for a number of protected species as set out in Section 7.6 below.

7.4 Value of Environmental Receptors and Resources

7.4.1 The scheme would result in the loss of improved grassland and arable habitats of limited ecological interest although severing/removal of sections of hedgerow and potentially some loss of woodland habitat (within the Barry Woodlands SSSI) is also likely to arise. The design should therefore seek to avoid (where possible) or minimise the amount of hedgerow/woodland removed with appropriate mitigation provided where possible.

7.4.2 Protected species that could potentially be affected include amphibians, reptiles, birds, bats, dormice, water voles, aquatic invertebrates and the riverine habitats of the River Waycock. These species are potentially of high value. Although previous survey information has not confirmed the presence of dormice, further surveys will be

repeated in 2014. Similarly, only limited evidence of use by badgers was reported and consideration of effects on this species was limited to the woodland areas.

7.5 Potential Effects

7.5.1 The greatest ecological impact would be associated with the loss of established habitats necessary to accommodate the scheme. Effectively this would reduce the available habitat for any species retained, potentially leading to local loss, degradation or fragmentation of populations of flora and fauna.

7.5.2 In addition, these species would be subject to temporary increased disturbance from construction vehicles as well as associated increases in noise, lighting and pollution risk due to site activities.

7.5.3 During scheme operational phase, foraging bats and nesting birds could potentially be impacted by the loss of hedgerows and fragmentation of habitat. In addition, lighting provision at junctions could also impact on bat foraging/feeding behaviour.

7.5.4 Indirect impacts arising from a reduction in water quality from e.g. highway run-off, may affect aquatic invertebrates as the quality is good at present.

7.6 Proposed Methodology including Significance Criteria

7.6.1 DMRB Volume 11, Section 2, Part 5 and IAN 130/10 provide a methodology for the consideration of significance of effects (for those receptors identified as requiring detailed assessment). It should be noted that IAN 130/10 has not been formally adopted in Wales. However, it is considered to provide the most relevant guidance for assessing the ecological impacts of highways schemes and is therefore proposed as the reference point in this instance.

7.6.2 Potential impacts will be characterised through the:

- probability of occurrence: certain, probable, unlikely;
- complexity: whether direct, indirect, cumulative;
- extent: area measures and percentage of total loss;
- size: description of level of severity of influence;
- duration: permanent or temporary in ecological terms;
- timing and frequency: important seasonal and/or life-cycle constraints and any relationship with frequency considered; and as being
- reversible or not reversible; and/or
- positive (beneficial) or negative (adverse)

7.6.3 Guidelines on ecological impact assessment note the difficulty of devising valuation criteria that can be consistently applied to designated sites, habitats and species in the same way in all parts of the country. It recommends an approach to valuation that involves teasing apart the different values that can be attached to the ecological receptors under consideration. However, it is beneficial to give examples of the sorts of criteria used in the valuation process, summarised in Table 7.1, which has been adapted from a similar table included in several of the earlier drafts of the IEEM guidelines. DMRB Volume 11, Section 2, Part 5 and IAN 130/10 provide a methodology for the consideration of significance of effects (for those receptors

identified as requiring detailed assessment) which has been applied in this assessment.

Table 7.1 Examples of Criteria used to Evaluate Ecology Receptors

Level of Value	Examples of definitions
International	An internationally important site, e.g. Special Protection Area (SPA), Special Area of Conservation (SAC) or Ramsar site (or a site considered worthy of such designation); a regularly occurring population of an internationally important species (listed on Annex IV of the Habitats Directive); 1% of the known international population of a particular species.
National (UK)	A nationally designated site, e.g. SSSI, or a site considered worthy of such designation; a viable area of a habitat type listed in Annex 1 of the Habitats Directive, or smaller areas of such habitat which are essential to maintain the viability of a larger whole; any regularly occurring population of a nationally important species, e.g. listed on Schedules 5 and 8 of the Wildlife & Countryside Act (1981); a feature identified as of priority in the UK BAP; 1% of the known UK population of a particular species.
County	Areas of internationally or nationally important habitats which are degraded but are considered readily restored; viable areas of key habitat identified in Local BAPs, or smaller areas of such habitat which are essential to maintain the viability of a larger whole; a site designated as a Wildlife Site or Site of Nature Conservation Interest (SNCI); a regularly occurring, locally significant number of a nationally important species; 1% of the known population of a particular species within the county.
District	Areas of habitat identified in a sub-county (district/borough) or in the relevant Natural Area profile; district sites that the designating authority has determined meet the published ecological selection criteria for designation, including Local Nature Reserves; sites or features that are scarce within the district or borough or which appreciably enrich the district or borough habitat resource; a diverse or ecologically valuable hedgerow network; a regularly occurring population of a species which is large enough to be considered to be of district level importance.
Local	Areas of internationally or nationally important habitats which are degraded and have little or no potential for restoration; a good example of a common or widespread habitat in the local area; a regularly occurring population of a species which is large enough to be considered to be of district level importance.
Neighbourhood (site and its vicinity, including areas of habitats)	Areas of heavily modified or managed vegetation of low species diversity or low value as habitat to species of nature conservation interest; common and widespread species

Level of Value	Examples of definitions
contiguous with or linked to those on site)	
Negligible	No intrinsic nature conservation value associated with habitat. Generally these are areas of hard standing or buildings with no nature conservation interest.

7.6.4 Ecological receptors are usually nature conservation sites, habitats and species. Impacts can be permanent or temporary, direct or indirect, and can be cumulative. These factors are brought together to assess the magnitude of the impact on particular valued ecological receptors and, wherever possible, the magnitude of the impact is quantified. Professional judgment is then used to assign a value to the effects on the receptors to one of four classes of magnitude, defined in Table 7.2.

Table 7.2 Definition of Magnitude

Magnitude	Definition
High	A permanent or long-term effect on the extent or size or integrity of a site, habitat, species assemblage or community, population or group. If adverse, this is likely to threaten its sustainability; if beneficial, this is likely to enhance its conservation status.
Medium	A permanent or long-term effect on the extent or size or integrity of a site, habitat, species assemblage or community, population or group. A short-term effect which will adversely affect the integrity of a receptor in a permanent manner. If adverse, this is unlikely to threaten its sustainability; if beneficial this is likely to be sustainable but is unlikely to enhance its conservation status.
Low	A permanent, long-term reversible or short-term effect on a site, habitat, species assemblage or community, population or group whose magnitude is detectable but will not threaten/change its conservation status.
Negligible	A short-term reversible effect on the extent, size or integrity of a site, habitat, species assemblage or community, population or group that is within the normal range.

7.6.5 Significance of effects will be deduced from assessing the value of the receptors against any residual impact (taking into account mitigation). In line with the guidelines set out within the DMRB, significance will be addressed as neutral, slight, moderate, large or very large (refer to Table 7.3).

Table 7.3 Significance of Effects (summarised from IAN 130/10)

Significance Category	Typical descriptors
Very Large	An impact on one or more receptor(s) of International, European, UK or National Value
Large	An impact on one or more receptor(s) of Regional Value

Significance Category	Typical descriptors
Moderate	An impact on one or more receptor(s) of County Value
Slight	An impact on one or more receptor(s) of Local Value
Neutral	No significant impacts on key nature conservation receptors

7.6.6 The assessment will be informed by a number of ecological field surveys to be carried out over the course of 2014. The field surveys will include an Extended Phase I Habitat survey in addition to targeted surveys for species (and/or habitats) likely to be present within the scheme footprint which could be subject to development impacts. Surveys were undertaken in 2008/09 but are now considered to be out of date and therefore will be repeated including:

- Amphibian survey (including great crested newts);
- Dormouse nest tube survey;
- Bat activity surveys;
- Bat roost inspections/tree climbing inspections; and
- Aquatic invertebrate surveys.

7.6.1 Bird surveys are not considered necessary. Updated data from South East Wales Biodiversity Records Centre (SEWBRc) will also be obtained and if necessary local recording groups contacted.

SECTION 8

LANDSCAPE AND VISUAL EFFECTS

8 LANDSCAPE AND VISUAL EFFECTS**8.1 Introduction**

8.1.1 The assessment will be undertaken in accordance with current best practise guidelines as set out within:

- Guidelines for Landscape and Visual Impact Assessment GLVIA 3rd edition 2013 (Landscape Institute/ Institute of Environmental Management & Assessment);
- DMRB – Interim Advice Note 135/10 (W) landscape and Visual Effects (2014); and
- Natural Resources Wales LANDMAP methodology:
 - Guidance Note 1: LANDMAP and Special Landscape Areas (May 2013);
 - Guidance Note 3: LANDMAP using LANDMAP for landscape and Visual Impact assessments of onshore wind turbines (May 2013);
 - Guidance Note 4: LANDMAP and the Cultural landscape (May 2013).

8.2 Study Area

8.2.1 The study area for landscape effects will be covered by the proposed scheme site and the wider landscape context within which the project may influence landscape character.

8.2.2 The study area for visual effects will extend to the area from which the project could be visible. The Zone of Visual Influence (ZVI) will be established to show the area of land from which there could be a view of the proposed project including vertical changes and traffic.

