Llywodraeth Cymru
Welsh Government

A483/A489 NEWTOWN BYPASS

Environmental Statement – Volume 1

Technical Assessment Report

November 2014

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Glossary and Abbreviations

AADT – Average Annual Daily Traffic

AGC – Alun Griffiths (Contractors) Ltd.

ACFOR – Abundant, Common, Frequent, Occasional, Rare – Method of Survey Data Collection.

AIES – Assessment of Impacts on European Sites

ALC – Agricultural Land Classification

APIS – Air Pollution Information System

AQMA – Air Quality Management Area

AQS – The Government's 'Air Quality Strategy'

ARN – Affected Road Network

ASIDOHL– Assessment of the Significance of Impact of Development on Historic Landscapes

BAP – Biodiversity Action Plan

BBS – Breeding Birds Survey

BCT – Bat Conservation Trust

BIS – Powys Biodiversity Information Service

BGS – British Geological Survey

BMV – Best and Most Versatile Agricultural Land

BMWP – Biological Monitoring Working Party

BOCC – Birds of Conservation Concern

BPM – Best Practicable Means

BGS – British Geological Survey

BS – British Standard

BTO - British Trust for Ornithology

CBS – Common Bird Survey

CCW – Countryside Council for Wales (now part of Natural Resources Wales)

CEMP – Construction Environmental Management Plan

CIEEM – Chartered Institute for Ecology and Environmental Management

CLR – Contaminated Land Report

CO – Carbon Monoxide

CO_2 – Carbon Dioxide

COSHH – Control of Substances Hazardous to Health

CMS – Continuous Monitoring Site

CWS – County Wildlife Site

COMEAP – Committee on Medical Effects of Air Pollution

CPAT – Clwyd Powys Archaeological Trust

CRoW Act – Countryside Rights of Way Act 2000

CSM – Conceptual Site Model

CTC – Cycle Touring Club

dB – Decibels

DCWW – Dwr Cymru Welsh Water

DEFRA– Department of Environment, Food & Rural Affairs

DMP – Dust Management Plan

DMRB – Design Manual for Roads and Bridges

DTM – Digital Terrain Model

DWS – Drinking Water Standards

EA / EAW – Environment Agency / Environment Agency Wales (now part of Natural Resources Wales)

ECI – Early Contractor Involvement (for of contract under which the Scheme is being delivered)

EFT– Emission Factor Tool Kit

EIA – Environmental Impact Assessment

ELEAMP – Environmental Landscape and Ecology Aftercare Management Plan (to be administered in 5-year post construction maintenance period)

EPA – Environmental Protection Act

EPR – Environmental Permitting Regulations

EPUK – Environmental Protection UK

EQS – Environmental Quality Standard

ES – Environmental Statement

FB – Fractional Bias

FCA – Flood Consequences Assessment

FRA – Flood Risk Assessment

GCN – Great crested newt

GCR – Geological Conservation Review

GI – Ground Investigation

GIR – Ground Investigation Report

GLVIA – Guidance for Landscape & Visual Impact Assessment

GQRA – Generic Quantities Risk Assessment

GSV – Gas Screening Values

HA – Highways Agency

HAWRAT – Highways Agency Water Risk Assessment Tool

HDV - Heavy Duty Vehicle (Vehicle greater than 3.5 tonnes - HGV and buses/coaches)

HER – Heritage Environments Record

HGV – Heavy Goods Vehicle (Vehicle greater than 3.5 tonnes – carries goods)

HRA – Habitats Regulations Assessment

HIS – Habitats Suitability Index

IAN – Interim Advice Note

IAQM – Institute of Air Quality Management

IEEM – Institute of Ecology and Environmental Management (now CIEEM)

IEMA – Institute of Environmental Management & Assessment

JNCC – Joint Nature Conservation Committee

KS2 – Key Stage 2 (refers to the study of transportation options undertaken in 2009 on behalf of the Welsh Government)

L_{Aeq} – Equivalent Continuous Level (term used in noise assessment)

LAQM – Local Air Quality Management

LBAP – Local Biodiversity Action Plan

LDP – Local Development Plan

LI – Landscape Institute

LNR – Local Nature Reserve

LDV – Light Duty Vehicle (less than 3.5 tones)

LUP – Land Use Planning

MAFF – Ministry of Agriculture, Fisheries and Food

MMP – Materials Management Plan

NAWC – National Assembly for Wales Circulars

NCN – National Cycle Network

NERC Act – Natural Environment and Rural Communities Act 2006

NHBC – National Housing Building Association

NIEC – New Index of Ecological Continuity

NMR – National Monuments Record

NMU – Non Motorised Users

NMWTRA – North and Mid Wales Trunk Road Agent

NO – Nitric Oxide

NPRN – National Primary Record Number

NNR – National Nature Reserve

NOx – Oxides of Nitrogen

NO_2 – Nitrogen Dioxide

NR – Network Rail

NRW – Natural Resources Wales

NTP – National Transport Plan

NVC – National Vegetation Classification

OS – Ordnance Survey

PAS – Portable Antiquities Scheme

PCC – Powys County Council

PCL – Potential Contaminant Linkage

PM_{10} – Particulate Matter with a small size range (between 1 and 10µm)

PPG – Planning Policy Guidance

PPW – Planning Policy Wales

PRN – Primary Record Number

PSSR – Preliminary Source Study Report

RBD – River Basin District

RCAHMW – Royal Commission on the Ancient and Historic Monuments of Wales

RIGS – Regionally Important Geodiversity Sites

RMSE – Root Mean Square Error

RSC – River Severn Custodians

RSPB – Royal Society for the Protection of Birds

RST– Run-off Specific Thresholds

RTP – Regional Transport Plan

SA – Sustainability Appraisal

SAC – Special Area of Conservation

SAM – Scheduled Ancient Monument

SEA – Strategic Environmental Assessment

SEB – Statutory Environmental Bodies

SIAA – Statement to Inform an Appropriate Assessment

SINC – Site of Importance for Nature Conservation (termed Wildlife Sites in Powys)

SOC – Schedule of Comments

SOM – Soilogramic Matter

SPA – Special Protection Area

SPI – Species of Principal Importance (under the NERC Act)

SPZ – Source Protection Zone

SS – Suspended Sediment

SSSI – Site of Special Scientific Interest

SSV – Soil Screening Value

SUDS – Sustainable Urban Drainage System

SWMP – Site Waste Management Plan

TAN – Technical Advice Note

TPO – Transport Planning Objectives

TraCC – Trafnidiaeth Canolbarth Cymru (the regional transport consortium for central Wales)

TREBAP – Trunk Road Estates Biodiversity Action Plan

TR111 – The planned route of a road protected for planning purposes

UDP – Unitary Development Plan

UKBAP – UK Biodiversity Action Plan

UNECE – United Nations Economic Commission for Europe

VID – Visual Impact Drawings

VIS – Visual Impact Schedule

WaFD – Waste Framework Directive

WCA – Wildlife and Countryside Act 1981, as amended

WelTAG –Welsh Transport Planning and Appraisal Guidance

WFD – Water Framework Directive 2000/60/EC

WaFD – Waste Framework Directive

WG – Welsh Government

WHO – World Health Organisation

WOC – Welsh Office Circular

WTS – Wales Transport Strategy

ZoI - Zone of Influence

ZVI – Zone of Visual Influence

µm – Micro Metre (= to $1x10^{-6}$ of a metre)

1. Introduction

1.1. This document

This document is the Technical Assessment Report (Volume 1) of the Environmental Statement (ES) for the A483/A489 Newtown Bypass Scheme hereinafter referred to as the "Scheme".

The ES for the Scheme is reported in the following four Volumes:

- Non-Technical Summary
- Volume 1 – Technical Assessment Report
- Volume 2 – Figures
- Volume 3 – Technical Appendices

The Scheme location is shown in Volume 2 Figure 1.1 and the Scheme on aerial photograph is shown in Volume 2 Figure 1.2. This ES has been completed in accordance with EC Directive 2011/92/EU[1] – as amended (the Environmental Impact Assessment (EIA) Directive) and the Public Participation Directive 2003/35/EC which is transposed into UK law by Section 105A of the Highways Act 1980 (as amended). This legislation is enacted by the Highways (Assessment of Environmental Effects) Regulations 2007 (as amended). These are often collectively termed the EIA Regulations.

The Highways Agency (HA) publishes detailed guidance on the completion of EIAs under the above legislation, namely the Design Manual for Roads and Bridges (DMRB). Volume 11 of the DMRB relates to Environmental Assessment. The Alun Griffiths (Contractors) (AGC) Team has used this guidance as a basis for the EIA.

In accordance with Regulation 61 of The Conservation of Habitats and Species Regulations 2010, a Statement to Inform an Appropriate Assessment (SIAA) has been prepared on the possible impacts associated with the Scheme on the Montgomery Canal Special Area of Conservation (SAC). This was concluded at the Screening stage and is available in (ES Volume 3, Appendix E.2).

1.2. Location of the proposed project

The Welsh Ministers propose to provide a 6.53km long Trunk Road to the south of the town of Newtown in Powys, which would link the A489 and A483 Trunk Roads (refer to Diagram 1 below). The Scheme is located between a point west of Newtown at Grid Reference SO 079,901 and a point east of the town at Grid Reference SO 134,922.

1.3. Context

1.3.1. Why the Scheme is needed

The A483/A489 Trunk Roads at Newtown form part of the north-south and east-west transport corridors linking areas such as Mid Wales and the West Midlands in England. Newtown is a pinch point on the network and the junction of the A483(T) and A489(T) regularly suffers from traffic congestion. Further industrial development of Newtown is believed to be hampered by transport/ congestion issues. Baseline traffic flows are shown in ES Volume 2, Figure 2.9a.

Some of the main problems experienced in Newtown arise from low headroom/reduced width on the A483(T) Dolfor Road and A489(T) Nantoer Railway overbridges, congestion along A483(T) New Road and A483(T) Pool Road and conflicts between pedestrians and vehicles at the A483(T) Dolfor Road/ A489(T) Llanidloes Road junction.

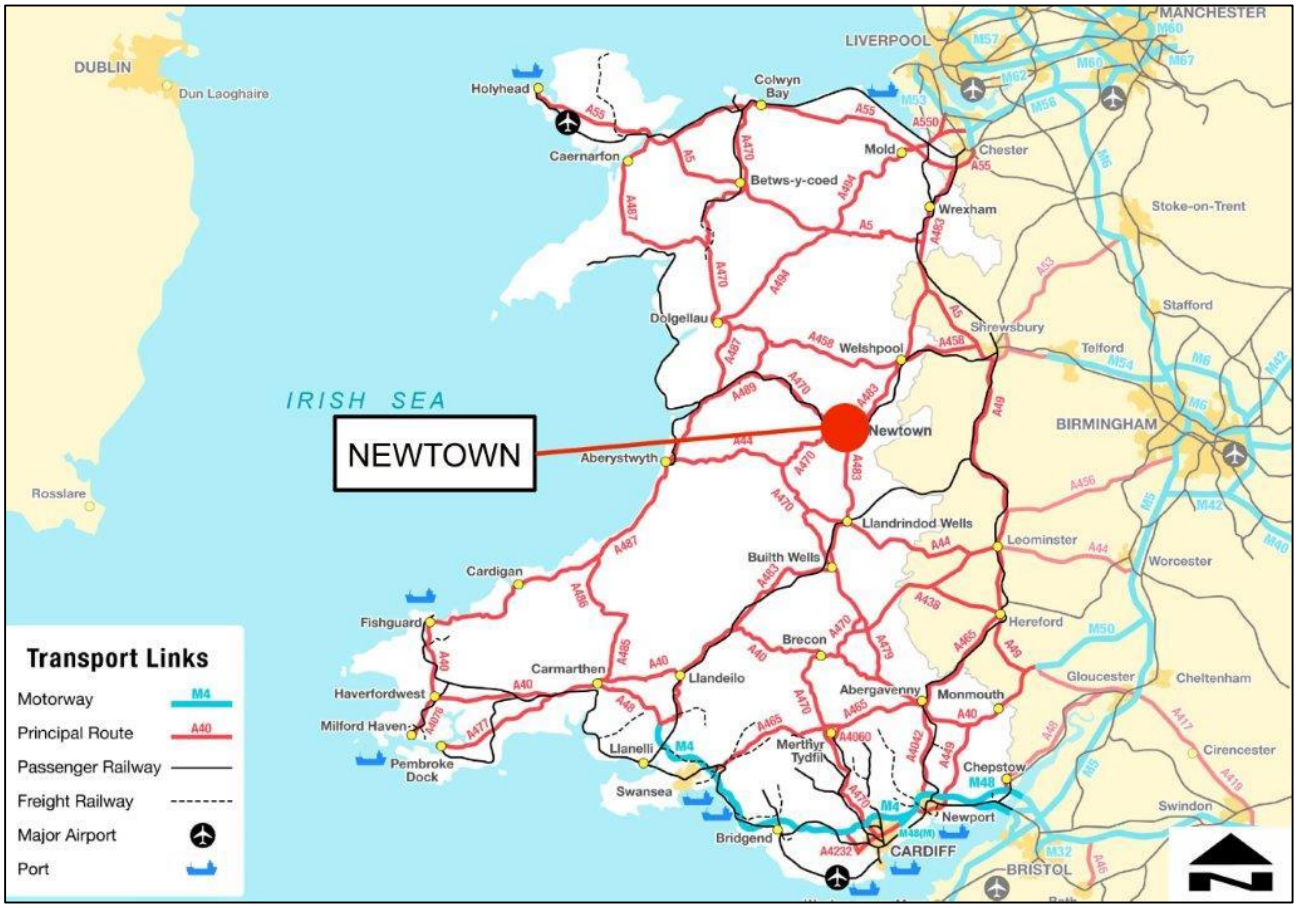
[1] Note that Directive 2011/92/EU was revised by Directive 2014/52/EU in March 2014. Member states have a three year period in which to transpose the legislation into their domestic legislation. Requirements of the revised Directive need not be implemented until Spring 2017.