8.3 Existing Baseline Knowledge

8.3.1 The Vale of Glamorgan is an attractive and productive lowland landscape on the north coast of the Severn estuary and Bristol Channel. The county is bordered by the large urban centres of Cardiff to the east and Bridgend to the west. The M4 lies to the north and coast to the south. 70% of the Vale of Glamorgan is agricultural land.

8.3.2 There are three broad character types within the Vale in visual terms: the Rural Vale; the South East Developed Vale; and the Coast. The Rural Vale is further divided into the North Rural Vale and the South Rural Vale, divided by the A48 Roman Road. Five Mile Lane forms a broad boundary between two variations of the South Rural Vale connecting to Barry within the South East Developed Vale.

8.3.3 Although the landscape has been classified into broadly homogenous units, or Landscape Character Areas (LCAs), the landscape displays common characteristics across the study area:

- Land cover and landscape pattern are closely related to elevation and topography;
- Main land use is pastoral agriculture; and

- Landscape trends relate to changing agricultural practices (removal of hedgerows to create larger fields or to replace with fences) and small scale infilling (new dwellings around existing farmsteads).

8.4 Value of Environmental Receptors and Resources

8.4.1 The landscape within the Vale of Glamorgan is considered to be unique within the South East Wales Region so large areas have been classified as Special Landscape Areas (SLAs) - a local landscape designation. The route of the current Five Mile Lane forms the boundary between two SLAs: Dyffryn Basin & Ridge Slopes; and Nant Llancafarn. This indicates that the landscape is particularly sensitive.

8.4.2 As part of the assessment a ZVI (Zone of Visual influence) will be under taken to help identify those locations from which the scheme will be visible. This will then inform the locations of key views and key receptors in which to carry out a more detailed analyse on to establish the significance of effect.

8.4.3 Those whose visual amenity would be most affected by the proposals are those that live in the dwellings alongside the existing Five Mile Lane, and people travelling through the landscape along the route corridor. Other potential receptors include walkers, equestrians and golfers.

8.5 Potential Effects

8.5.1 There is the potential for some degree of adverse effect on landscape character and visual amenity as a result of scheme construction. However, it is felt that, with appropriate mitigation, these effects could be effectively minimised and in some places could lead to a positive impact on the receptor in the long term.

8.6 Proposed Methodology including Significance Criteria

8.6.1 Interim Advice Note (IAN) 135/10(W) provides a methodology for consideration of the significance of identified effects in accordance with the principles set out in DMRB Volume 11, Section 2. Potential impacts will be identified and the magnitude of these assessed. Evaluation of the significance of the landscape and visual effects of the project will be deduced from assessing the sensitivity of the landscape and visual receptors against the magnitude of impact, taking into account mitigation.

8.6.2 The magnitude of impact (which could be either adverse or beneficial) will be estimated on the basis of expert professional judgement. In assessing the magnitude of any landscape impact due regard is given to the scale, nature and duration of the impact. Indicative criteria for guidance are given in Table 8.1 below.

Table 8.1 Magnitude of Landscape Impact

Magnitude of Impact	Definition
Major	<p>Total loss or major change to key element of the landscape resource to the extent that there is a fundamental change to landscape character.</p> <p>A permanent or long term impact.</p> <p>.e. introduction of elements considered to be totally uncharacteristic when set within the attributes of the receiving landscape</p>

Magnitude of Impact	Definition
Moderate	<p>Partial loss or change to key elements, features or characteristics of the landscape resource to the extent that there is a partial change to landscape character.</p> <p>A long term impact that can be partially mitigated to reduce the impact.</p> <p><i>i.e.</i> introduction of elements that may be prominent but may not necessarily be considered to be substantially uncharacteristic when set within the attributes of the receiving landscape</p>
Minor	<p>Minor loss or change to key elements, features or characteristics of the landscape resource to the extent that there may be some slight perception of change to landscape character.</p> <p>Short term effect that in part can be reversed through appropriate mitigation.</p>
Negligible	<p>Very minor loss or change to elements, features or characteristics of the landscape resource and there would be no fundamental change to landscape character.</p> <p>A short term reversible impact.</p>
No Change	<p>No noticeable loss, damage or alteration to character or features or elements.</p>

8.6.3 Typical descriptors of landscape sensitivity are given in Table 8.2.

Table 8.2 Typical Descriptors of Landscape Sensitivity

Sensitivity category	Typical Descriptors of Sensitivity
High	<ul style="list-style-type: none"> • Of high quality with distinctive elements and features making a positive contribution to character and sense of place • Likely to be designated • Areas of special recognised value through use, perception or historic and cultural associations • Likely to contain features and elements that are rare and could not be replaced • Low capacity to accommodate change
Moderate	<ul style="list-style-type: none"> • Comprised of common place element and features creating generally unremarkable character but with some sense of place. • Locally designated or their value may be expressed through non statutory local publications • Containing some features of value through use, perception or historic and cultural associations. • Likely to contain some features and elements that could not be replaced. • Medium capacity to accommodate change

Table 8.2 Typical Descriptors of Landscape Sensitivity

Sensitivity category	Typical Descriptors of Sensitivity
Low	<ul style="list-style-type: none"> • Comprised of some features and elements that are discordant or in decline, resulting in indistinct character with little or no sense of place. • Not designated • Likely to contain few if any features and elements that could not be replaced. • High capacity to accommodate change

8.6.4 Typical descriptors of the significance of effect are given in Table 8.3.

Table 8.3 Typical descriptors of the Significance of Effect Categories

Significance category	Typical Descriptors of Effect
Large adverse	<p>The project would:</p> <ul style="list-style-type: none"> • Be at considerable variance with the character (including quality and value) of the landscape. • Degrade or diminish the integrity of a range of characteristic features and elements. • Damage a sense of place.
Moderate adverse	<p>The project would:</p> <ul style="list-style-type: none"> • Conflict with the character (including quality and value) of the landscape. • Have an adverse impact on characteristic features and elements. • Diminish a sense of place.
Slight adverse	<p>The project would:</p> <ul style="list-style-type: none"> • Not quite fit the character (including quality and value) of the landscape. • Be at variance with characteristic features and elements. • Detract from a sense of place.
Neutral effect	<p>The project would:</p> <ul style="list-style-type: none"> • Maintain the character (including quality and value) of the landscape. • Blend with characteristic features and elements. • Enable a sense of place to be retained.
Slight beneficial	<p>The project would:</p> <ul style="list-style-type: none"> • Compliment the character (including quality and value) of the landscape. • Maintain or enhance characteristic features and elements. • Enable some sense of place to be restored.

Table 8.3 Typical descriptors of the Significance of Effect Categories

Significance category	Typical Descriptors of Effect
Moderate beneficial	<p>The project would:</p> <ul style="list-style-type: none"> • Improve the character (including quality and value) of the landscape. • Enable the restoration of characteristic features and elements partially lost or diminished as a result of changes from inappropriate management or development. • Enable a sense of place to be restored.
Large beneficial	<p>The project would:</p> <ul style="list-style-type: none"> • Enhance the character (including quality and value) of the landscape • Enable the restoration of characteristic features and elements lost as a result of changes from inappropriate management or development • Enable a sense of place to be restored.

8.6.5 The sensitivity of visual receptors is categorised on a three point scale ranging between high, medium and low as set out in Table 8.4.

Table 8.4 Sensitivity of Visual Receptors

Sensitivity	Receptors
High	<p>Viewers with proprietary/high interest in their everyday visual environment and/or with prolonged and regular viewing opportunities. Such receptors would include:</p> <ul style="list-style-type: none"> • Residential properties • Users of Public Rights of Ways or other recreational trails e.g. National Trails • Users of outdoor recreational facilities whose attention or interest is focused on the landscape i.e. Country Parks, National Trust or other access land
Medium	<p>Viewers with moderate interest in their environment, and discontinuous and/or irregular viewing periods. Such receptors would include:</p> <ul style="list-style-type: none"> • Users engaged in outdoor sport or recreation other than appreciation of the landscape (i.e., hunting, shooting, golf, water-based activities) • Outdoor workers • Schools and other institutional buildings, and their outdoor areas.
Low	<p>Viewers with a passing interest in their surroundings and momentary viewing periods. Such receptors include:</p> <ul style="list-style-type: none"> • Drivers/travellers and/or passengers of moving vehicles including trains.

Table 8.4 Sensitivity of Visual Receptors

Sensitivity	Receptors
	<ul style="list-style-type: none"> • People at their place of work, including agricultural workers, road users or those already impacted by intrusive features.

8.6.6 The scale by which magnitude of the visual impacts is judged is set out in Table 8.5.

Table 8.5 Magnitude of Visual Impact and Typical Descriptors

Magnitude of impact	Typical criteria descriptors
Major	The project, or a part of it, would become the dominant feature or focal point of the view.
Moderate	The project, or a part of it, would form a noticeable feature or element of the view which is readily apparent to the receptor.
Minor	The project, or a part of it, would be perceptible but not alter the overall balance of features and elements that comprise the existing view.
Negligible	Only a small part of the project would be discernible, or it is at such a distance that it would form a barely noticeable feature or element of the view.
No change	No part of the project, or work or activity associated with it, is discernible.

8.6.7 In summary the assessment will follow the following process;

Landscape

- Baseline; including an assessment of the value of the landscape, both of character areas and features and elements;
- Assess sensitivity of landscape with reference to its capacity to accommodate change arising from the project;
- Assess magnitude of impacts on landscape; features, elements and character, with reference to; scheme design, including bridges, approach roads, cuttings and embankments, scale of change, nature of change;
- Develop mitigation to reduce potential adverse effects;
- Evaluate significance of landscape effects; and
- Report residual landscape effects.

Visual

- Baseline; identification of visual receptors and their sensitivity to change; this will involve the preparations of a ZVI – zone of visual influence which in turn will then be used to identify;

- Key viewpoints in which to carry out more detailed assessments.
- Residential properties affected by the proposal
- PROW affected by the proposal
- Consultation with the statutory bodies will be carried out at this time to help identify and agree viewpoints that are most characteristics of the area;
- Assess magnitude of visual impacts with reference to scheme design, including bridges, approach roads, cuttings and embankments, scale of change, nature of change;
- Develop mitigation to reduce potential adverse effects;
- Evaluate significance of visual effects; and
- Report residual visual effects for each receptor.

8.6.8 Landscape effects will be assessed by comparing the predicted effects of the scheme with the situation if the project were not to proceed (i.e. the 'Do Minimum'), using the following scenarios;

- On a winters day during construction when mitigation will be restricted to offsite and advanced planting where possible to ascertain maximum effect;
- In the winter of the year of opening (to represent a maximum effect situation, before any planted mitigation can take effect), taking account of the completed project and the traffic using it; and
- In the summer of the fifteenth year after project opening (to represent a least effect scenario, where any planted mitigation measures can be expected to be reasonably effective), taking account of the completed project and the traffic using it.

8.6.9 Visual effects will be assessed using the following scenarios;

- During the construction period, assuming a maximum visibility or maximum perceived change situation (i.e. when construction activity is at its peak for any given view);
- A winter's day in the year that the project would open to traffic or be fully operational (i.e. with noise/visual screens and mounds in place but before any planted mitigation has begun to take effect). This is usually a reflection of the operationally non-fully mitigated/maximum visibility scenario; and
- A summer's day in the fifteenth year after opening (i.e. when the planted mitigation measures can be assumed to be substantially effective). This is usually a reflection of the near fully mitigated scenario under normal conditions.

8.6.10 Landscape and visual impacts will be considered both in terms of day-time and night-time effects.

SECTION 9

NOISE AND VIBRATION

9 NOISE AND VIBRATION**9.1 Introduction**

9.1.1 This section sets out the methodology with which noise and vibration will be assessed, the baseline conditions as they are currently understood and the predicted effects. The assessment of noise and vibration will be undertaken in accordance with BS5228 and DMRB Volume 11, Section 3, Part 7 (HD 213/11).

9.2 Study Area

9.2.1 The study area, based on DMRB methodology, will be 600m from the centre line of the road at either side, including side roads that are likely to be affected by any changes in traffic flows.

9.3 Existing Baseline Knowledge

9.3.1 The current traffic noise and vibration level experienced on the existing road network varies depending on time of day and year, and it is likely the trends found in national traffic data would be relevant and applicable on these sections of roads.

9.3.2 The road surface is generally in good condition and the speed limit is 40mph. Farm traffic and the road geometry serves to slow traffic below the speed limit at points along Five Mile Lane.

9.3.3 In places, hedgerows and mature vegetation help to attenuate traffic noise.

9.3.4 Generally, the Transport Assessment estimates that the national increase in motorist numbers would increase traffic levels on existing A4226 with or without a scheme implementation. This increase would have the greatest effect at the northern Sycamore Cross junction and at the southern Waycock Cross roundabout as motorists not intending to use Five Mile Lane will use the improved junctions.

9.4 Value of Environmental Receptors and Resources

9.4.1 Noise Sensitive Receptors (NSRs) include approximately 90 private residences with a frontage on to the road along the route corridor.

9.4.2 The Welsh Hawking Centre is not considered to be an NSR as the effect of the upgrading of the route is unlikely to result in any significant changes in noise levels at that location. Barry College of Further Education is also not considered to be an NSR for the same reason outlined above.

9.5 Potential Effects

9.5.1 The impacts caused during the construction phase could include constant above average noise and vibration from the works heavy plant and frequent sharp increases in levels caused by sudden impacts such as piling. Construction impacts are temporary and generally more localised than other impacts.

9.5.2 Following the installation of appropriate mitigation along the route corridor, the scheme is unlikely to produce a significant adverse effect to receptors along its whole length.

9.6 Proposed Methodology including Significance Criteria

- 9.6.1 A noise and vibration assessment will be undertaken to estimate the effects of the operation of the route on the local noise environment. The assessment will be prepared in line with the principles described in the Planning Policy Wales Edition 6.
- 9.6.2 A baseline noise survey will be undertaken to establish the existing noise climate representative of the NSRs. In addition, the results of the survey will assist the preparation of the noise model. The methodology will be discussed and agreed with VoG prior to commencement of the baseline survey. The noise survey will be undertaken following recommendations in BS7445.
- 9.6.3 The likely noise & vibration impacts arising from the construction phase of the scheme will be assessed in accordance with BS5228 -1&2 (2009). This standard provides a methodology for the assessment and control of noise from construction operations. The standard contains detailed information on noise reduction measures and promotes the 'best practicable means' (BPM) approach to control noise and minimise associated impacts on local residents.
- 9.6.4 The significance of impacts during the construction phase will be assessed based on the 'ABC' method described in BS5228. This method presents the threshold of significant effects at dwellings due to construction noise. Mitigation measures including BPM will be recommended, as required.
- 9.6.5 A computer noise model using CadnaA will be prepared to determine the potential noise impact arising from the operational phase of the Scheme. The prediction and assessment of noise from the scheme will be done in accordance with DMRB and Calculation of Road Traffic Noise (CRTN), published by the Department of Transport and the Welsh Office in 1988. This prediction method requires a good understanding of the traffic flows, percentage heavy vehicles (HVs) and traffic speeds amongst other factors. Information from the Transport Assessment will be used to inform the road traffic noise level predictions.
- 9.6.6 The quantification and assessment of the potential noise and vibration impacts of the proposed scheme will be assessed by a combination of site surveys, desktop studies, consultations and predictions. The assessment for the operation phase of the scheme will be based upon the "detailed" assessment methodology set out in Chapter 3 and Annex 1 of DMRB 2.3.7 (HA 213/11) dated February 2011. A detailed assessment is considered to be the most appropriate assessment methodology to use when undertaking assessments involving the final scheme option, and noise impacts are likely.
- 9.6.7 The overall magnitude of short term and long term operational impacts will be reported using the classifications in Table 9.1 and 9.2. Both tables report magnitudes of impact for both increased and decreased traffic volumes.

Table 9.1 Classification of Magnitude of Operational Noise Impacts in the Short Term

Noise Change, LA10,18h	Magnitude of Impact
0	No Change
0.1 - 0.9	Negligible
1 - 2.9	Minor
3 - 4.9	Moderate
5+	Major

Table 9.2 Classification of Magnitude of Operational Noise Impacts in the Long Term

Noise Change, LA10,18h	Magnitude of Impact
0	No Change
0.1 - 2.9	Negligible
3 - 4.9	Minor
5 - 9.9	Moderate
10+	Major

9.6.8 The increases and decreases in traffic volumes will then be judged according the sensitivity of receptors along the route corridor.

SECTION 10

COMMUNITY AND PRIVATE ASSETS

10 COMMUNITY AND PRIVATE ASSETS**10.1 Introduction**

10.1.1 This section sets out the methodology for assessing the impact on the existing community and local private assets. It also describes the existing baseline information and potential likely effects. The assessment of community and private assets will be undertaken in accordance with parts of DMRB Volume 11, Section 3, Part 8 and Part 6.

10.2 Study Area

10.2.1 The impact of the proposals on the baseline land uses will be considered at two geographic levels:

- The proposed development site itself; and
- Within a 1km buffer zone from the proposed scheme centre line.

10.2.2 The scope of the assessment will be as set out in Part 6 of Section 3 of DMRB Volume 11.

10.2.3 Land Use will cover the following:

- Private Property;
- Land Used by the Community;
- Development Land; and
- Agricultural Land.

10.2.4 Effects on the community will consider the presence and location of key community facilities and any changes in the ability of local people to reach these facilities by non-motorised methods. General community effects including on community facilities of importance or significance will be considered within 1km of the route corridor. The boundary of the study area may be extended for facilities of particular importance or significance that serve vulnerable members and/or a high proportion of the community.

10.3 Existing Baseline Knowledge

10.3.1 The dominant land use in the study area is agriculture, which in turn is influenced by geology and soils. There are areas of best and most versatile agricultural land (Agricultural Land Classification (ALC) Grades 2 and 3a) within the study corridor.

10.3.2 Small woodlands are included within the study corridor, frequently occupying valley sides. Most woodland is privately owned rather than commercial and there are also a good distribution of copses and hedgerow trees. A significant proportion of the woodland is designated as Ancient Woodland or SSSI.

10.3.3 Community facilities include the Amelia Trust Farm (Whitton Rosser Farm), located to the west of Five Mile Lane. The Farm is open to the public with no admission charge. The volunteer charity supports adults with learning difficulties and disadvantaged young people. The Welsh Hawking Centre is a visitor attraction located close to Five

Mile Lane and adjacent to the Barry woodland SSSI. Cottrell Park Golf Club lies close to the Sycamore Cross junction.