To avoid the low headroom bridges high sided Heavy Goods Vehicles and high sided agricultural vehicles divert through the residential areas of Garth Owen and Treowen. This in turn compromises the safety of local residents, and in particular school children attending the Treowen and Cedewain Schools.

1.3.2. History of the Scheme

Historically, extensive work has been undertaken to identify traffic problems in Newtown, dating back to 1969 and a TR111 Preferred Route was announced in 1973. A study was commissioned by the Welsh Government (WG) to assess the transport issues associated with the A483(T) and A489(T) through Newtown in 2006. This resulted in a Preferred Route which was announced in 2010. Following further investigations a modified Preferred Route was announced in March 2014 which is the alignment referred to in the draft Orders and described in the ES.

Diagram 1 – Location of the Scheme (taken from National Transport Plan 2009)



1.4. Background

The Welsh Government (WG) commissioned a Key Stage 2 (KS2) Study to investigate options to resolve the transport problems in Newtown in 2006. The study was conducted and options appraised in accordance with the Welsh Transport Planning and Appraisal Guidance (WelTAG), taking into account the numerous policies, plans and strategies including undertaking a Health Impact Assessment. The study placed specific emphasis on the social, economic and environmental impacts.

The Newtown Planning Objectives and Pre-Appraisal Report (February 2006) concluded it was unlikely that further traffic management measures, improvements in public transport or a combination of such measures, would have a significant impact on alleviating the problems. A road improvement or bypass option, which removes the low headroom restrictions and reduces congestion within the town, was likely to be the only acceptable solution.

In October 2010 the Deputy First Minister announced a TR111 Preferred Route which was protected for planning purposes.

The Alun Griffiths (Contractors) Ltd (AGC) team was commissioned in April 2013 to develop the Scheme and prepare draft Orders and accompanying information during Key Stage 3 (KS3). The team will support the Welsh Government through the Statutory Process in Key Stage 4 (KS4) and would proceed to construction in Key Stage 6 (KS6) on the award of a separate contract between the Contractor and the Welsh Government. A summary of the project Key Stages is shown below:

A revised TR111 was announced in March 2014, following design development work carried out by the AGC team.

1.5. The Project Objectives and Reason for the Project

1.5.1. Welsh Government Objective and Mission Statement

The Welsh Government's objective is to provide a bypass to Newtown in accordance with the findings of the KS2 study, and to include the commitments made during the Public Consultation undertaken as part of the study. This is to be carried out through appointment of a design and build Contractor under an Early Contractor Involvement (ECI) contract to be managed following the principles of PRINCE2 project management system and to deliver the works to programme, budget, and with due regard to the Welsh Ministers' policies.

The Welsh Government's mission is to:

"Promote the vision and transport strategy described in the Welsh Government's 'One Wales: Connecting the Nation', the Wales Transport Strategy, and the National and Regional Transport Plans".

1.5.2. Scheme / Planning Objectives

Seven specific Transport Planning Objectives (TPOs) have been identified for the Scheme. These were developed during the KS2 study. The TPOs would be achieved through the Scheme (Objectives 2, 3, 6 and 7) and by several other stakeholders, namely PCC/TraCC (Objectives 1, 4 and 5). The objectives are detailed below:

Objective 1 – Maintain economic base

- Maintain economic base of Newtown measured by levels of local employment by the date in the Local Development Plan (2025).

Objective 2 – Meeting relevant environmental targets

- Within Newtown settlement boundary limit and within 200m of the Scheme;
- Meet targets and comply with appropriate environmental legislation and policies by 2018;
- Reduce greenhouse gas emissions along Pool Road and New Road by 3% from 2008 levels, by 2018 (in accordance with Wales Transport Strategy).

Objective 3 – Removing through traffic from local roads

- Reduce through traffic on Heol Treowen, Plantation Lane and Milford Road by 50% over 2008 levels by 2018;
- Reduce HGVs on Heol Treowen, Plantation Lane by 90% from 2008 levels, by 2018.

Objective 4 – Increasing level of usage for non-car forms of transport

- For travel with origin and destination within Newtown, achieve modal shift of 10% from car to non-car forms of transport (cycling, walking and public transport), over 2008 levels, by 2018;
- For travel with origin or destination within Newtown, achieve modal shift of 2% from car to public transport, over 2008 levels, by 2018.

Objective 5 – Integration of public transport

- Within Newtown limit interchange penalty linking bus services and train services to 20 minutes, by 2018;
- Within Newtown, during morning and evening peak hours (0700-0900 and 1600-1800) limit interchange penalty between bus services to 10 minutes, by 2018.

Objective 6 – Improve journey time consistency (North-South, East-West)

- Reduce journey times during morning and evening peak hours (0800-0900 and 1615-1715) on A489/A483 between A470/A489 junction (Caersws) and A483/B4389 junction (Aberbechan junction) by 10% by 2018;
- Reduce journey times during morning and evening peak hours (0800-0900 and 1615-1715) on A489/A483 between A483/unnamed C class Road at 'The Dingle, and A483/B4389 junction (Aberbechan junction) by 10% by 2018;
- Reduce journey times during morning and evening peak hours (0800-0900 and 1615-1715) on A489/A483 between A483/unnamed C class Road at 'The Dingle', and A470/A489 junction (Caersws) by 10% by 2018.

Objective 7 – Reduction in accidents

- Within Newtown settlement boundary limit, reduce road traffic accidents on A483(T), A489(T), Heol Treowen, Plantation Lane and Milford Road by 25% by 2018.

1.6. Draft Orders

The following draft Orders have been prepared for the Scheme and are published concurrently with the ES:

THE SWANSEA TO MANCHESTER TRUNK ROAD (A483) AND THE NEWTOWN TO ABERYSTWYTH TRUNK ROAD (A489) (NEWTOWN BYPASS AND DE-TRUNKING) ORDER 201-

THE SWANSEA TO MANCHESTER TRUNK ROAD (A483) AND THE NEWTOWN TO ABERYSTWYTH TRUNK ROAD (A489) (NEWTOWN BYPASS SIDE ROADS) ORDER 201-

THE WELSH MINISTERS (THE SWANSEA TO MANCHESTER TRUNK ROAD (A483) AND THE NEWTOWN TO ABERYSTWYTH TRUNK ROAD (A489) NEWTOWN BYPASS) COMPULSORY PURCHASE ORDER 201-

Copies of the ES and draft Orders may be inspected free of charge, during normal office hours during the Objection period, as set out in the Public Notice, at the following premises:

Welsh Government Offices, Cathays Park, Cardiff, CF10 3NQ

Welsh Government Offices, Ladywell House, Newtown, Powys SY16 1JB

Powys County Council, Neuadd Maldwyn, Severn Road, Welshpool, Powys SY21 7AS

Powys County Council, County Hall, Llandrindod Wells, Powys, LD1 5LG

Newtown Library, Park Lane, Newtown, Powys SY16 1EJ

Copies of the ES can be purchased from the Welsh Government in Cardiff at the following address:-

Orders Branch,
Transport,
Welsh Government
Cathays Park
Cardiff CF10 3NQ

At a cost of:-

Volumes 1 (Technical Assessment Report) - £50

Volume 2 (Figures) - £50

Volume 3 Parts 1 to 4 (Technical Appendices) - £50 each Part

Electronic copies of the ES can be purchased at a cost of £5. Further copies of the Non-Technical Summary may be obtained free of charge from the Welsh Government at the address shown above or via the following websites:

www.wales.gov.uk/transport

www.newtownbypass.co.uk

If you wish to support, comment or object to the draft Orders or Compulsory Purchase Order (CPO), put forward alternative proposals, or comment on the Environmental Statement, you should write to the Welsh Government at the address shown above.

All such correspondence should be sent to arrive at the Welsh Government no later than the end of the period as set out in the Public Notice.

1.7. Overview of the ES and the EIA process

1.7.1. ES Structure

The ES for the Scheme is reported in the following four Volumes and has followed guidance given in the DMRB Volume 11 Sections 1, 2, 3 and 4:

- Non-Technical Summary
- Volume 1 – Technical Assessment Report
- Volume 2 – Figures
- Volume 3 – Technical Appendices

The Non-Technical Summary is a report, which summarises the findings of the EIA in non-technical language in both English and Welsh.

The ES provides detailed information to help anyone with an interest in the Scheme understand the proposals and express an opinion on them before the Welsh Ministers decide whether to proceed with the development. The ES describes the proposals, identifies the main environmental effects on both the manmade and natural environment and describes the proposed measures to avoid, remedy or reduce impacts and provide environmental enhancement where relevant.

Volume 1 (this document) is the main technical assessment report, which details the methodologies and results of the EIA. It sets out ways in which identified impacts can be mitigated. Volume 2 is a set of supporting figures which should be read alongside Volume 1. Volume 3 is a set of technical appendices which should also to be read alongside Volume 1. Some figures and technical appendices are not available to the public as they contain sensitive information regarding protected species or local landownership.

1.7.2. Strategic Environmental Assessment (SEA)

The Welsh Government have proposed the Scheme through the Wales Transport Strategy and National Transport Plan (refer to Sections 4.3 and 4.4). These national plans and strategies have been subject to Strategic Environmental Assessments (SEA)[1.1, 1.2] and in the case of the National Transport Plan, also a Habitats Regulations Assessment (HRA)[1.3].

The SEAs were undertaken to implement the requirements of the European Union (EU) Environmental Assessment Directive (2001/42/EC) as transposed by the Environmental Assessment of Plans and Programmes (Wales) Regulations 2004. The HRA has been carried out to meet the requirements of Article 6(3) of the EU Habitats Directive and Part IV A of the Conservation (Natural Habitats &c) (Amendments) Regulations 2007. This reviews the impacts of plans and programmes upon EU protected sites and species. Additionally, the Welsh Government is obliged to undertake Equality Impact Assessments under race, disability and

gender legislation such as public sector duties and under Section 77 of the Government of Wales Act 2006.

These strategic assessments report on impacts identified on these Plan's proposals at a broad strategy level. This ES reports the environmental impact of the Scheme at the project level. The SEAs and HRAs completed for the Wales Transport Strategy and National Transport Plan by the WG and any other relevant policies and plans help inform this ES, especially in terms of the assessment of cumulative and in combination effects, with other plans or projects (refer to Section 1.7.6 and 15).

1.7.3. Screening

The requirement to undertake an EIA has been established through the EIA screening process which has been carried out in accordance with HD 47/08[1.4]; the outcome of which is provided in the Record of Determination (refer to Volume 3, Appendix A.1).