10.3.4 There are a number of public rights of way which connect with Five Mile Lane, however, none will be affected by the scheme. There are no cycle routes anywhere in the study area.

10.3.5 Dyffryn Gardens, a Grade I Listed park and garden covering an area of just over 22 hectares, is a visitor attraction. The Cory Education Centre, within the grounds, is used for talks and other educational activities.

10.3.6 There are also a number of buildings owned by Barry College of Further Education within the study area and a private golf course (Brynhill Golf Course) on the outskirts of Barry.

10.4 Value of Environmental Receptors and Resources

10.4.1 In total twenty five identified landholdings border Five Mile Lane and may be affected by loss of land, or change or loss of access. There is likely to be some best and most versatile agricultural land lost which is of high value.

10.5 Potential Effects

10.5.1 Construction of the scheme would involve temporary loss of land for construction compounds, working areas and haulage routes. There would be permanent loss of land in some areas occupied by the improvement works to Five Mile Lane during operation.

10.5.2 No public rights of way will be affected by the scheme, although access to them from Five Mile Lane may be altered temporarily during construction and permanently during operation.

10.5.3 Operational improvements to five mile lane could make the route more 'cyclist-friendly', although there will be no new specific facilities provided as part of the scheme.

10.5.4 There would be no impacts on local communities with regards to access to key facilities.

10.6 Proposed Methodology including Significance Criteria

10.6.1 Discussions with landowners will inform the assessment of the impact of land take and any private and commercial interests.

10.6.2 Magnitude of impact will be measured on a five-point scale according to example criteria set out in Table 10.1.

Table 10.1 Magnitude of Community Impacts

Magnitude	Typical Criteria Descriptors
Major	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (Adverse).
Moderate	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements (Adverse).

Magnitude	Typical Criteria Descriptors
Minor	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (Adverse).
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse).
No change	No loss or alteration of characteristics, features or elements; no observable in either direction.

10.6.3 The measures will inform an assessment on the significance of effects of the scheme on community and private assets as set out in Table 10.2.

Table 10.2 Significance Criteria of Community Effects

Category	Description of Effect
Very Large	The proposed scheme would result in an adverse effect due to the damaging impact and loss of property/land that is of international or national or regional importance or rarity. A serious change in a site or feature of district importance may also be included.
Large	These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.
Moderate	These beneficial or adverse effects may be important, but are not likely to be key decision making factors. The cumulative effects of such issues may become a decision making issue if leading to an increase in the overall adverse effect due to the loss of land uses of local importance.
Slight	The beneficial or adverse effects may be raised as local issues. They are unlikely to be critical in the decision making process, but are important in enhancing the subsequent design of the project.
Neutral	No effects predicted or those identified are beneath the levels of perception, within normal bounds of variation or within the margin of forecasting error.

10.6.4 Table 10.3 overleaf sets out for the significance of the identified effects is judged when taking into account the magnitude of the impact and the sensitivity of the receptor.

Table 10.3 Significance of Effect Criteria Descriptors

		Magnitude of Impact				
		No Change	Negligible	Minor	Moderate	Major
Environmental Value (Sensitivity)	Very High	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
	High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
	Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
	Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
	Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

10.6.5

In addition to considering the significance of effects the assessment will also define the effects as either direct or indirect according to the following criteria.

Direct impact – where the proposed scheme would directly impinge on the land or farm business in question (e.g. demolition of buildings, loss of some or all of the associated land).

Indirect impact – where the scheme option would pass in close proximity, or directly adjacent to the agricultural receptors being considered, or the possible scheme would encroach on the land uses over a wider area (e.g. Countryside Stewardship Scheme land).

No impact – scheme option would not impact upon land.

SECTION 11

EFFECTS ON ALL TRAVELLERS

11 EFFECTS ON ALL TRAVELLERS**11.1 Introduction**

11.1.1 This section sets out the methodology for assessing the effects on travellers using the scheme, which will be undertaken in accordance with guidance set out in the DMRB Volume 11 Section 3 Part 8 Pedestrians, Cyclists, Equestrians and Community Effects and Part 9 Vehicle Travellers. The existing baseline information and potential environmental effects are also described.

11.2 Study Area

11.2.1 The assessment of effects on pedestrians, equestrians and cyclists (known as Non-Motorised Users (NMUs)) will consider the impact of the scheme on local journeys made by people on the local public rights of way network.

11.2.2 The effects on vehicle travellers using the local road network will also be assessed. There are two elements to the assessment of vehicle travellers: view from the road; and driver stress.

11.2.3 The study area for the assessment of impact on pedestrians, cyclists and equestrians is within 1km of the route corridor.

11.2.4 The following will be considered:

- Community severance including journey lengths, times and local travel plans;
- Amenity; and
- Physical fitness.

11.2.5 The study area that will be considered for views from the road will be equivalent to the ZVI of the proposed route corridor identified in the Landscape chapter (see Section 8). There is no specific study area for driver stress.

11.3 Existing Baseline Knowledge

11.3.1 There are currently no cycling facilities or bridleways within the study area.

11.3.2 There are a number of public footpaths within the study area, some of which intersect with Five Mile Lane, including Valeways Millennium Heritage Trail.

11.4 Value of Environmental Receptors and Resources

11.4.1 The receptors considered in the assessment of effects on all travellers are the various road users including NMUs e.g. cyclists, pedestrians and equestrians, and vehicle travellers.

11.5 Potential Effects

11.5.1 Effects on vehicle travellers predicted during construction may include delays and local diversions, but these would be of a short term nature. To reduce driver frustration and uncertainty relating to the route being followed appropriate signage would be installed informing vehicle travellers of the proposed scheme, diversions and that delays due to works would be probable.

- 11.5.2 The narrow carriageway contained within roadside hedgerows restricts views to the landscape despite the fact it passes over the plateau where views can be expansive. Views tend to be of landscape adjacent to the road where vertical alignments and topography allow. Enhancement to the baseline condition would allow views across the Special Landscape Areas where this measure does not degrade landscape character and screening of the road is not required to minimise effects on visual amenity.
- 11.5.3 Influencing the three main components of driver stress (frustration, fear of potential accidents, and uncertainty relating to the route being followed) are factors such as road layout and geometry, surface riding characteristics, junction frequency, and speed and flow per lane. Taken together, these factors can induce in drivers the feelings of discomfort, annoyance, frustration or fear culminating in physical and emotional tension that detracts from the value and safety of a journey. The scheme may increase driver fear to some extent because it will increase traffic speeds. However, this increased perception of danger is likely to be more than offset in most cases by the superior design standards to which a new scheme is built.
- 11.5.4 Frustration may be caused by a driver's inability to travel at a constant speed due to the volume of traffic and slow moving vehicles, which in turn leads to unreliable journey times which further increases stress. Proposed routes would reduce frustration through improved forward visibility.
- 11.5.5 Reduced fear of potential accidents would be due to improved road standards including increased sight distances, a widened carriageway and controlled access on to the carriageway.
- 11.5.6 Route uncertainty is caused primarily by signing that is inadequate for the individual's purposes. Good design and layout of signs eliminates this cause of stress from new road schemes. However, as the scheme is broadly similar to the existing orientation, views will be considered, and forward visibility and signage would be improved, it is considered that this component of driver stress would likely also decrease in the long term.

11.6 Proposed Methodology including Significance Criteria

Non-Motorised Users

- 11.6.1 The proposed methodology will be based on the procedures set out in the DMRB Volume 11, Section 3, Part 8 and 9 and the application of DMRB Volume 5, Section 2, Part 5, HD42/05 and will consider:
- The scheme's impact on the journeys that pedestrians, cyclists and equestrians make in its locality;
 - The impact on existing usage of the community facilities and routes by pedestrians and others;
 - Counts of pedestrians and other vulnerable users;
 - Changes in safety and amenity value of routes which may be affected by the proposed route.
 - The effects of the proposed scheme on community severance.

11.6.2 The assessment will involve a desk study and site visit to observe NMU activity, as well as how local community facilities are likely to be impacted by the construction and operation of the proposed scheme in both adverse and beneficial senses.

11.6.3 The level of new severance will be taken into account using criteria set out by DMRB Volume 11, Section 3, Part 8 which categorises the level of severance as either Slight, Moderate or Severe.

Views from the Road

11.6.4 The DMRB Volume 11, Section 3, Part 9 describes 'Views from the Road' as follows;

...the extent to which travellers, including drivers are exposed to the different types of scenery through which a route passes.

11.6.5 Aspects to be considered are:

- The types of scenery or the landscape character as described and assessed for the baseline studies;
- The extent to which travellers may be able to view the scene;
- The quality of the landscape as assessed for the baseline studies; and
- Features of particular interest or prominence in the view.

11.6.6 The view from the road assessment has been informed by the assessment of landscape impacts set out in Section 8 (Landscape), with particular regard to the landscape character and quality areas.

Driver Stress

11.6.7 Driver stress is defined in Volume 11 of the DMRB as the adverse mental and psychological effects experienced by a driver traversing a road network. Stress can induce in drivers feelings of discomfort, annoyance, frustration, or fear culminating in physical or emotional tension that detracts from the value and safety of the journey. Volume 11 of the DMRB indicates that with increased driver stress, a drop in driving standards occurs, which may be expressed as an increase in aggression towards other road users, or a diminished response to visual and other stimuli.

11.6.8 The level of stress experienced by a driver may be affected by a number of factors including; road layout and geometry, surface riding characteristics, junction frequency and speed and flow per lane. There are three main components of driver stress; frustration, fear of potential accidents and uncertainty relating to the route being followed.

- **Driver frustration** – Caused by an inability to drive at a speed consistent with the standard of the road, and increases as speed falls in relation to expectations.
- **Driver fear** – The main factors are the presence of other vehicles, inadequate sight distances and the likelihood of pedestrians, particularly children, stepping into the road. Fear is highest when speeds, flows and the proportion of heavy vehicles are all high, becoming more important in adverse weather conditions.
- **Driver uncertainty** – caused primarily by signing that is inadequate for the individual's purposes.

11.6.9 A matrix to determine the level of driver stress on single and dual carriageways is provided within Volume 11 of the DMRB as detailed in Table 11.1 below.

Table 11.1 Assessing driver stress on single carriageway roads

Average peak hourly flow per lane in flow units/hour ¹	Average Journey Speed km/h		
	Under 50 (<31 mph)	50-70 (31-43 mph)	Over 70 (>43 mph)
Under 600	High ²	Moderate	Low
600-800	High	Moderate	Moderate
Over 800	High	High	High

11.6.10 Taking average known and modelled journey speeds (Peak hour 2-way flows) for the baseline and future years (for Do-Minimum and Do-Something scenarios) driver stress will be quantified and compared as tabulated above. The analysis will include consideration of HGV frequency to give an indication of flow units per lane.

SECTION 12

**ROAD DRAINAGE AND THE WATER
ENVIRONMENT**

12 ROAD DRAINAGE AND THE WATER ENVIRONMENT**12.1 Introduction**

12.1.1 This section sets out the assessment methodology to be used to assess the potential effects on road drainage and the surrounding water environment. It also describes the existing baseline information and potential likely effects of the scheme. The assessment of road drainage and the water environment will be undertaken in accordance with DMRB Volume 11, Section 3, Part 10 (HD 45/09).

12.2 Study Area

12.2.1 This section will cover surface water features surrounding the proposed scheme and within 1 km in all directions from the proposed scheme. This section will also cover the potential impacts of flood risk to the scheme and to people and property elsewhere as a result of the scheme.

12.2.2 This section will not cover hydrogeology. Potential impacts to groundwater resources and groundwater quality will be addressed in Section 13 Soils and Geology.

12.3 Existing Baseline Knowledge

12.3.1 Between the A48 in the north and Barry in the south, the A4266 (Five Mile Lane) passes over the River Waycock. Five Mile Lane also passes 50m to the west of the source of the Moulton Brook, crosses a continuous channel of water that flows from Ffynnon Whitton Mawr into Ford Brook, and passes over/adjacent to other smaller culverted tributaries and drains within the Waycock catchment.

12.3.2 The existing road extends across the Waycock Valley and its associated flood risk areas. These are defined as Zones B and C2 on the Development Advice Maps associated with Technical Advice Note (TAN) 15 - Development and Flood Risk (July 2004). The greatest risk to the existing road occurs at the crossing over the River Waycock where approximately 500m of road is indicated to lie in Zones B and C2. Smaller areas of land adjacent to the road are indicated to lie in Zone C2 along the routes of Moulton Brook and Ford Brook.

12.3.3 The draft River Basin Management Plan for the Waycock indicates that it is included within the river basin District of Western Wales, in the Ogmere to Tawe management catchment. The current ecological quality in the River Waycock is 'moderate' and the predicted ecological quality for 2015 is also 'moderate' in accordance with the Water Framework Directive.

12.3.4 Along the route of Five Mile Road the bedrock is primarily classified as Secondary A aquifer with areas of Secondary B aquifer along the alignment of existing watercourses. Bedrock to the north of the study area by Bonvilston is classified as Secondary (undifferentiated) and Principle aquifer.

12.3.5 Groundwater vulnerability maps indicate that the overlying soils along Five Mile Lane have low, intermediate and high leaching potential. The soils overlying the Principle aquifer in the north of the study area are classified as having intermediate leaching potential.

12.3.6 There are ten consented discharges within 1km of Five Mile Lane and a large number of licensed abstractions at distances ranging from 950m to 1300m from Five Mile Lane. Most of the abstracted water in the area is used for potable water supply and

for industrial and commercial purposes. The majority of licensed abstractions in the Thaw catchment area are for agricultural purposes.

12.3.7 Groundwater quality is monitored by NRW at a borehole approximately 1.2km west of the A4226, at Walterston Farm.

12.3.8 There are no Source Protection Zones within the study area.

12.4 Value of Environmental Receptors and Resources

12.4.1 The environmental receptors that would potentially be affected by the scheme include sources of surface and groundwater, and the River Waycock. Watercourses, including the River Waycock and tributaries of the Llancarfen are considered to be of high value (see table 12.1 below). Groundwater is considered to be of medium value as it supports agricultural abstractions. The existing floodplain is considered to be of high value due to the risk of flooding downstream.

12.5 Potential Effects

12.5.1 The scheme has the potential to affect the water environment during construction and operation.

12.5.2 Potential impacts to surface water features and flood risk during construction could arise from:

- Polluted surface water runoff consisting of high sediment load, chemicals, and hydrocarbons from construction vehicles, plant and high risk activities that may migrate or be discharged to surface water features; and
- Increased rates and volumes of surface water runoff resulting from intense rainfall combined with compacted soils and reduced vegetation, which could lead to an increase in flood risk.

12.5.3 Potential impacts to surface water features and flood risk during operation could arise from

- Polluted surface water runoff consisting of silts and hydrocarbons from the proposed scheme (including an assessment of the potential increase in traffic flow) that may migrate or be discharged to surface water;
- Increased rates and volumes of surface water runoff from an increase in impermeable area and/or changes to the existing drainage regime leading to a potential increase in flood risk;
- Flood risk to the proposed scheme as a result of construction within areas identified to be at flood risk; and
- Impact to the natural flow of watercourses and flood waters within identified fluvial flood extents, caused by the construction of the scheme and re-profiling of current land forms, leading to a potential increase in flood risk.

12.5.4 Impacts will be assessed over the expected lifetime of the proposed scheme, taking into consideration the potential effects of climate change.

12.5.5 Note that these impacts have been assessed prior to the consideration of appropriate mitigation.

12.6 Proposed Methodology including Significance Criteria

12.6.1 The approach that will be adopted for this assessment comprises:

- Review of international, national and local legislation, policies and guidelines in relation to water resources, water quality and flood risk. This shall include a review of the requirements of the Water Framework Directive;
- Establish baseline conditions on and around the site through discussions with the client and design team, literature review, consultation with relevant authorities, Envirocheck report, review of water quality monitoring data and site walkover;
- Identify sensitive receptors and likely key issues;
- Identify risks to water resources, water quality and flood risk from the proposed scheme and hence the likely impacts, magnitude of change and significance of impact during both the construction and operational phases;
- Develop mitigation strategies through consultation with the client, design team and relevant authorities;
- Identify opportunities for enhancement of water quality and water management through design and mitigation; and
- Identify residual effects and cumulative impacts.

12.6.2 The assessment will be supported by the preparation of a Flood Consequence Assessment prepared in accordance with TAN 15.

12.6.3 The method of assessment and reporting of significant effects will be undertaken and based on HD 45/09 guidance. The assessment will include an update of the findings of the 2004 assessment as detailed in the baseline knowledge section previously.

12.6.4 The DMRB promotes the following approach:

- i) Estimation of the importance of the attribute.
- ii) Estimation of the magnitude of the impact.
- iii) Assessment of the significance of the impact based on the importance of the attribute and magnitude of the impact.

12.6.5 The importance of the attribute is considered in terms of indicators, such as quality, scale, rarity and substitutability. The following criteria have been developed following the general guidance of HD 45/09 as set out in Table 12.1.

Table 12.1 Criteria for Assessing the Value of Environmental Receptors.

Importance	Criteria	Example
Very High	Attribute with a high quality and rarity, regional or national scale and limited potential for substitution	Aquifer providing potable water to a large population EC designated Salmonid fishery
High	Attribute with a high quality and rarity, local scale and limited potential for substitution Attribute with a medium quality and	GQA Grade A reach of river aquifer providing potable water to a small population EC designated Cyprinid fishery

Importance	Criteria	Example
	rarity, regional or national scale and limited potential for substitution	
Medium	Attribute with a medium quality and rarity, local scale and limited potential for substitution Attribute with a low quality and rarity, regional or national scale and limited potential for substitution	GQA Grade B/C reach or river Aquifer providing abstraction water for agricultural or industrial use
Low	Attribute with a low quality and rarity, local scale and limited potential for substitution	Floodplain with limited existing development

12.6.6

The criteria for assessing the magnitude of a potential effect are summarised in Table 12.2 below, as developed from HD 45/09. Not all effects are adverse and there is the potential for beneficial effects, for example a significant reduction in AADT reducing risks to water quality.

Table 12.2 Criteria for Assessing the Potential Magnitude of an Effect.