An EIA is a mandatory requirement for those developments which are listed in Annex I of the EIA Directive. For those developments listed in Annex II of the Directive the completion of an EIA is discretionary, depending on the likely environmental effects having regard for the criteria listed in Annex III of the Directive. The construction of a new road, which is not a motorway, falls under Annex II of the EIA Directive. It must therefore be assessed whether it has sufficient potential environmental impacts as to warrant an EIA. In Wales, the threshold for project size and environmental sensitivity are defined under the Highways (Assessment of Environmental Effects) Regulations 1999 (as amended). The Regulations define a 'relevant' Annex II project as:

'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'.

As the size of the Scheme exceeds 1 hectare, and considering criteria set out in Annex III of the directive, an EIA is required.

1.7.4. Scoping

An Environmental Scoping Report (Report No. 5105742/ENV/SR/RT203/A1) was prepared outlining the proposed approach, methodology and surveys to be documented in the ES. This report was circulated to the following statutory consultees for their comment:

- Natural Resources Wales (NRW)
- Cadw
- Clwyd-Powys Archaeological Trust (CPAT)
- Powys County Council (PCC)
- North and Mid Wales Trunk Road Agency (NMWTRA)
- Welsh Government Environment Co-ordination and Advisory Team (ECAT)

Comments were received from the above and were used to establish further survey and assessment work required along with measures to mitigate potential impacts.

A copy of the combined Schedule of Comments (SOC) from the consultees together with the response from the AGC team is available in Volume 3, Appendix A2.

A working draft of the ES was issued to the consultees listed above in March 2014 for their comment. A copy of the combined Schedule of Comments (SOC) from the consultees together with the response from the AGC team is also available in Volume 3, Appendix A2.

1.7.5. Consultation

A proactive approach has been taken to consultation to ensure that issues have been addressed during the design development phase wherever possible. Consultation with statutory environmental bodies and other stakeholders has been key in determining the work required to inform the ES and the measures required to mitigate potential environmental impacts. This consultation has been carried out on both a formal and informal basis.

The Scheme Environmental Liaison Group (ELG) consists of a number of statutory and non-statutory environmental bodies and stakeholders. The ELG meet on a quarterly basis throughout

the outline design, pre-construction and construction period (KS3 and 6 of the contract) and during the statutory process (KS4) as required. Following completion of the Scheme, the ELG would meet less frequently over the five-year post construction aftercare and monitoring period. In addition to the formal ELG meetings, there have also been meetings with the Natural Resources Wales (NRW) water resources team on September 26th 2013 and January 8th 2014 to discuss specific water related issues. A meeting was also held with NRW, Powys County Council and NMWTRA on 11th June 2014 to discuss ecological mitigation and results from ecological surveys. Minutes from the ELG and NRW meetings are available in Volume 3, Appendix A.3.

Formal consultation has taken place with the general public through public information exhibitions. Exhibition were held in Newtown on 9th July 2013 and the 8th April 2014.

An initial meeting was held with the Design Commission for Wales (DCfW) on 30th January 2014 with an extended presentation undertaken on 20th March 2014 in Newtown. A further presentation was held on 23rd October 2014 in Cardiff.

In addition to the formal meetings there has been close liaison between the environmental specialists and the statutory, non-statutory and interest groups as appropriate to request baseline information, obtain their views and concerns with regards the design development of the Scheme, confirm methodologies and discuss mitigation measures.

The AGC team has held meetings with landowners and local residents whose properties or private accesses would be directly affected by the Scheme and local and national elected members. Presentations have also been made to the Community and Town Councils to obtain their views and address their concerns wherever possible.

Service providers have been consulted regarding diversions and protection of infrastructure. Detailed discussions have also taken place with Network Rail.

Table 1.7.1 below summarised what consultation has taken place with different stakeholders:

Table 1.7.1 – Summary of Consultation

Stakeholders	Consultation undertaken
Statutory Environmental Bodies (SEBs) – e.g. Natural Resources Wales, Cadw, Clwyd-Powys Archaeological Trust, Powys County Council)	• Meetings (ELG and individual meetings) • Correspondence by phone and email • Comments and input on work undertaken (e.g. responses to Environmental Scoping Report, Draft ES etc.) • Public Information Exhibitions (09/07/13 & 08/04/14)
Other non-statutory consultees (e.g. Community and Town Councils, Design Commission for Wales, Walking Newtown, Sustrans, Powys Ramblers)	• Meetings • Presentations • Correspondence by phone and email • Public information exhibitions (09/07/13 & 08/04/14)
Land owners and property owners	• Meetings • Correspondence by phone, letter and email • Public information exhibitions (09/07/13 & 08/04/14)
Utility companies	• Meetings • Correspondence by phone, letter and email
Businesses	• Meetings • Correspondence by phone, letter and email • Public Information Exhibitions (09/07/13 & 08/04/14)
Public	• Public Information Exhibitions (09/07/13 & 08/04/14) • Press releases • Public liaison officer

1.7.6. Assessment of cumulative impacts

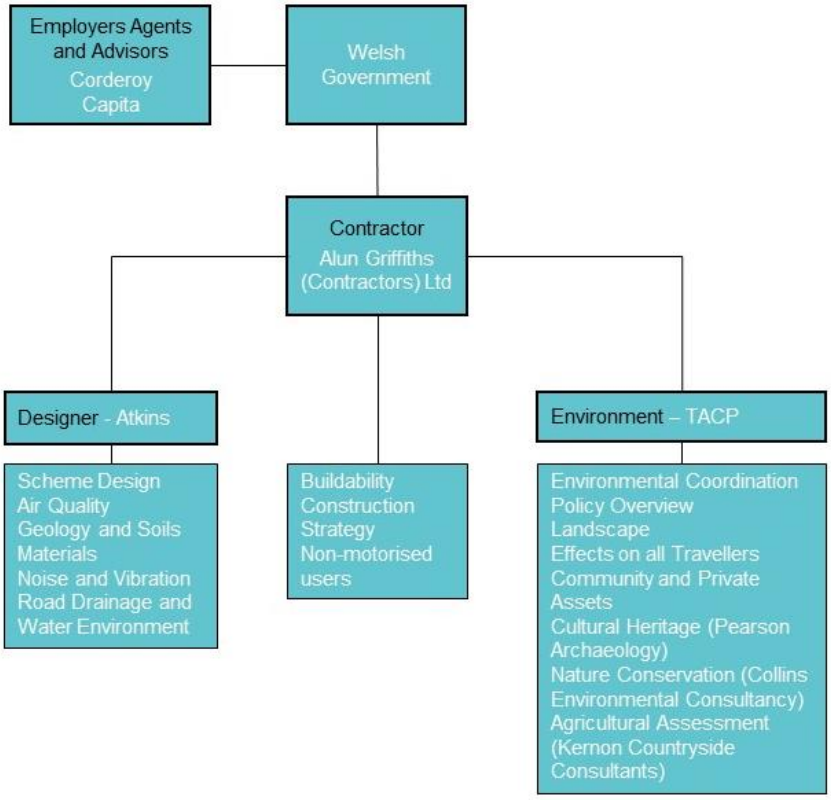
The consideration of potential cumulative effects is an important aspect of the EIA process. The assessment of cumulative effects within this report is based on current best practice guidance

and consultation with Statutory Environmental Bodies. The assessment of cumulative impacts and in combination effects is addressed in Section 15 of this ES.

1.8. Project team

The Welsh Government (Overseeing Organisation) awarded Alun Griffiths (Contractors) Ltd. (AGC) (the Contractor) the Early Contractor Involvement (ECI) contract for the Scheme. The AGC Team includes Atkins Ltd as Designers and TACP (UK) Ltd as Environmental Consultants. The Welsh Government's Team include Corderoy as Employers' Agent and Capita as advisers.

TACP is responsible for coordinating the environmental components for the Scheme and preparing the ES. Specialist environmental inputs have been undertaken by Atkins, TACP, Pearson Archaeology, Collins Environmental Consultancy, Kernon Countryside Consultants and individual specialists (TACP's sub-contractors). Technical input regarding the Scheme design has been provided by Atkins Highways and Transportation team. AGC prepared the Construction Strategy and inputted as relevant throughout the assessment process to ensure that proposed mitigation is practical, buildable and value for money. The flow diagram below summarises the inputs into the Environmental Statement from the different team members and shows who is responsible for each specialist environmental topic chapter.



2. The Project

2.1. Description of the Scheme

2.1.1. General

The Scheme would be 6.53km in length and would comprise 5.8km of Wide Single 2+1 Road. This would provide two lanes in one direction and one lane in the opposite direction. These lanes would be separated by double solid white lines, 1 metre apart, with cross hatching on red surfacing between the lines. In addition, single carriageway trunk roads would be provided: 0.3km at the western terminal, 0.1km at the eastern terminal and 0.11km at Dolfor Road to connect the Scheme into the existing Trunk road network.

Five at-grade roundabout junctions and 2.7km of single carriageway new and improved side roads would also be provided. Only the roundabouts would be lit. New or diverted lengths of Public Rights of Way and Private Means of Access would be provided to replace those affected by the Scheme.

Road drainage would be provided through piped systems which would discharge into 8 ponds along the Scheme. These ponds would attenuate and treat the collected surface water prior to discharging it into existing watercourses. The majority of the Scheme would be fenced with mammal protection fencing.

Two properties would be demolished, these are Kinsale on Middle Dolfor Road and Gelli on Pool Road. A barn on Pool Road and outbuildings at Lower Brimmon Farm would also be demolished.

For the General Arrangement plans refer to Volume 2 Figure 2.1 (a – d), long sections are shown in Volume 2, Figure 2.2 (a – b) and indicative cross sections are shown in Volume 2 Figure 2.8 (a – c). Volume 2, Figure 2.9 (a – c) shows baseline traffic flows (a) and traffic flows during the Scheme's opening year (2017) (b) and the design year (2032) (c).

Volume 2, Figure 2.10 shows a series of illustrative views of the Scheme within the landscape, with established mitigation compared with the existing situation as follows:

- Figure 2.10a – Illustrative view from the western end of the Scheme
- Figure 2.10b – Illustrative view of A483 Dolfor Road Roundabout from the north west
- Figure 2.10c – Illustrative view of A483 Dolfor Road Roundabout from the south west
- Figure 2.10d – Illustrative view of Kerry Road Roundabout from the south west
- Figure 2.10e – Illustrative view of Scheme from the east of Newtown
- Figure 2.10f – Illustrative view of A483 Pool Road Roundabout from the east

2.1.2. Ch. 0 – 550 A489 Llanidloes Road Roundabout to Mochdre Bridge (S2)

The Scheme would commence at its western connection with the A489(T) 0.3km west of the three-arm A489 Llanidloes Road Roundabout. This would improve sight lines for the existing trunk road and provide a minor realignment for the access to Hafren View. The northern length of bridleway BW251/16 along the existing Hafren View access would be stopped up. The eastern roundabout arm would connect with the existing Llanidloes Road leading to Newtown. Glanhafren Hall lies to the north of the Scheme and would be accessed to the east of the A489 Llanidloes Road Roundabout. Flood compensation would be provided as the Scheme would pass across the 1:1000 year floodplain on embankment between the tie-in to the existing A489(T) and A489 Llanidloes Road Roundabout. A section of known Roman Road would be left in situ within the flood compensation area. A treatment/attenuation pond (pond 1A West) would be located to the east of the roundabout.

The Scheme would continue south eastwards, as a 2+1 Road, and pass through the Glandulas Holiday Home Park between established caravan plots. The north eastern section of bridleway BW251/5 would be stopped up and footpaths FP251/8 and FP251/9 would be diverted and upgraded to a bridleway to the west of the Scheme. A 35m single span Glandulas Overbridge (S1) would be provided at Ch. 150 to access the western section of the Park and carry a diverted bridleway to link bridleway BW251/2 with the remaining sections of bridleways BW251/5 and

BW251/16. The bridleway would continue along the south of the Scheme to Mochdre Bridge. False cuttings s up to 3m high would be provided on both sides of the Scheme through the Holiday Home Park to reduce the visual and noise impacts on the caravans and properties. This would require realigning the internal access road and the removal of four caravan pitches.

The Scheme would enter a section of cutting 15m deep between Ch. 250 – 450 before passing over the Mochdre Brook on a 45m long clear span bridge. The structure would also cross the diverted bridleway which would link with footpath FP251/3 north of the Scheme, Mochdre Lane and the upper Mochdre Lane. Noise mitigation fencing would be provided between Ch. 410 – 650 to the north and between Ch. 370 – 610 to the south of the Scheme. This fencing would be 2m high reducing to 1m as it crosses the Mochdre Bridge structure.

2.1.3. Ch. 550 – 1500 Mochdre Bridge (S2) to Castell-y-Dail

Two underpasses would be provided to the east of the Mochdre Bridge to facilitate access south of the Scheme for Coleg Powys. The eastern underpass would also accommodate a diverted bridleway. Pond 1A East would be located south of the Scheme to the east of Mochdre Brook.

The Scheme would then cross agricultural fields on embankment up to 16m high and in cutting as it traverses the undulating landform until Ch. 1200. At Castell-y-Dail Wood there would be a cutting up to 28m deep on the southern side. This would lie to the north of the Iron Age fort and to the south of Castell-y-Dail House which is a Grade 2 Listed Building. The cutting would be through rock in the lower section. Footpath FP253/N4 would be stopped up east of Mochdre Lane to Castell-y-Dail. A length of replacement bridleway along the northern Scheme fenceline would extend from Mochdre Lane to Castell-y-Dail to replace the above. The north eastern length of bridleway BW253/N5 and BW253/N6 would be stopped up and diverted through the bridleway Underpass at Ch. 1100. This would link with bridleway BW253/N5, BW253/N6 and a permissive path to the south. A track would be provided to access adjacent fields to the west on the south side of the underpass. Noise mitigation fencing up to 2m high would be provided between Ch. 1230 – 1460 to the north of the Scheme.

A series of culverts would be provided between Ch. 1000 – Ch. 1500 to accommodate the watercourses and drainage channels with an arch structure to retain the natural bed at culvert C3a and a box culvert to allow for connectivity for mammals especially bats, Badgers and Otters at Culvert C4.

2.1.4. Ch.1500 – 2620 – Castell-y-Dail to Upper Dolfor Overbridge (S6)

The Scheme would continue eastwards, to the south of Mochdre Industrial Estate on an embankment up to 13m, crossing over Green Brook at Ch. 1880 in an arch structure at Culvert C8. It would then connect to the four arm A483 Dolfor Road Roundabout located near Black Hall Farm (Ch. 2200). An eastbound layby would be provided between Ch. 1550 and 1750 which would be partially screened by an false cutting 2m high. Footpath FP253/N3 would be stopped up between Hoel Ashley and the A483(T) Dolfor Road.

The northern arm of this roundabout would provide a 0.4km link road to the four-arm Lower Dolfor Road Roundabout. This would provide an access into the Mochdre Industrial Estate along Hoel Ashley, a northern connection with the existing Dolfor Road leading to Newtown and a connection to Middle Dolfor Road. A 170m length of 2m high noise mitigation fence would be provided to the north of the Hoel Ashley link road to the Lower Dolfor Road Roundabout. Pond 2A and flood alleviation culverts would be provided adjacent to the Lower Dolfor Road Roundabout. Lengths of existing culverts along the existing A483(T) Dolfor Road would be de-culverted.

East of the A483 Dolfor Road Roundabout, the Scheme would cross through an area of high ground in a cutting up to 23m deep prior to crossing over Middle Dolfor Road on an 80m long three span bridge. It would then pass under Upper Dolfor Road which would cross over the Scheme via a 35m long single span overbridge at Ch. 2620. A small pond 2B would be located along Middle Dolfor Road adjacent to Dolfor Underbridge.

2.1.5. Ch.2620 – 4500 Upper Dolfor Overbridge (S6) to Kerry Road Roundabout

From Upper Dolfor Overbridge the Scheme would continue north-eastwards in cutting up to 21m deep through agricultural land and then on embankment 21m high crossing over Brimmon Farm Underpass (S7) and Brimmon Lane Underpass (S8). Pond 3 would be located to the north of the

Scheme at Ch 3500. To reduce the visual and noise impacts on local properties a false cutting up to 2m high would be provided between Ch 3060-3420 to the north of the Scheme. A false cutting and a short section of noise attenuation fencing up to 2m high would also be provided between Ch 3500-3850 to the south of the Scheme.

The Brimmon Farm Underpass (S7) would accommodate footpath FP253/N14. Bridleway BW253/N15 would be diverted along the fenceline to the north of the Scheme and through the Brimmon Lane Underpass (S8). East of these structures the Scheme would pass in cutting to the four-arm Kerry Road Roundabout located North West of Lower Brimmon Farm.

The northern roundabout arm would connect to the existing Kerry Road leading to Newtown and the southern arm would connect with the existing A489 Kerry Road to Kerry. A diverted access would be provided to Lower Brimmon Farm. Pond 4 would be located to the south of the western arm of the roundabout.

2.1.6. Ch.4500 – 6000 Kerry Road Roundabout to A483 Pool Road Roundabout

The Scheme would continue north-eastwards in cutting passing under the 35m long single span Wern Ddu Overbridge (S9). A westbound lay-by would be provided between Ch. 5250 – 5310 which would be partially screened by a 2m high false cutting. Pond 5 would be located near Ch. 5500 to the south of the railway.

An embankment up to 13m high would take the Scheme over the Cambrian Railway at Ch 5500 via a 11m long single span Railway Bridge (S10). It would then curve eastwards crossing over the 12.6m long single span Pool Road Underbridge (S11) before connecting into the three-arm A483 Pool Road Roundabout. The southern arm of this roundabout would curve westwards and connect with the existing Pool Road leading to Newtown. The 0.1km long eastern arm would connect into the existing A483(T) leading to Welshpool at the Scheme's eastern termination.

A diverted access would be provided off Pool Road to serve Hazeldene, Avondale, Melstone, The Gables and Glan Hafren House. False cuttings up to 2m high would be provided between Ch. 5550 – 5630 to the north of the Scheme and around the northern perimeter of the A483 Pool Road Roundabout for a distance of 160m. Pond 6 would be located to the north of the Scheme at the eastern tie-in.

2.1.7. Lighting, signage, earthworks and structures

The lighting strategy has been developed in liaison with WG and PCC. The lighting would be restricted to the following:

- A489 Llanidloes Road Roundabout
- A483 Dolfor Road Roundabout
- Lower Dolfor Road Roundabout and the links into the existing Dolfor Road and Hoel Ashley
- Kerry Road Roundabout
- A489 Pool Road Roundabout and link to the western limits of Pool Road Underbridge

Full cut off energy saving lighting units would be provided.

Reflective traffic signs would be provided on the approaches to all roundabouts and their exits. Information signs showing the extents of safe overtaking lanes along the 2+1 Road and routes to the Industrial Estates and local facilities within Newtown would also be provided.

The Scheme would be earthworks neutral with all material excavated from the site reused in embankments, false cuttings and re-graded landscaping areas. A plan showing areas of cut and fill along the Scheme is shown in Volume 2 Figure 2.3 (a – d). The Scheme on contours is shown in Volume 2 Figure 2.4 (a – d).

Weathering steel composite bridge decks would be provided for the single and three span bridges with concrete box culverts for the underpasses. Accompanying information to show the form of

these structures is shown in Volume 2 Figure 2.5 (a – g) and examples of finishes to existing structures within Newtown are shown in Volume 2, Figure 2.6.

2.2. Construction Strategy

2.2.1. Methodology and overview

The start date for the construction phase would depend upon a number of factors including the successful completion of the statutory processes into making the Orders to construct the Scheme, the availability of Welsh Government funding and the formal signing of the contract to construct the works. It is currently anticipated that the construction activities for the Scheme would commence in late 2015. It is also anticipated that it would be completed in two and a half years (30 months) with an anticipated completion date of winter 2017. The works would be planned to ensure that the construction activities and traffic management would have minimal disruption to road users.

At the start of construction the site would be fenced and site clearance would commence. All works would be undertaken as detailed in the Construction Environmental Management Plan (CEMP) and in accordance with ecological constraints. Protected species licences would be obtained for bats, badgers and dormice as necessary and as outlined in Chapter 8 Nature Conservation. Temporary and permanent drainage and other environmental consents would be obtained where required.

Works on the majority of structures would be undertaken early to allow the mass earthworks to commence in 2016. Details on the works in the key areas are explained in the following sections.

Existing topsoil would be removed for future use, it would be stored in 2m high bunds along the edge of the Scheme. This reduces the requirement to move topsoil to and from a storage area, ensures the topsoil, and its associated seed bank is reused within a local area and it would provide a bund to assist with the control of construction run-off.

The demolition of the properties Kinsale and Gelli and the barn would take place early in the construction period to allow construction of the bridges to commence.

2.2.2. Site compound and delivery routes

The main site office compound would be located to the south of the Mochdre Industrial Estate and west of the A483 Dolfor Road Roundabout extending from Ch. 1600 to Ch. 1800. It would be surrounded with 2m high chain-link fencing, or hoarding where necessary to provide security and noise mitigation. The compound would have one main access off the existing A483(T) Dolfor Road to the south of the Scheme, with access to the site from the north of the compound, thus reducing unnecessary traffic movements on the existing roads.

A number of satellite compounds would be required along the length of the Scheme and these would predominately be located at the location of major structures, with provisions for small offices, welfare, storage / preparation areas, and access to the local road network.

Construction of the Scheme would be carried out over a period of 30 months. The first three months would be predominantly site clearance works and the last three months would be comprise mainly the preparation of landscape plots, planting and finalising the site works. Therefore the main construction vehicular and earth moving works would be undertaken over a period of 24 months, as noted in the Air Quality (chapter 5) and Materials (chapter 10) chapters.

A plan showing the compound areas, access points and delivery routes is shown in Volume 2, Figure 2.7. Relic landslip areas are shown in Volume 2, Figure 9.3 (a – d).

2.2.3. Western tie-in to Mochdre Bridge (S2) (Ch0-500)

At the western end of the Scheme the A489 Llanidloes Road Roundabout would be constructed off-line allowing road users to continue to use the existing trunk road until diverted onto the new carriageway. A culvert and a mammal pipe would be constructed east and west of the A489 Llanidloes Road Roundabout. From the roundabout the Scheme would pass south-eastwards, through the Glandulas Holiday Home Park. A new overbridge would be constructed away from the existing access track in the Park in 2015/16, prior to the earthworks and road construction in

2016/17. This would allow the Holiday Home Park user's uninterrupted access to the Park. Access to this area for construction would be off the existing A489(T) Llanidloes Road.

Anticipated phasing of the works in this area is shown in Table 2.2.1 below. Phase 1 commences at start of construction and all durations follow on.

Table 2.2.1: Phasing of the Works from Chainage 0 – Chainage 500

Phase[1]	Approximate Duration	Key Activities
1	9 months	Fencing, reptile translocation, and site clearance Construct Glandulas Overbridge (S1) Construct culverts, mammal pipes and temporary pond Commence earthworks and road construction for overbridge Open overbridge to Park and bridleway users. Service diversions and protection measures
2	12 months	Complete earthworks Commence drainage and flood compensation Construct roundabout and carriageway links to existing trunk road and to the by-pass Complete culverts and Pond 1A West
3	9 months	Complete tie-ins and divert traffic on to new roundabout Complete earthworks/drainage/road construction Lighting and signage Landscaping and environmental mitigation

[1]. Phase 1 commences at start of construction and phases 2 and 3 follow on for the durations shown above

2.2.4. Mochdre Bridge (S2) (Ch500 – 600)

The Mochdre Bridge (S2) would be a single span structure thereby eliminating any significant impacts during construction on the Mochdre Brook and existing local road network. Construction to the bridge abutments would commence early in the construction period. A satellite office and stores area would be erected near the east abutment area with access off Mochdre Lane for light vehicles only.

The large construction vehicles would access the bridge site from within the scheme boundary gaining access to the western abutment from the A489(T) Llanidloes Road and the eastern abutment from the site compound. A weekend road closure of Mochdre Lane would be required around Autumn 2016, to allow the steel beams to be erected. These would also be delivered to the site from the A489(T) Llanidloes Road and craned into position. The diversion route would be planned and agreed with PCC to ensure road users are informed and diverted with the minimum of disruption. No other construction activities are anticipated to have a direct effect on the local road users within this section of works.