Magnitude	Criteria	Example
Major Adverse	Results in loss of attribute and / or quality and integrity of the attribute	Loss or extensive change to a fishery / designated nature conservation site. Loss of, or extensive change to, an aquifer / groundwater supported designated wetlands. Change to the environmental status/classification of a water feature, including water quality classification. Changes to site resulting in an increase in discharge/runoff of > 75% with flood/sewage exceedance potential. Increase in peak flood level (1% annual probability event (ape)) > 100mm. Loss of flood storage areas.
Moderate Adverse	Results in effect on integrity of attribute, or loss of part of attribute	Partial loss or change to a fishery / designated nature conservation site. Loss in the productivity of a fishery. Partial loss or change to an aquifer/ groundwater supported designated wetlands. Pollution of a receiving water body, but insufficient to change the environmental status/classification, including water quality classification. Changes to site resulting in an increase in discharge/runoff of > 50% with flood/sewage exceedance potential. Increase in peak flood level (1% ape) > 50mm.
Minor Adverse	Results in some measurable change in attribute's quality or vulnerability	Potential low risk of some pollution to a surface water or groundwater body, but insufficient to cause loss in quality, fishery productivity or biodiversity. Changes to site resulting in an increase in discharge/runoff of > 25% with flood/sewage exceedance potential. Increase in peak flood level (1% ape) > 10mm.

Magnitude	Criteria	Example
Negligible	Results in effect on attribute, but of insufficient magnitude to affect the use of integrity	The proposed scheme is unlikely to affect the integrity of the water environment. No measurable impact upon an aquifer. Negligible change in peak flood level (1% ape) < +/-10mm
Minor Beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring	Potential for slight reduction in pollution to a surface water or groundwater body, but insufficient to cause noticeable benefit in quality, fishery productivity or biodiversity. Changes to site resulting in a decrease in discharge/runoff > 25%. Reduction in peak flood level (1% ape) > 10mm.
Moderate Beneficial	Results in moderate improvement of attribute quality	Moderate improvement to a fishery / designated nature conservation site. Potential increase in the productivity of a fishery. Reduced pollution of a receiving water body, but insufficient to change the environmental status/classification, including water quality classification. Changes to site resulting in a decrease in discharge/runoff > 50%. Reduction in peak flood level (1% ape) > 50mm.
Major Beneficial	Results in major improvement of attribute quality	Significant improvement to a fishery / designated nature conservation site. Removal of existing polluting discharge, or removing the likelihood of polluting discharges occurring. Change to the environmental status/classification of a water feature, including water quality classification. Changes to site resulting in a decrease in discharge/runoff of > 75%. Reduction in peak flood level (1% ape) > 100mm.

12.6.7 The overall significance of potential impacts considers both the magnitude of the effect against the value of the receptor, as demonstrated in Table 12.3.

Table 12.3 Criteria for Assessing Significance of Effect

Magnitude of Impact	Value of Receptor			
	Very high	High	Medium	Low
Major	Very Large	Large	Moderate	Slight
Moderate	Large	Moderate	Slight	Slight
Minor	Moderate	Slight	Slight	Neutral
Negligible	Neutral	Neutral	Neutral	Neutral

12.6.8 In addition to Table 12.3, the overall significance of an effect is also assessed with regards to the likelihood of the effect, the potential use of mitigation, and any legal

obligations. A detailed review of relevant planning policy and legislation will be undertaken in the assessment to assess compliance with the proposed scheme and recommended mitigation.

- 12.6.9 Following the impact assessment process, further mitigation measures will be outlined to minimise any significant adverse effects upon the water environment. Any residual effects following these measures will be detailed.

SECTION 13

GEOLOGY AND SOILS

13 GEOLOGY AND SOILS**13.1 Introduction**

13.1.1 This section of the Scoping Report outlines the methods to be used to assess the impacts on 'Geology and Soils' associated with the construction and operation of the scheme in accordance with the updated DMRB Volume 11, Section 3, Part 11. The existing baseline information and potential environmental effects are also described.

13.2 Study Area

13.2.1 The Geology and Soils section, will include the contaminated land assessment, and will consider the potential impacts on and off site, within 250m of the carriageway. It is not considered likely that significant environmental effects associated with geology and soils or contamination would arise beyond this distance.

13.3 Existing Baseline Knowledge

13.3.1 The following assessment is based on information provided by third parties, which has been reviewed in light of our current knowledge.

13.3.2 The current land use of the scheme is predominantly the current A4226 carriageway, however, the currently proposed route corridor of the scheme includes areas of agricultural land.

13.3.3 An Envirocheck™ Report (obtained to inform the preliminary design) indicates that the scheme corridor is predominantly underlain by interbedded limestone and mudstone of the Lower Jurassic Porthkerry Member (Blue Lias Formation). Other limestone and mudstone formations have been identified underlying the study area, including the Gully Oolite Formation and the Lavernock Shale Formation. Superficial deposits are present locally within the study corridor, comprising glacial till in the northern section (by Sycamore Cross) and fluvial deposits comprising alluvium and alluvial fan deposits in the southern section (surrounding the route of the River Waycock).

13.3.4 The Vale of Glamorgan is of geological interest as it is the only place in Wales where Jurassic strata can be seen on land. However, there are no geological SSSIs, RIGS or quarries within the study corridor.

13.3.5 There is a history of mineral extraction off-site, within 250m of the carriageway, comprising the quarrying of limestone. All operations have now ceased.

13.3.6 There is no Made Ground recorded within the scheme corridor, but given the study corridor is situated predominantly on the existing A4226 road location, Made Ground will be present associated with the construction of the existing highway.

13.3.7 The Envirocheck Report indicates that the superficial fluvial deposits are classified as a secondary A aquifer. The superficial glacial till deposits are classified as unproductive strata. The bedrock formations have also been classified, varying from a principal aquifer associated with the Gully Oolite (limestone) Formation, a secondary A aquifer associated with the Porthkerry Member, a secondary B aquifer associated with the Lavernock Shale Formation to a secondary undifferentiated aquifer associated with the Mercia Mudstone Group. There are currently no groundwater source protection zones (SPZs) within 1km of the site.

13.3.8 Contaminated land is a fairly minor issue in this predominantly rural area although there is indicative evidence of one former landfill site within the scheme corridor at Blacklands Farm. It was licensed from December 1990 to December 1991 and there was no known restriction on the source of the waste. However, the type of waste deposited included 'inert', which means the waste should remain largely unaltered once buried and could include constituents such as glass, concrete, bricks, tiles, soil and stones.

13.4 Value of Environmental Receptors and Resources

13.4.1 The significance of a project effect is a function of the environmental value (or sensitivity) of an environmental receptor and the magnitude of the potential change (impact). In order to determine the significance of an environmental effect, a value must be assigned to the appropriate receptors.

13.4.2 The following potential receptors are considered appropriate for preliminary consideration:

- Underlying bedrock geology and superficial deposits;
- Groundwater resources including principal, secondary A, secondary B and secondary undifferentiated aquifers;
- Surface water bodies, most significantly the River Waycock that bisects the site towards the southern section of the study corridor;
- Built environment;
- Residents and users adjacent to the scheme corridor;
- Construction and maintenance workers; and
- Small areas of agricultural land along the route corridor of the scheme.

13.4.3 Potential ecological receptors have not been included in this chapter.

13.5 Potential Effects

13.5.1 The potential effects upon the geology and soil quality within the study corridor would manifest as a result of the construction and subsequent operation of the highways improvement scheme. The assessment of the current status of the site with respect to land contamination will be a key aim of the baseline assessment which will include the assessment of potential risk to residents and users of land adjacent the study corridor, and aim to establish any remedial requirements.

13.5.2 Other potential effects include:

- Road cuttings and soil erosion risks – sediment load to surface water bodies (if contaminated this could be a potentially more significant negative effect);
- Increased hardstanding cover, compacted soils and reduction in vegetation could lead to a reduction in infiltration and increase in surface water runoff;
- Potentially contaminated surface water runoff from the proposed scheme may discharge to surface water bodies or groundwater resources;
- Creation of new migratory pathways between potentially contaminated soils and the underlying aquifers through ground disturbance;

- The aggressivity of the ground conditions constraining the design of the scheme;
- Health of construction workers arising from contact with potential contaminants within the Made Ground and historical landfill or inappropriate procedures and working methods; and
- Introduction of potential contaminating materials, e.g. inappropriate storage and use of fuels, etc. which may impact water resources.

13.5.3 These impacts have been assessed prior to the consideration of appropriate mitigation. Where such mitigation is considered standard practice, it will be assumed to be embedded in the design which will be subject to the Geology and Soil impact assessment.

13.6 Proposed Methodology including Significance Criteria

13.6.1 This assessment will be undertaken in general accordance with the guidance presented in:

- Design Manual for Roads and Bridges (DMRB) Volume 11, Section 2, Part 5 Assessment and Management of Environmental Effects, August 2008; and
- Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 11 Geology and Soils, June 1993.

13.6.2 As well as identifying the attribute importance of geology and soils and the significance of the potential effects upon them, there is also a requirement to establish the potential for land contamination within the scheme corridor.

Potential Land Contamination

13.6.3 Baseline studies will be completed to establish the "geo-environmental" setting and establish the ground conditions within the study corridor with particular emphasis on the value of the geology present, the presence of any historical extractive industries, any history of ground instability and the presence of any significant aquifer resources.