To reduce the requirement for a haul road crossing at Mochdre Lane, the earthworks has been designed to provide a general cut/fill balance between Mochdre/Glandulas Holiday Home Park to the west, and Mochdre/Dolfor to the east. Any remaining material would then be transported over the bridge once construction was complete.

Table 2.2.2: Phasing of the Works from Chainage 500 – Chainage 600

Phase[1]	Approximate Duration	Key Activities
1	9 months	Fencing & Site clearance Construct new Mochdre Bridge Construct culverts and temporary attenuation pond
2	12 months	Complete earthworks to structure Commence earthworks to west and east of structure Service diversions Commence drainage Complete culverts and Pond 1A East Install bridge beams and construct deck

3	9 months	Complete earthworks/drainage/road construction to east and west of structure Finishes to deck Signage Landscaping and environmental mitigation

[1]. Phase 1 commences at start of construction and phases 2 and 3 follow on for the durations shown above

2.2.5. Mochdre Bridge (S2) to Dolfor Underbridge (S5) (Ch600 – 2500) including the A483 Dolfor Road Roundabout, Lower Dolfor Road Roundabout and link to Mochdre Industrial Estate

This section of the works would include the Coleg Powys Underpass (S2A) and Bridleway Underpass (S3), ten culverts, clearance of a small section of the Castell-y-Dail woods, rock cutting of the Castell-y-Dail area and earthworks cut/fill along the route. The main site compound would also be located in this area and would be erected in Autumn 2015.

The construction programme would ensure that the Coleg Powys and Bridleway Underpasses would be constructed in 2015/16 to allow the earthworks/drainage to start in 2016. Haul routes in the Castell-y-Dail area would remain within the highway boundary because of the height of the cutting to the south and the proximity of properties to the north.

The rock cut from the Castell-y-Dail area would be excavated and hauled to a processing area at Ch. 1700 where it would be crushed and graded for use in the fill areas. It is not envisaged that any blasting of the rock would be required. A protection slab to cover the Very High Pressure Gas Main would be required at Ch 1800 and would be designed in agreement with the service provider.

A haul road crossing would be formed and controlled on A483(T) Dolfor Road at Ch. 2100. This crossing would be a four-way traffic signalled junction, controlled manually at peak hours as agreed with the North and Mid Wales Trunk Road Agency (NMWTRA).

The Lower Dolfor Road Roundabout and link to the Mochdre Industrial Estate would be constructed off-line to allow uninterrupted use of the existing trunk road, until the traffic would be diverted onto the new alignment. Some minor diversions would be provided throughout the construction, but these would be localised to assist the construction in the area and the road users.

Table 2.2.3: Phasing of the Works from Chainage 600 – Chainage 2500

Phase[1]	Approximate Duration	Key Activities
1	9 months	Fencing, reptile/badger mitigation as required, and site clearance Construct new Coleg Powys (S2A) and Bridleway (S3) Underpasses Construct culverts and temporary attenuation pond
2	12 months	Commence earthworks (Including rock cutting) Service diversions including protection slab. Backfill around underpasses Commence road drainage Complete culverts, flood compensation and Ponds 2A and 2B
3	9 months	Complete earthworks/drainage/road construction Lighting and signage Landscaping and environmental mitigation

[1]. Phase 1 commences at start of construction and phases 2 and 3 follow on for the durations shown above

2.2.6. Dolfor Underbridge (S5) (Ch2500 – 2600)

The Dolfor Underbridge (S5) would be a 3 span steel composite structure with a piled foundation western abutment, two intermediate sets of column piers and a spread foundation for the east abutment. The construction to the intermediate piers would commence in 2015/16, but construction of the abutments would be delayed to allow for the extensive earthworks

excavations on the approaches to the abutments to be undertaken prior to their construction. These would then be constructed in 2016/17 following the first earthworks season.

Access to the intermediate piers would be from the Middle Dolfor Road, and a satellite compound would be formed in this area. A number of weekend road closures to Middle Dolfor Road are anticipated in 2017, to allow the steel beams of the deck to be erected. This diversion route would be planned and agreed with PCC to ensure road users are informed and diverted with the minimum of disruption. No other construction activities are anticipated to have an effect on the local road users for this section of works.

Table 2.2.4: Phasing of the Works from Chainage 2500 – Chainage 2600

Phase[1]	Approximate Duration	Key Activities
1	9 months	Fencing and site clearance Demolition of building Construct Intermediate piers Locally realign water course, if required
2	12 months	Commence earthworks to the east and west abutments Service diversions Commence drainage Construct west and east abutments (piling to west)
3	9 months	Complete earthworks/drainage/road construction to east and west of structure Install beams and construct bridge deck Finishes to deck Landscaping and environmental mitigation

[1]. Phase 1 commences at start of construction and phases 2 and 3 follow on for the durations shown above

2.2.7. Middle Dolfor Road to Kerry Road (Ch2600 – 4500)

This section would include the construction of Upper Dolfor Overbridge (S6), two underpasses, (at Ch. 3500 and Ch. 3700), two culverts and two mammal pipes. Access to this section of the site would mostly be off the A489 Kerry Road but accesses to the bridge sites would also be provided from Upper Dolfor and Brimmon Lane.

Haul roads would be formed around the underpass locations to allow access as required and a satellite compound area would be formed near Ch. 3600. During the construction of the Upper Dolfor Overbridge (S6) a temporary road diversion would be provided to allow Upper Dolfor Road to remain open to traffic whilst the bridge is constructed. A road closure would also be necessary to allow the bridge beams to be delivered and erected. The diversions would be agreed in conjunction with PCC to ensure that road users have minimal disruption.

The Kerry Road Roundabout and its Kerry Road links would be constructed mostly off-line to the existing road. This would ensure minimal disruption to the road users. On completion of the roundabout and link roads, the road users would be diverted onto the roundabout allowing the tie-in connections to be completed.

Table 2.2.5: Phasing of the Works from Chainage 2600 – Chainage 4500

Phase[1]	Approximate Duration	Key Activities
1	9 months	Fencing, badger mitigation and site clearance Install temporary access route on Upper Dolfor Road. Construct Upper Dolfor Overbridge (S6) Construct new Brimmon Farm (S7) and Brimmon Lane (S8) Underpasses Construct culverts and temporary Ponds 3 and 4 Complete Upper Dolfor Overbridge (S6) and open to traffic Remove temporary overbridge
2	12 months	Commence earthworks Service diversions Backfill around structure

		Commence drainage Complete culverts and Ponds 3 and 4
3	9 months	Complete earthworks/drainage/road construction Lighting and signage Landscaping and environmental mitigation

[1]. Phase 1 commences at start of construction and phases 2 and 3 follow on for the durations shown above

2.2.8. A489 Kerry Road to South of the Railway (Ch. 4500 – 5500)

An overbridge would be constructed at Wern Ddu Lane and this structure would be constructed off-line to allow the road users to continue using the existing road until the new bridge has been constructed. A small pond would be replaced by two new ponds to the north and south of the Scheme linked by a culvert.

The Very High Pressure Gas main would be crossed at two locations and protection slabs would be constructed in these areas, in conjunction with the service provider. The medium pressure gas main, south of the railway would also be diverted.

Access would be via the existing A489 Kerry Road, and the earthworks in this section has been designed to provide a general cut/fill balance so that a plant crossing would not be required across the railway line.

A haul road crossing would need to be formed and controlled over A489 Kerry Road.

Table 2.2.6: Phasing of the Works from Chainage 4500 – Chainage 5500

Phase[1]	Approximate Duration	Key Activities
1	9 months	Fencing, reptile translocation and site clearance Construct Wern Ddu Overbridge (S9) Construct culverts and temporary Pond 5
2	12 months	Commence earthworks Service diversions including protection slabs Commence drainage Complete culverts and permanent Pond 5
3	9 months	Complete earthworks/drainage/road construction Landscaping and environmental mitigation

[1]. Phase 1 commences at start of construction and phases 2 and 3 follow on for the durations shown above

2.2.9. Railway Bridge (S10) & Pool Road Underbridge (S11) (Ch5500 – 5700)

The bridge would cross the railway at Ch. 5500 as a single span structure, with abutments on either side of the railway track. The abutments would be positioned at a distance to allow construction to be carried out in a safe zone. The abutments would have spread foundations and a detailed method statement would be agreed with Network Rail (NR) to ensure safety to the NR infrastructure during the construction operation. It is anticipated that a number of night and weekend rail possessions would be required to construct the bridge deck and these would be confirmed with NR during the detailed design stage.

Pool Road Underbridge (S11) would be constructed off the line of the existing A483 (T) Pool Road- with minimal disruption to the road users. On completion of the bridge the traffic would be diverted through the structure to allow the abutments to be backfilled and the earthworks completed.

The construction for both structures would commence in 2015/16, with beam erection anticipated for Autumn 2016.

A culvert would be constructed at Ch. 5650 which would have a drop chamber to ensure that there was no access for mammals.

Table 2.2.7: Phasing of the Works from Chainage 5500 – Chainage 5700

Phase[1]	Approximate Duration	Key Activities
1	9 months	Fencing, reptile translocation and site clearance Demolition of Gelli and barn Construct Railway Bridge (S10) abutments Construct Pool Road Underbridge (S11) abutments Construct culverts and temporary Pond 6
2	12 months	Commence earthworks Service diversions Commence drainage and complete Pond 6 Erect beams and construct deck to both bridges Divert traffic through Pool Road Underbridge Backfill to structures. Finishes to bridges
3	9 months	Complete earthworks/drainage/road construction Signage Landscaping and environmental mitigation

[1]. Phase 1 commences at start of construction and phases 2 and 3 follow on for the durations shown above

2.2.10. A483 Pool Road Roundabout and Link Roads (Ch, 5700 - 6000)

The roundabout and its connecting roads would be constructed off-line to ensure minimal disruption to road users. Following their completion traffic would be diverted on to the these roads to allow the tie-in connections to be completed.

The new access to the 5 No properties to the north of the existing Pool Road would be constructed and put into operation with minimal disruption to users.

Table 2.2.8: Phasing of the Works from Chainage 5700 – Chainage 6000

Phase[1]	Approximate Duration	Key Activities
1	9 months	Fencing and site clearance Commence service diversions
2	12 months	Commence earthworks Complete service diversions Commence drainage Construct roundabout Form access road to properties north and south of existing road
3	9 months	Complete earthworks/drainage/road construction and tie-ins Lighting and Signing Landscaping and planting

[1]. Phase 1 commences at start of construction and phases 2 and 3 follow on for the durations shown above

2.3. Summary of Culverts and Associated Mitigation

The Scheme and the associated side roads would cross fifteen watercourses and minor streams and five small ditches. A list of the streams and their locations is included in Section 4 of the Flood Consequence Assessment in Volume 3 Appendix K.1. A list of the culverts that would be required for highway drainage and those required as part of the flood mitigation strategy is given in Table 2.3.1 below.

All new or retained land drainage culverts would convey a 1% (1 in 100 year) chance flow including 20% allowance for climate change. Checks would also be made to ensure that a 0.1% (1 in 1000 year) chance event does not increase flood risk in the locality. The exceptions are culverts C1 and C3b. In the case of C1, this is an existing culvert which would be retained.

Culvert C3b would replace an existing culvert and would be designed to match the conveyance of the existing culvert to avoid the transfer of flood risk downstream. Highway drainage culverts would be sized in accordance with the DMRB.

Culverts associated with the flood mitigation strategy would be designed to ensure that flood risk in the locality is not adversely affected by flood events up to the 0.1% (1 in 1000 year) chance event.

For a detailed appraisal of all the culverts associated with the flood risk management strategy for the Scheme refer to Section 14 and to the Flood Consequence Assessment which is included in Volume 3 Appendix K.1. For details of the highway drainage culverts, refer to Section 14 and to the Drainage Strategy in Volume 3 Appendix K.3.

Table 2.3.1 below shows the existing and proposed culverts along the Scheme.

Table 2.3.1 – Summary of Scheme Culverts and associated wildlife mitigation

Ref	Works		Length	Gradient	Associated mammal mitigation	Chainage of mammal mitigation if not in culvert	Function
	Type	Size	(m)	(1 in x)			
C1	Existing pipe	600mm	-	-	-		Land Drainage
C2	Existing to be abandoned						
C2a	Pipe	900mm	50 then 30	137 then 250	Dry pipe	350w	Land Drainage
C2b	New Pipe	300mm	38	250	Dry pipe	350e	Highway Drainage
C2c	Pipe	300mm	23	200	Dry pipe		Flood Mitigation
C3a	Concrete arch structure	3m span	85	13	Raised ledge	N/A	Land Drainage
C3b	Pipe	600mm	40	300	-	-	Land Drainage
C4	Box Culvert	1.2 x 1.2m	51	7.7	Raised ledge	-	Land Drainage
C5	Pipe	900mm	21 then 25	2.2. then 24.9	-	-	Land Drainage
C6	Pipe	900mm	26 then 42	2.6 then 21.3	-	-	Land Drainage
C7	Pipe	900mm	75	4.8	-	-	Land Drainage
C8	Concrete arch structure	3m span	86	21.2	Raised ledge	N/A	Land Drainage
S4	Box Culvert	1.5m x 1m	38	46.8	Raised ledge	N/A	Land Drainage
C9	Box Culverts	2 No. 2m x 1.1m	25	61.8	Raised ledge	N/A	Land Drainage
C10	Box Culverts	2 No. 2m x 1.1m	27	35.5	Raised ledge	N/A	Land Drainage
Existing A483 culvert	-	-	-	-			Land Drainage
C11	Pipe	1200mm	110	200	Underpass	3650	Land Drainage
C12	Pipe	1200mm	85	200	Dry pipe	N/A	Land Drainage
C13	No longer required						

C14	Pipe	900mm	32	200	-	-	Land Drainage
C15	Pipe	900mm	62 then 27	15.3 then 19.1	There would be no access for mammals – dry pipe to be provided	120	Land Drainage
C16	Pipe	375mm	40	100			Highway Drainage

2.4. Long-term management

On completion of the construction phase the AGC Team would continue to maintain the highway for 12 months and monitor and maintain the environmental mitigation, especially the landscape and ecological works, for five years. The environmental requirements for this period are set out in an Environmental Landscape and Ecology Aftercare Management Plan (ELEAMP), which would be produced and managed by the AGC Team environmental specialists. During the post construction period, the AGC Team would review the effectiveness of the environmental mitigation against their intended function as identified within the ES and would provide any remedial actions if required.

At the completion of this five year period, the management of the soft estate and environmental mitigation measures would be transferred to the North and Mid Wales Trunk Road Agent (NMWTRA). The AGC Team would prepare a ten year Maintenance Environmental Management Plan (MEMP), which would set out on-going management and monitoring actions. For further details refer to Chapter 16 – Environmental Management.

3. Alternatives Considered

3.1. Design options that have been examined

3.1.1. General

The Conceptual Design for the Scheme, and other associated transport measures were developed and appraised as part of the Key Stage (KS) 2 study which was commissioned in 2006 (refer to Section 1.4). The KS2 study was undertaken using the Welsh Transport Planning and Appraisal Guidance (WelTAG)[3.1] as outlined in 3.1.2 below.

The main bypass alternative routes considered during the KS2 Study are shown in Volume 2 Figure 3.1. The TR111 routes protected for planning purposes are shown in the ES Volume 2, Figure 3.2 and the alternative junction options considered during this ECI contract are shown in ES Volume 2, Figure 3.3 (a – j).

3.1.2. WelTAG Approach

The WelTAG Planning Stage firstly established Newtown's transportation problems, constraints and opportunities and the 'Transport Planning Objectives' (TPOs) were developed against which the appraisal of options could be tested against. Once these had been established, potential solutions were developed in the form of transportation options.

Following the Planning Stage, the WelTAG Stage 1 Appraisal was undertaken and 21 transportation options were appraised against the TPOs, criteria relating to the Welsh Impact Areas and other criteria relating to public and stakeholder acceptability, feasibility, risk and affordability. The Welsh Impact Areas represent the three elements of sustainability which underline policy in Wales:

- The economy,
- The environment,
- Society:

The WelTAG Appraisal Summary Table (AST) which was completed for each option appraised at WelTAG Stage 1 is included in Volume 3, Appendix A.4. This shows all the criteria considered in the appraisal of each option.

3.1.3. Appraisal of Options

Twenty one options were considered as part of the study comprising a northern and southern bypass as stand-alone schemes and also combined with online improvements to the existing A483 (T)/A489(T) through Newtown and local transport measures. The bypass options and other improvements are described below:

Bypass Options

Northern bypass linking the A489(T) with the A483(T) to the north of the River Severn and requiring two new river bridges.

Southern bypass options also linking the A489(T) with the A483(T), all of which cross the main Cambrian railway east of Dyffryn Industrial Estate. There was a single route for these options from the Dolfor Junction with the A483(T) to the south and the tie-in with A483(T) Pool Road to the east. There were three variations for this option between A483(T) Dolfor Road to the south and the tie-in with the A489 to the west of Newtown. These options included the following:

- South of Mochdre Industrial Estate
- Through Mochdre Industrial Estate on the approximate line of Heol Ashley
- Passing between Maesyrhandir and Mochdre Industrial Estate on the approximate line of the 1973 TR111 Preferred Route protected for planning purposes.

Off-line Improvements

- A new highway link to B4568 at Llanllwchaiarn via a new bridge across the River Severn
- A new highway link to B4568 at Aberbechan via an existing river bridge

Online Improvements – Bridges

- Raising the Nantoer and Dolfor Road railway bridges or lowering the road underneath to achieve the standard 5.3m clearances

Online Improvements – Highways/Traffic

- Linking of all existing traffic signals
- Provision of new traffic signals at the Kerry Road roundabout
- Provision of new traffic signals at the access to Morrison's supermarket.
- Improvements to right turn facilities at existing industrial estate junctions.

Local Transport Improvements

- Creation of a new public transport interchange at New Church
- Improvement to parking facilities at the railway station
- Bus priority measures
- Improvement to the bus / train link
- Improvement to the 'Dial a Ride' service
- Implementation of Travel Plans
- Improved provision for cyclists and other NMU
- Improvements to the safe routes to schools and colleges

3.1.4. WelTAG Stage 2 Appraisal

Following the completion of WelTAG Stage 1, 15 of the transportation options were not taken forward as they performed poorly against the TPOs, Welsh Impact Area criteria and other criteria. This left the following six options that were appraised at WelTAG Stage 2:

- **Option 5.2a:** Southern bypass (south of Mochdre Industrial Estate) and local transport improvements
- **Option 5.2b:** Southern bypass (through Mochdre Industrial Estate) and local transport improvements.
- **Option 5.2c:** Southern bypass (on approximate line of original TR111 route) and local transport improvements.
- **Option 7.2a:** Southern bypass (south of Mochdre Industrial Estate) combined with online improvements to A489(T) and A483(T) (highways and traffic) and local transport improvements
- **Option 7.2b:** Southern bypass (through of Mochdre Industrial Estate) combined with online improvements to the A489(T) and A483(T) (highways and traffic) and local transport improvements
- **Option 7.2c:** Southern bypass (on approximate line of original TR111 route) combined with online improvements to A489(T) and A483(T) (highways and traffic) and local transport improvements

The Stage 2 appraisal included further consideration against the TPOs which had been developed to be 'SMARTER' i.e. **S**pecific, **M**easurable, **A**ttainable, **R**elevant, **T**imed, **E**ffective and **R**ealistic. It also included more detailed consideration against the Welsh Impact Area criteria and other criteria (i.e. affordability, risk etc.). The options were subject to a DMRB Stage 2 EIA, which was carried out in accordance with guidance given in the DMRB Volume 11. A public consultation exhibition was held in order to establish the public's opinion of each of the transportation options.

The results of the appraisal process showed that Option 7.2a was the best solution to the transportation problems in Newtown and had the greatest public support. It is therefore this option that was protected for planning purposes in the 2010 TR111 Preferred Route and taken forward as the Conceptual Design to KS3.

3.2. Design Alternatives assessed through KS3

As part of the ECI contract the 2010 Preferred Route design (the Conceptual Design) was reviewed through a detailed Options Appraisal process. Key areas where it was considered that alternative options could add benefits to the overall Scheme were assessed as listed below:

- A489 Llanidloes Road Roundabout
- A483 Dolfor Road Junctions and link roads.
- A489 Kerry Road Junction
- The railway crossing and A483 Pool Road Roundabout.
- Alignment to the south of Glandulas Holiday Home Park
- Alignment partially following the Stage 2 Brown Route.

A number of alternative options were considered in each of these areas, which were appraised using the WelTAG methodology. Table 3.2.1 below shows a summary of the appraisal process and highlights which options were rejected and which were taken forward. The 'high level' Appraisal Summary Tables (ASTs) for all the options are provided in Volume 3, Appendix A.5. This describes why certain options highlighted in Table 3.2.1 were rejected. Some of the options described in Table 3.2.1 below are also shown in Volume 2, Figure 3.3 (a – j) as indicated within the table

Table 3.2.1 - Summary of Initial Screening Assessment of All Options

Option No.	Brief Description of Option	Recommendation of Initial Screening Assessment
1	**A489 Llanidloes Road Roundabout Options**	
1a	Three arm roundabout (Volume 2, Figure 3.3a)	Conceptual Design
1b	Roundabout repositioned further north (Volume 2, Figure 3.3b)	Considered Further
1c	Roundabout near Castell-y-Dail	Rejected
1d	Roundabout near Hafren View	Rejected
1e	Glandulas Holiday Home Park Alternative (Volume 2, Figure 3.3c)	Rejected
1f	Modified Stage 2 Brown Route (Volume 2, Figure 3.3d)	Rejected
2	**A483 Dolfor Road Roundabout Options**	
2a	Conceptual Design option (Volume 2, Figure 3.3e)	Conceptual Design
2b	AGC Tender Design option	Rejected in favour of 2c but better than 2a
2c	Southern Alignment and Roundabout arrangement (Volume 2, Figure 3.3f)	Considered Further
2d	Grade Separated Junction near Castell-y-Dail	Rejected
Option No.	**Brief Description of Option**	**Recommendation of Initial Screening Assessment**
3	**Kerry Road Junction Options**	
3a	Compact Grade separated junction (Volume 2, Figure 3.3g)	Conceptual Design
3b	At-grade four arm roundabout (Volume 2, Figure 3.3h)	Considered Further
4	**A483 Pool Road Roundabout Options**	
4a	Three arm roundabout north of railway line with the bypass passing beneath the railway line (Volume 2, Figure 3.3i)	Conceptual Design
4b	Three arm roundabout located at Gelli with bypass passing above the railway line	Rejected
4c	Three arm roundabout north of A483 Pool Road with bypass passing above the railway line	Rejected
4d	Three arm roundabout south of railway line with link roads passing above the railway line	Rejected
4e	Three arm roundabout north of A483 Pool Road with bypass passing above the railway line and above the diverted link to Newtown. (Volume 2, Figure 3.3j)	Considered Further

The options highlighted in Table 3.2.1 above that were considered further (Options 1b, 2c, 3b, and 4e) were then subject to a further appraisal against the Conceptual Design. The outcome of this process was that Options 1b, 2c, 3b and 4e performed better than the Conceptual Design in terms of the WelTAG criteria. These options are summarised below.

Option 1b (Volume 2, Figure 3.3b)

Option 1b offered some significant advantages over the Conceptual Design Option1a. These advantages include reduced impact on the broadleaved woodland and the species that this habitat supports, reduced earthworks, more acceptable to the immediately surrounding properties and business, reduced impact on services, less programme constraints and increased financial affordability.

Option 2c (Volume 2, Figure 3.3f)

Option 2c has clear advantages over the Conceptual Design Option 2a, which include reduced impact upon the Garth Owen residential area and Mochdre Industrial Estate units, reduced impact on traffic during construction, greatly reduced impact on services and associated costs, less programme constraints, reduced risk and increased financial affordability.

Option 3b (Volume 2, Figure 3.3h)

Option 3b offers some significant advantages over the Conceptual Design Option 3a. The main advantages include reduced visual impact, reduced disruption to traffic during construction, substantially increase westbound overtaking facilities, greatly reduced impact on services and associated costs, less programme constraints reduced risk and increased financial affordability.