13.6.4 The baseline assessment will commence with a Phase I or "Desk Study" investigation to collate and review the available published and publicly accessible background data to establish the ground conditions.

13.6.5 The desk study will also include a review of the available historical maps and records relating to the use of the study corridor with a view to determining the likelihood of any historic contamination being present prior to development. The need or otherwise for intrusive investigation will only be established upon completion of the Desk Study and the Conceptual Site Model (CSM) developed from this.

13.6.6 The assessment method for identifying significant effects from land contamination will be undertaken in line with CLR11. The CSM is reviewed to establish the presence of any "contaminant linkages", put simply, in order for a potential risk to be identified, a source of risk, a receptor and a pathway between the two need to be identified. In order to assess the potential impact of each of the identified potential contaminant linkages, they will be 'ranked' according to both the probability and severity of any likely impact. This approach is based on guidance presented in CIRIA Document C552 'Contaminated Land Risk Assessment - A Guide to Good Practice 2001'.

13.6.7 For each of the contaminant linkages, an estimate will be made of:

- The potential severity of the risk; and
- The likelihood of the risk occurring.

13.6.8 Table 13.1 presents the classification of the severity of the risk.

Table 13.1: Contaminant Linkage Severity of Risk Classification

Severe	Acute risks to human health; and/or Major pollution of controlled waters (watercourses or groundwater)
Medium	Chronic (long-term) risk to human health; and/or Pollution of sensitive controlled waters (surface waters or aquifers)
Minor	Requirement for protective equipment during site works to mitigate health effects; and/or Damage to non-sensitive ecosystems or species

13.6.9 The probability of the risk occurring is classified according to criteria given in Table 13.2.

Table 13.2: Probability of Risk

High Likelihood	Contaminant linkage may be present, and risk is almost certain to occur in the long term, or there is evidence of harm to the receptor
Likely	Contaminant linkage may be present, and it is probable that the risk will occur over the long term
Low Likelihood	Contaminant linkage may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so
Unlikely	Contaminant linkage may be present but the circumstance under which harm would occur are improbable

13.6.10 Once the severity and probability have been determined for a contaminant linkage, an overall evaluation of the level of risk is produced, as presented in Table 13.3:

Table 13.3: Evaluation of Level of Risk

		Severity of Risk		
		Severe	Medium	Minor
Probability	High Likelihood	Very high risk	High risk	Moderate / low risk
	Likely	High risk	Moderate risk	Low risk
	Low Likelihood	Moderate risk	Moderate/ low risk	Very low risk
	Unlikely	Moderate/low risk	Low risk	Very low risk

Value/Sensitivity of Receptors and Resource

- 13.6.12 Environmental values/sensitivity are assigned to receptors and resources in accordance with the principles established in Volume 11, Section 2, Part 5 of DMRB, 2008. Consideration must also be given to the potential for any post-construction environmental effects, caused by remobilisation of contamination within the ground following disturbance during the construction process.
- 13.6.13 The environmental value of the relevant receptors is qualitatively described within
- 13.6.14 Table 13.4.

Five Mile Lane Improvements: EIA Scoping Report

Distance (Sensitivity) for Resources / Receptors

Contaminated Land Receptors					
Is	Controlled Waters	Ecological Systems	Built Environment	Construction Workers	End Users
Good to excellent ability agricultural	Principal aquifer and/or major surface water in close proximity	Nationally or internationally designated ecological sites	Buildings of high historic value or other high sensitivity	Extensive earthworks including demolition of buildings	Residential development, allotments, play areas
Or to moderate ability agricultural	Secondary aquifer and/or minor surface water in close proximity	Locally designated ecological sites	Buildings, including services and foundations	Limited to moderate earthworks	Landscaping or public open space
Very poor quality cultural land ground, with potential for re-use	Aquifer or aquiclude beneath site, no surface water body in close proximity	No sites of significant ecological value in close proximity	Not applicable	Minimal disturbance of ground	'Hard' end use (e.g. industrial use, road, car park)

Magnitude of Impacts

13.6.15 The magnitude of impacts and typical descriptors are detailed within Table 13.5. They have been adapted from Volume 11, Section 2, Part 5 of DMRB, 2008.

Table 13.5: Magnitude of Impacts

Magnitude	Typical Criteria Descriptors
Major	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements; exposure to acutely toxic contaminants (ADVERSE).
	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality; (BENEFICIAL).
Moderate	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements; short-term exposure to contaminants with chronic (long-term) toxicity (ADVERSE).
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (BENEFICIAL).
Minor	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (ADVERSE).
	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduce risk of negative impact occurring (BENEFICIAL).
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (ADVERSE).
	Very minor benefit to or positive addition of one or more characteristics, features or elements (BENEFICIAL).
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

Significance of Effects

13.6.16 The approach to assigning the significance of effects relies on reasoned argument, professional judgement and taking on board the advice and views of appropriate organisations (DMRB Volume 11, Section 2, Part 5, August 2008). In order to aid the decision-making process, each potential impact is assigned a significance category. The methodology for determining the significance of effect categories is detailed within Table 13.6.

Table 13.6: Arriving at the Significance of Effect Categories

		Magnitude of Impact (Degree of Change)				
		Major	Moderate	Minor	Negligible	No Change
Environmental Value (Sensitivity)	High	Large or very large	Moderate or large	Slight or moderate	Slight	Neutral
	Medium	Moderate or large	Moderate	Slight	Neutral or slight	Neutral
	Low	Slight or moderate	Slight	Neutral or slight	Neutral or slight	Neutral

13.6.17 Typical descriptors for effects are summarised within Table 13.7.

Table 13.7: Typical Descriptors of Effects

Significance Category	Typical Descriptors of Effects
Very Large	Only adverse effects are normally assigned this level of significance. They represent key factors in the decision making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category.
Large	These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision making process.
Moderate	These beneficial or adverse effects may be important, but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
Slight	These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process, but are important in enhancing the subsequent design of the project.
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

13.6.18 In addition to the overall significance of an effect being assessed, mitigation measures will also be recommended throughout the Geology and Soils ES chapter to minimise any significant adverse effects upon geology and soils. Any residual effects following these measures will also be outlined.

SECTION 14

MATERIALS

14 MATERIALS

14.1 Introduction

14.1.1 Section 3, Part 6 of DMRB Volume 11 requires the assessment of materials. Interim Advice Note 153/11 provides further guidance on the environmental assessment of material resources.

14.1.2 The assessment of materials should consider the use of material resources and the generation and management of waste. It does not include the direct energy use associated with operation of the network. Material resources include the materials and construction products required for implementation of the project, both raw materials and manufactured items.

14.2 Study Area

14.2.1 Many material resources will originate off site e.g. construction products. Some will arise on site during construction such as excavated soil and rock or recycled elements of existing roads.

14.2.2 Some impacts will occur off site or possibly outside of the UK. This includes the depletion of non-renewable resources, production of waste at the point of extraction of minerals or during the manufacturing process and transport. As these stages of the process are likely to have been subject to an environmental assessment, they will fall outside of the scope of this assessment. The assessment will concentrate on the impacts and effects resulting from the use of those materials within the proposed scheme.

14.3 Existing Baseline Knowledge

14.3.1 The project will inevitably result in surplus material which will need to be disposed of as waste. This usually arises from two sources as follows:

- Existing site materials e.g. concrete from demolition of an existing structure and excavation of material from earthworks; and
- Materials brought on to the site but not used for its intended purpose e.g damaged goods.

Table 14.1: Summary of materials and waste that have the potential to generate significant effects

Scheme Process	Type	Potential Use	Potential Waste
Site Clearance	Concrete		✓
	Bricks		✓
	Concrete/Bricks Mix		✓
	Wood		✓
	Bitmac (road planings)		✓
	Iron and Steel		✓
	Mixed metals		✓
	Plastics		✓
	Soil and Stone		✓
	Type 5 A (topsoil/turf)		✓
	Type 2 (general excavation/fill)		✓
	Type 4 (landscaping/topsoil)		✓

Scheme Process	Type	Potential Use	Potential Waste	
	Type 6F1 & 2 (aggregates)		✓	
	Vegetation		✓	
Site Construction	Concrete	✓	✓	
	Bricks	✓	✓	
	Wood	✓	✓	
	Bitmac			
		<i>Base, binder and wearing courses</i>	✓	✓
		<i>SLX tack coat</i>	✓	
		Iron and Steel	✓	✓
		Mixed Metals	✓	✓
		Plastic	✓	✓
		Soil and Stone		
		<i>Type 1 (803 sub-base/capping)</i>	✓	✓
		<i>Type 503 (pipe bedding)</i>	✓	✓
		<i>Type 505 (pipe filter material)</i>	✓	✓
		<i>Reclaimed Hedging Stone</i>	✓	
		<i>Type 5 A (topsoil/turf)</i>	✓	✓
		<i>Type 2 (general excavation/fill)</i>	✓	✓
		<i>Type 4 (landscaping/topsoil)</i>	✓	✓
	Vegetation	✓		
Site Operation/ Maintenance	Concrete	✓	✓	
	Bricks	✓	✓	
	Wood	✓	✓	
	Bitmac			
		<i>Base, binder and wearing courses</i>	✓	✓
		<i>SLX tack coat</i>	✓	✓
		Iron and Steel	✓	✓
		Mixed Metals	✓	✓
		Plastic	✓	✓
		Soil and Stone		
		<i>Type 5 A (topsoil/turf)</i>	✓	✓
		<i>Type 2 (general excavation/fill)</i>	✓	✓
		<i>Type 4 (landscaping/topsoil)</i>	✓	✓
	<i>Type 6F1 & 2 Aggregates</i>	✓	✓	
	<i>Type 1 (803 sub-base / capping)</i>	✓	✓	
	<i>Type 503 (pipe bedding)</i>	✓	✓	
	<i>Type 505 (pipe filter material)</i>	✓	✓	
	Reclaimed Hedging Stone	✓	✓	
	Vegetation		✓	

14.4 Value of Environmental Receptors and Resources

14.4.1 An assessment will be undertaken to identify how the use of materials conforms to high level strategy targets outlined in the following policy documents (this list is not exhaustive):

- Toward Zero Waste (2010);
- Waste (Wales) Measures (2010);
- The Vale of Glamorgan Adopted Unitary Development Plan (2005);
- Emerging Vale of Glamorgan Local Development Plan Written Statement (2013); and

- Municipal Waste Management Strategy for Vale of Glamorgan Council Strategy report (2004).