Option 4e (Volume 2, Figure 3.3j)

Option 4e offers clear advantages over the Conceptual Design Option 4a. These advantages include greatly reduced impact on services and Network Rail. These would contribute substantial cost savings and remove major programming risks. Advantages also include avoiding a long deep cutting thereby improving the earthworks balance, less potential groundwater flood risk and pollution at railway crossing and avoids the need to divert watercourses for significant length of cutting.

3.3. Recommended Optimum Scheme

The preferred options at each of the four junction locations Options 1b, 2c, 3b and 4e have been combined to form the recommended optimum Scheme. The AGC team recommended to the Welsh Government that this Scheme be published as a revised TR111 Preferred Route shown in Volume 2 Figure 3.2.

Additional related issues of earthworks and overtaking opportunities are outlined below.

3.3.1. Overtaking

The Conceptual Design would have only provided overtaking facilities for 15% of the Scheme length in the westbound direction. The DMRB design document Highway Link Design - TD 9/93 states that 30% should be provided in each direction for a single carriageway road. Hence the Conceptual Design would not have met these requirements in the westbound direction and a Departure from Standards would have had to be granted by the Welsh Government.

The Recommended Optimum Scheme, with 2+1 Road between roundabouts, would increase the percentages of overtaking to 36% in the westbound direction and 40% in the eastbound direction.

3.3.2. Revised TR111

The Recommended Optimum Scheme formed the basis for the revised TR111 Preferred Route which was announced by the Minister for Economy, Science and Transport in March 2014. This is now protected for planning purposes. The published 2010 TR111 route together with the revised TR111 route published in March 2014 are shown in Volume 2 Figure 3.2.

3.3.3. Design Development

The following amendments have subsequently been made to the Scheme following discussions with Statutory Environmental Bodies and landowners:

- Development of arch bridge culverts with replicated natural stream beds at Culverts C3a and C8 in liaison with NRW
- Location and extent of flood compensation and alleviation measures
- Development of a solution to provide an accommodation bridge east of Mochdre Bridge (Coleg Powys Underpass)
- Amendment to the vertical alignment around the A483 Dolfor Road Roundabout to reduce the depth of cutting within the relic landslip area. This would enhance the landscape integration and improve the cut-fill earthworks balance. This included a realignment of the link road between the A483 Dolfor Road Roundabout and the Lower Dolfor Road Roundabout nearer to the existing A483 alignment.
- Realignment of the link into the Mochdre Industrial Estate to reduce impact on industrial units and the open space to the north of Hoel Ashley
- Realignment of the Scheme to the north between Ch 4500 to Ch 5300 to provide greater protection for the veteran oak previously within Scheme boundary. Development of environmental mitigation measures
- Identification of areas where re-profiling would help the Scheme fit better within the landscape and enhance its use for agriculture
- Agreeing more favourable accesses to properties and severed agricultural land, following consultations with landowners

4. Policy Overview

4.1. General

This section provides an overview of the main policies and plans which are relevant to the Scheme. These include overarching national and regional policies together with the development planning polices of Powys County Council (PCC) within whose county the Scheme is situated. The most pertinent sections of the policies and plans to the Scheme are replicated where relevant. Each specialist assessment will consider the impact of the Scheme on policies and plans relevant to that topic.

4.2. Programme for Government

The 'Programme for Government' is the Welsh Government's plan of action and represents *'a real commitment to delivery, measured by the impact government is actually having on people's lives'.*

One of the key policy areas under the programme is *'growth and sustainable jobs'. 'Improving our infrastructure'* is one of the four commitments that the Welsh Government has made in this policy area.

4.3. Wales Transport Strategy – One Wales: Connecting the Nation (April 2008)

The Strategy establishes a national framework for transport planning in Wales. The goal of *One Wales: Connecting the Nation* is to promote sustainable transport networks that safeguard the environment while strengthening the country's economic and social life. The outcomes of the strategy, through the strategic priorities, will be achieved by the Welsh Government at national level, Regional Consortia at regional level and Local Authorities at local level. TraCC (Trafnidiaeth Canolbarth Cymru) is the regional consortium for Central Wales responsible for achieving the outcomes of the strategy through their Regional Transport Plan (RTP).

The Wales Transport Strategy has been subject to a Strategic Environmental Assessment (SEA) to establish the impact of plans and programmes upon the environment (refer to Section 1.7.2 above).

4.4. National Transport Plan (March 2010) & Prioritised National Transport Plan (December 2011)

The Plan details the Welsh Government's approach to putting Transport onto a carbon reduction pathway, whilst at the same time ensuring that it can continue to support sustainable economic development and social inclusion.

Under item 70 the plan states: *'we will start work on the programme of proposals, by 2014 to the north-south road corridor to address sub-standard alignment, journey reliability, safety and local environmental issues on A483 in Newtown'.*

The prioritisation of the National Transport Plan has brought forward investment that will make the transport system in Wales work better to help tackle poverty, increase well-being and assist economic growth. The prioritised National Transport Plan published in December 2011 states that between 2012 and 2013 contractors will be appointed for the A483 in Newtown.

The draft NTP has been subject to a Strategic Environmental Assessment (SEA), Habitats Regulations Assessment (HRA) and Equality Impact Assessment all published in 2009 (refer to Section 1.7.2 above).

Where relevant the specialist topic chapters in this ES (refer to Sections 5 – 14) refer to where the Scheme is helping to meeting the objective and sub-objectives of the NTP SEA.

Section 9.2 of the NTP HRA states that *'all projects in the NTP will be subject to a project level HRA/AIES regardless of the findings of the screening or appropriate assessment stages of this HRA'.* The Scheme meets this commitment as an Assessment of Implications on European Sites

(AIES) has been completed for the Scheme in relation to the Montgomery Canal SAC. This is reported in the 'Statement to Inform an Appropriate Assessment' (SIAA) available within the ES Volume 3, Appendix E.2.

4.5. One Wales: One Planet (May 2009)

The One Wales: One Planet states that sustainable development in Wales means enhancing the economic, social and environmental wellbeing of people and communities, achieving a better quality of life for our own and future generations:

- In ways which promote social justice and equality of opportunity;
- In ways which enhance the natural and cultural environment and respect its limits using only our fair share of the earth's resources and sustaining our cultural legacy.

It also states that sustainable development is a core principle within the National Assembly's founding statute, and that Welsh Ministers '*have a statutory duty to promote sustainable development*'. '*This duty, under the Government of Wales Act 2006 (Section 79), requires Welsh Ministers to make a scheme setting out how they propose, in the exercise of their functions, to promote sustainable development'.*

The document is set out under a number of different chapters. Following the introduction, chapter 2 sets out the National Assembly's vision of a sustainable Wales and chapter 3 shows how the National Assembly will ensure that sustainable development is the central organising principle of WG. The remaining chapters (4 to 8) demonstrate what actions will be taken in delivering sustainable development. These are set out under the following headings:

- Sustainable Resource Use,
- Sustaining the Environment,
- A Sustainable Economy,
- A Sustainable Society,
- The Wellbeing of Wales.

4.6. People, Places, Future: Wales Spatial Plan (2008 Update)

The Wales Spatial Plan was adopted by the National Assembly in November 2004, and sets out strategic spatial planning guidance over a 20-year period. An update to the plan was issued in 2008.

The themes for the Plan addresses: the plan's vision, building sustainable communities; promoting a sustainable economy; valuing our environment; achieving sustainable accessibility and respecting distinctiveness. These themes then relate to each of the Wales Spatial Plan Area Strategies.

Section 13 of the Plan is entitled 'Achieving Sustainable Accessibility' and states: *'We will develop access in ways that encourage economic activity, widen employment opportunities, ensure quality services and balance the social, environmental and economic benefits that travel can have'.*

4.7. Economic Renewal: A New Direction (July 2010)

Economic Renewal: A New Direction was published in July 2010. The vision of the Welsh Government for economic renewal is of *'a Welsh economy built upon the strengths and skills of its people and natural environment; recognised at home and abroad as confident, creative and ambitious; a great place to live and work'.*

One of the five priorities for delivering this vision is *'investing in high quality and sustainable infrastructure'*, which states: *'Wales needs modern, sustainable infrastructure to underpin economic growth and the wellbeing of our people. Our people, businesses and communities need to be well-connected within and beyond Wales, and to have access to the right facilities and services where they live and work'.*

4.8. Trunk Road Forward Programme (November 2009)

This paper maps the changes to the Trunk Road Forward Programme from 2002 to 2008. It also details the changes to the programme and includes information on the development of Wales' National Transport Plan and the four Regional Transport Plans.

The Scheme is allocated within Phase 2 of the Trunk Road Forward Programme (2008 Update). This is defined as being 'high ranking and programmed to be ready to start between April 2011 and April 2014'.

4.9. TREBAP (2004 – 2014)

The National Assembly for Wales, as Highway Authority for Wales, has direct responsibility for the maintenance, improvement and development of the trunk road and motorway network for Wales. Under the Countryside and Rights of Way (CRoW) Act 2000, the National Assembly for Wales has a duty to have a regard for the conservation of biodiversity in its work. The WG Transport Directorate is already incorporating biodiversity into its work, and the Trunk Road Estate Biodiversity Action Plan (TREBAP) is to contribute to this ongoing process.

The Objectives of the TREBAP, within the constraints of recourses and road safety, are to:

- Set practical and realistic actions and targets for the period 2004 – 2014
- Link with other Biodiversity Action Plan targets for habitats and species
- Increase awareness of the Transport Directorate's staff and contributors, its environmental partners and the general public, of the biodiversity interest of the trunk road and motorway network,
- Encourage the use, the dissemination, of best practise for biodiversity in the management and development of the trunk road and motorway network; and
- Reflect the requirements of the National Assembly's Sustainable Development Scheme (Learning to Live Differently) and Action Plan where relevant.

Of the eleven Habitat Action Plans included in the TREBAP, five are of relevance to the Scheme, these being: boundary features, rivers and streams, rock faces and screes, water bodies and woodland and planted native trees and shrubs.

Of the seventeen Species Action Plans included in the TREBAP, seven are of relevance to the Scheme, these being: Amphibians, Aquatic Species, Otters, Bats, Dormice, Reptiles and Bluebells.

Both of the two Generic Action Plans within the TREBAP are also of relevance to the Scheme, these being the Action Plan for Ecological Surveys and Education and Awareness.

4.10. Environment Strategy for Wales (2006)

The Environment Strategy for Wales was published in 2006 and outlines the Welsh Government's long-term strategy for the environment of Wales, for the next 20 years. It provides a framework within which to achieve an environment, which is clean, healthy, biologically diverse and valued by the people of Wales.

4.11. Climate Change Strategy for Wales (October 2010)

The Climate Change Strategy and associated delivery plans (refer to Sections 4.12 and 4.13 below) confirms the Welsh Government's level of ambition in tackling the causes and consequences of climate change. They highlight areas where the Welsh Government will act to reduce emissions and enable effective adaptation in Wales. They also show the importance of UK and EU intervention in achieving targets set in Wales and make clear the critical contribution that people, communities, organisations and businesses across Wales will need to make to enable us deliver on this agenda.

The Welsh Government's key target is to reduce greenhouse gas emissions by 3% per year from 2011 in areas of devolved competence.

Section 8 of the Climate Change Strategy is related to the transport sector's emissions reduction. The Welsh Government's actions to reduce emissions in the transport sector is summarised as:

- Developing sustainable travel centres, and supporting 'Smarter Choices',
- Promoting eco-driving, walking and cycling,
- Investing in bus and rail services, and improving traffic management,
- Promoting the infrastructure for electric and hydrogen vehicles.

The strategy states that the transport sector is responsible for approximately a fifth of the emissions covered by the 3% target. It also notes that there is no single solution for reducing emissions in the transport sector and this is why a range of measures to reduce carbon intensity of transport and secure behavioural change (as summarised above) is proposed.

4.12. Climate Change Strategy for Wales Adaption Delivery Plan (2010)

The plan recognises that as a result of past and current emissions, we cannot avoid the impacts of climate change completely and so we need to consider how we are going to adapt to changes that may affect many aspects of our lives in the future. The National Assembly's adaption framework is introduced in Chapter 15 of the Climate Change Strategy, October 2010. This is the national coordinated approach the Assembly is taking to ensure that Wales understands the risks and opportunities the changes associated with a changing climate present and that Wales is well-placed to adapt in a sustainable way.