14.4.2 The impacts of waste will mainly be on the waste management infrastructure of the Vale of Glamorgan.

14.5 Potential Effects

14.5.1 For projects with an estimated cost greater than £300,000 it is assumed that the potential does exist for impacts and effects to take place. This threshold has been set by the Site Waste Management Plan Regulations 2008, based on a cost benefit analysis undertaken by Defra. The cost of the proposed scheme will be approximately £25 million.

14.5.2 For material resource use, the potential environmental effects will be mainly associated with the extraction and transport of primary raw materials, such as aggregates and the manufacture and transport of products for use in construction. Road schemes such as that proposed will consume large quantities of materials and will therefore have permanent direct effects on the environment e.g. the depletion of natural resources and the embodied energy associated with the manufacture and transport of materials.

14.5.3 The potential environmental effects arising from waste will be associated with production, transport, processing and disposal. The assessment will identify the quantities and types of waste to be produced.

14.5.4 The use of materials and management of waste may give rise to other impacts to be assessed elsewhere in the ES, such as detrimental impacts on air quality and increased noise.

14.6 Proposed Methodology including Significance Criteria

14.6.1 For the purpose of assessing the effects associated with materials use and waste, the assessment will aim to identify and quantify the following:

- The types and quantities of materials required for the project;
- Details of the source of materials;
- The cut and fill balance;
- The types and quantities of forecast waste arising from the project, including the identification of any forecast hazardous waste;
- Waste that requires storage on site prior to re-use, recycling or disposal;
- Waste to be pre-treated on site for re-use within the project;
- Waste requiring treatment and/or disposal off site;
- The impacts that will arise from the issues identified in relation to materials and waste;
- A conclusion about the magnitude and nature of the impacts; and
- The identification of measures to mitigate the identified impacts.

14.6.2 The assessment will identify whether the impacts are positive or negative, permanent or temporary and direct or indirect. Permanent impacts are likely to be significant in

terms of their effects. The quantities of materials to be used and the waste forecasts will be used to identify the magnitude for change.

14.7 Summary

14.7.1 The assessment of materials will be in accordance with DMRB and further guidance is provided by IAN 153/11. The assessment will consider both materials originating off-site and those during construction. The assessment is primarily concerned with impacts and effects resulting from the use of those materials within the proposed scheme. An assessment will be undertaken in order to identify of the materials conform to national and local policy. The SWMP will play an integral role to the implementation of best practice and mitigation of potential risks and impacts.

SECTION 15

CUMULATIVE EFFECTS

15 CUMULATIVE EFFECTS**15.1 Cumulative Effects**

15.1.1 In accordance with legislation the DMRB Volume 11, Section 2 Part 5: Assessment and Management of Environmental Effects (HA205/08) requires that Cumulative Effects are assessed as part of the assessment process.

Methodology

15.1.2 The DMRB identifies two types of cumulative impact in environmental assessment:

- Cumulative effects from a single scheme (acknowledging the outcomes of each of the environmental topics assessed for the proposed scheme); and
- Cumulative effects from different schemes (assessed in combination with the scheme in question).

15.1.3 The approach to identify the likely cumulative effects arising from the proposed scheme and its interaction with other schemes will be based upon guidance contained within DMRB. However, this guidance will be adapted in order to make it relevant to each environmental topic being considered as part of the assessment.

Study Area

15.1.4 DMRB guidance on the assessment of cumulative effects requires that the spatial boundary of the receptor/resource with potential to be affected directly or indirectly is considered. The study area will be set for each individual topic in line with DMRB Guidance. In setting the study area consideration will be given to schemes that:

- will be occurring at times prior to or during construction of the proposed scheme;
- are 'in proximity' to the proposed scheme; or
- are considered likely to result in environmental effects which could act in synergy with effects arising from the proposed scheme.

15.1.5 Although the construction programmes of individual projects may not necessarily overlap, cumulative effects could still occur due to residual effects continuing after a project is operational, for example as a result of maintenance works.

15.1.6 In order to carry out the assessment it will be necessary to define the location and timing of nearby potential developments. In effect, the 'study area' will encompass all schemes which are 'committed' including (but not necessarily limited to):

- Trunk Road projects which have been confirmed (i.e. gone through the statutory processes) in proximity to the scheme; and
- Development projects with valid planning permissions as granted by the Local Planning Authority, and for which statutory EIA is a requirement or a non-statutory EIA has been undertaken.

15.1.7 Although the assessment will primarily include developments that are likely to occur and have some form of planning/land use approval, speculative developments will also be mentioned, specifically when their approval is fairly certain and if they are likely to have significant impacts.

Identification of Cumulative Effects Receptors

- 15.1.8 Receptors are defined as a resource or user group that may experience a cumulative effect. The receptors considered within each cumulative effect assessment will be dependent on the environmental topic under consideration.

Data Collection

- 15.1.9 The main source of data for the cumulative effects assessment will be the outcomes and information obtained from the individual environmental topic assessments. The assessment of cumulative effects arising from the proposed scheme in combination with other schemes will primarily constitute a desk-top study of planning documents broadly covering the location of schemes (if any are identified) considered relevant to the assessment.
- 15.1.10 Liaison will be undertaken with the Local Planning Authority to determine whether other schemes in the vicinity of the proposed scheme should be taken into consideration.
- 15.1.11 The focus of the desk-top study will be the collection of information relating to the background of relevant projects, their expected timelines and likely environmental impacts.

15.2 Assessment of the Potential for Cumulative EffectsConstruction

- 15.2.2 Receptors most at risk from cumulative effects, during scheme construction, are those in close proximity to construction activities. Cumulative effects arising from construction phase activities are likely to relate to visual intrusion, dust, noise and vibration.
- 15.2.3 The severity of cumulative effects would be dependent upon:
- The type of works being undertaken;
 - The duration of the works;
 - The distance between the works and their respective proximity to the receptor;
 - The sensitivity of the receptor; and
 - The visible presence of the works.
- 15.2.4 Temporary land-take required for ancillary works such as compounds, diversions or working space and material storage would also have environmental impacts.
- 15.2.5 Indirect cumulative effects as a result of construction can also occur. To avoid disruptions to traffic flow caused by construction works, drivers sometimes choose to travel on surrounding roads, known as 'rat-running'. This can affect traffic flows on roads not directly affected by the construction works. Rat-running can result in reduced air quality, increased noise, reduced amenity etc. Rat-running is a common concern at a local level although by, for example, effective traffic management or night-time working then it may be possible to reduce the risk of rat-running.

Operational

- 15.2.6 The prediction and evaluation of cumulative effects is not straightforward as the interaction between schemes is potentially complex and subject to change if projects are delayed or postponed. Contributing to the complexity is the variations in the geographical proximity of other schemes.
- 15.2.7 Furthermore, the significance of individual scheme impacts on each receptor will play a role in the overall importance of the effect; highly likely to be at least as significant as the most important contributory environmental impact. Therefore cumulative effects are considered according to the frequency of impacts upon receptors in the identified locality, as well as the significance of the impacts on each receptor.
- 15.2.8 For example, the majority of developments are likely to affect transport movements to a certain degree. A multitude of developments occurring at the same time would adversely affect local travellers to a degree greater than the disruption caused by one scheme alone. By contrast, a string of developments one after another would result in a prolonged period of disruption to travellers, although the location of the developments would play an important role in the significance of the effect.
- 15.2.9 Ecologically, habitats close to the road are commonly subjected to cumulative effects; possibly experiencing a combination of edge effects, light and noise pollution and reduced air quality as a result of the same development. If another development is occurring at the same time then significance of the effects experienced by the habitat would be increased.
- 15.2.10 Overall, cumulative effects are anticipated to diminish in the longer term. As local residents or receptors become accustomed to post-construction conditions the impact may become measurably less significant (for example the recovery of ecological areas after the effects of multiple schemes), or may be perceived to be less significant, for example, acclimatisation to noise levels.

15.3 Potential Developments to be Considered

- 15.3.1 The potential developments to be considered in the cumulative effects assessment will be agreed with Vale of Glamorgan Council.

SECTION 16

FIGURES

Figure 1

Site Location & Preferred Route Alignment