The adaption delivery plan sets out specific policies and programmes that the Welsh Government expects to implement in delivering the Adaption Framework. The first edition of the Delivery Plan has 24 actions which will be addressed under the following categories:

- Strategic actions,
- Natural environment,
- Infrastructure,
- Communities,
- Health,
- Business and tourism.

The actions, which are of most relevance to the Scheme, include:

Action 10 – Support consideration of climate change impacts in sustainable infrastructure development and regeneration. One of expected outcomes of this action is that all infrastructure developments sponsored by the Welsh Government are to incorporate climate change adaption as part of its approach to sustainable development.

Action 15 – Review the resilience of the transport infrastructure to the effects of climate change and develop a programme to address risks.

4.13. Climate Change Strategy for Wales – Emissions Reduction Plan (2010)

Wales has a target of 3% greenhouse gas emissions reduction from 2011 in areas of devolved competence. The emissions reduction plan sets out how emission reductions will be set out in Wales and what contribution different activities are expected to make in achieving the 3% target.

The reduction plan shows that approximately a third of Wales's emissions are traded emissions and that these are excluded from the 3% target. The plan also shows what contributions the various sectors across Wales have to make in achieving the 3% reduction target. Currently it is anticipated that measures implemented by the Welsh Government will deliver emissions savings of 2.71 $MtCO_2e$ in 2020, which will contribute 0.89% towards the 3% target (or 30% of the total required emission reductions).

In relation to transport, it is expected that emission reductions from the Welsh Government actions will contribute to 0.29 $MtCO_2e$ savings in 2020 which is a 0.10 contribution to the 3%

target. Emission reductions from the UK government measures in relation to transport will contribute to 1.07 $MtCO_2e$ savings in 2020 which is a 0.36 contribution to the 3% target.

4.14. Economic Renewal, A New Direction (July 2010)

The document states that the Welsh Government wants a strong economy, not as an end in itself, but for the integral contribution it can make to the quality of life and the economic, social and environmental wellbeing of the people and communities of Wales, placing sustainable development as the central organising principal.

The Vision for economic renewal is 'of a Welsh economy built upon the strengths and skills of its people and natural environment; recognised at home and abroad as confident, creative and ambitious; a great place to live and work'.

The five priorities for delivering this vision are:

- Investment in high quality and sustainable infrastructure,
- Making Wales a more attractive place to do business,
- Broadening and deepening the skills base,
- Encouraging innovation,
- Targeting the business support we offer.

The Scheme would help in providing infrastructure and in relation to infrastructure, the plan states: *'Wales needs modern, sustainable infrastructure to underpin economic growth and the wellbeing of our people'.*

4.15. Walking and Cycling Action Plan for Wales 2009 – 2013

The plan is designed to encourage more people to walk and cycle more safely and more often. The Action Plan explains how the Welsh Government and their partners are supporting walking and cycling throughout Wales. The key objectives of the plan are:-

- Improve the health and wellbeing of Wales through increased physical activity.
- Improve the local environment for walkers and cyclists.
- Encourage sustainable travel to combat climate change.
- Increase levels of walking and cycling through promotion of facilities.
- Ensure that walking and cycling are prioritised in policies, guidance and funding.

The plan also contains a range of actions aimed to deliver these objectives and are grouped under the following four themes:

- Changing behaviour,
- Sustainable travel encouraged via better walking and cycling infrastructure,
- Policy objectives,
- Evaluation.

Item 15 of the Action Plan identifies: '*Trunk Road Improvement funding to provide walking and cycling facilities on trunk roads and associated junctions where it is safe and appropriate to do so'*. This is important in relation to the de-trunking works, as funding should be made available for walking and cycling infrastructure.

4.16. The UK Low Carbon Transition Plan (2009)

The Low Carbon Transition Plan (National Strategy for Climate and Energy, July 2009) is the UK Government's five-point plan to tackle climate change. The plan has been presented to parliament and is pursuant to Sections 12 and 14 of the Climate Change Act 2008. The five points are as follows:

- Protecting the public from immediate risk,
- Preparing for the future,
- Limiting the severity of future climate change through a new international climate agreement,

- Building a low carbon UK,
- Supporting individuals, communities and businesses to play their part.

Chapter 6 of the plan is entitled 'Transforming Transport', and highlights the fact that our domestic transport in the UK contributes to approximately a fifth of total UK greenhouse gas emissions and that these are growing. Some of the highlights of the plan in relation to transport include:

- Continuing to improve fuel efficiency of new conventional vehicles,
- Supporting the low carbon vehicles and fuels of the future,
- Help people make low carbon travel decisions,
- Requiring international aviation and shipping to reduce emissions,
- Securing the oil supplies the UK needs during the transition, by sustaining investment in the North Sea, working to improve the functioning of international oil markets, and working with the downstream oil industry to address the issues which that sector faces.

4.17. Capturing the Potential – A Green Job Strategy for Wales (July 2009)

The strategy delivers the commitment made in the One Wales programme of Government to develop a Green Jobs Strategy. The Green Jobs Strategy provides an important delivery mechanism for our Sustainable Development Scheme, One Wales: One Planet and describes in more detail how we can achieve the vision of:

'A resilient and sustainable economy for Wales that is able to develop whilst stabilising then reducing, use of natural resources and reducing its contribution to climate change'.

The overall aim of this strategy is to help businesses to:

- Enhance competitiveness and profitability by being more energy, water and waste efficient,
- Explore and develop products and services needed in a low carbon, low waste society and stimulate their demand,
- Strengthen the low carbon energy sector in Wales.

The plan identifies business, consumers and government as the three key stakeholders involved in moving towards a sustainable future-ready economy.

The Framework for the strategy's delivery is organised into three-high level priorities. These being:

- Priority 1: Supporting Business
- Priority 2: Fostering Innovation and Technology
- Priority 3: Investing in a More Sustainable Economy.

4.18. Circulars

Circulars provide a procedural guidance that interprets and explains a particular piece of legislation. These were issued by the Welsh Office (between 1965 and 1999), the National Assembly for Wales (between 2001 and 2005), the Welsh Assembly Government (in 2007) and the Welsh Government (between 2012 – present). The Circulars that remain in force and may be pertinent to the Scheme are as follows:

National Assembly for Wales Circulars

- NAWC 31/01 – Countryside Rights of Way Act 2000
- NAWC 23/01 – New Guidance for Local Planning Authorities on European Protected Species and Changes in Licensing procedures

Welsh Office Circulars

- WOC 36/87 Use of Waste Material for Road Fill
- WOC 26/94 Environmental Protection Act 1990: Part II, Waste Management Licensing, The Framework Directive on Waste
- WOC 60/96 Planning and the Historic Environment: Archaeology,
- WOC 61/96 Planning and the Historic Environment: Historic Buildings and Conservation Areas,
- WOC 1/98 Planning and the Historic Environment: Directions by the Secretary of State for Wales,
- WOC 11/99 Environmental Impact Assessment (EIA),
- WOC 23/01 New Guidance for Local Planning Authorities on European Protected Species and Changes in Licensing Procedures.

4.19. Planning Policy Wales (July 2014)

Planning Policy Wales is the Welsh Government's principal statement of national policy and was adopted in March 2002. Version No.7 was published in July 2014.

The first four chapters of the statement introduce the planning system, development plans, making and enforcing planning decisions and the principles of planning for sustainability. The later chapters (5 to 13) set out policy on all key land use topics, some of which will have relevance to the Scheme, particularly Transport.

4.20. Technical Advice Notes

Technical Advice Notes (TAN) are produced by the Welsh Government to give strategic planning advice in Wales on a number of topics and should be read in conjunction with Planning Policy Wales. The TANs that may be pertinent to the Scheme are as follows:

- TAN 5 – Nature Conservation and Planning (2009)
- TAN 6 – Planning for Sustainable Rural Communities (2010)
- TAN 8 – Renewable Energy (2005)
- TAN 10 – Tree Preservation Orders (1997)
- TAN 11 – Noise (1997)
- TAN 12 – Design (2009)
- TAN 15 – Development and Flood Risk (2004)
- TAN 18 – Transport (2007)
- TAN 21 – Waste (2001)

4.21. LANDMAP Guidance

4.21.1.1. LANDMAP Information System

The LANDMAP Information System is the Welsh Government approved landscape assessment methodology (refer to Planning Policy Wales (2002) Section 5.3.13). The methodology divides the landscape into component elements known as aspect topic layers which are of equal importance and are assessed in terms of their characteristics and value against a standard set of criteria. The five aspect layers include Geological Landscape (GL), Landscape Habitats (LH), Visual and Sensory Landscapes (VS), Historic Landscape (HL), and Cultural Heritage (CH). This information is collected in a structured and rigorous way that aims to be as objective as possible. All information is reviewed through an independent quality assurance process.

Each Aspect layer is mapped individually for an area as a separate layer and each can be viewed independently or overlaid by other Aspect layers to support analysis and decisions made. The classification of the database is a very structured, consistent method of breaking the landscape into manageable parts, which now takes the form of a predefined typology. LANDMAP data has been used in this environmental impact assessment as baseline information and to inform the assessments especially cultural heritage, ecology and nature conservation and landscape effects.

4.21.1.2. LANDMAP evaluation

- **Geological Landscape (GL):** is the study of the geology, geomorphology and hydrology of the area.

- **Landscape Habitats (LH):** indicate the distribution of vegetation and habitats and the basis for landscape ecology.

- **Visual & Sensory (VS):** identifies those landscape qualities that are perceived through the senses. It deals with the individual physical attributes of landform and land cover, as well as their visual patterns of distribution and sensory characteristics, and the relationships between them in a particular area.

- **Historic Landscape (HL):** focuses on how archaeological and historical sites relate to each other and to the surrounding landscape.

- **Cultural Landscape (CL):** considers the relationship that exists between people and places; how people have given meaning to places, how the landscape has shaped their actions and their actions have shaped the landscape.

For each Aspect Area an evaluation is provided by the Aspect Specialist. This is to a degree a subjective assessment, but based on objectively described components. There are five levels within the Evaluation scale, as follows:

Outstanding	of international or national importance
High	of regional or county importance
Moderate	of local importance
Low	of little or no importance
Unknown	insufficient information exists to evaluate
NB: Where the Evaluation refers to 'importance' it is in terms of that particular Aspect only	

Within each aspect area there are a series of questions that are completed by the aspect specialist, there are also specific criteria which are evaluated and inform the overall evaluations outlined above, these are outlined below:

Geological Landscapes
- Research Value
- Educational Value
- Historic Value
- Rarity/Uniqueness
- Classic Example

Landscape Habitats
- Priority Habitats
- Significance
- Opportunity
- Decline Rates
- Threat
- Fragmentation
- Habitat Evaluation
- Importance for Key Species

Visual and Sensory
- Scenic Quality
- Integrity
- Character
- Rarity

Historic Landscape
- Rarity
- Survival
- Cohesiveness
- Potential
- Amenity Value

Cultural Landscapes
- Recognition/transparency
- Period
- Rarity
- Documentation
- Group value
- Survival
- Vulnerability
- Diversity
- Potential

4.21.2. LANDMAP review within the study area

Newtown falls within the Montgomeryshire aspect areas MNTGM. The aspect areas within the study area are shown in Volume 2 Figure 4.1. These are outlined below.

Geological Landscapes (Volume 2, Figure 4.1a): the main aspect areas within the study area are evaluated as moderate with the exception of MNTGMGL769 along the river Severn and GL444 to the south of the study area which are both evaluated as moderate. Relevant aspect areas include:

GL279 Mochdre – this aspect area lies at the base of a solid geology massif. All the criteria are evaluated as low, with an overall score of moderate.

GL414 Newtown – this aspect area is similar to GL279, all the criteria are evaluated as low with an overall score of moderate.

GL444 Kerry Hills – this area is undulating upland terrain and dissected plateau. Generally the criteria are evaluated as moderate with an overall evaluation for the aspect area of high indicating its regional importance.

Landscape Habitats (Volume 2, Figure 4.1b): the main aspect areas within the study area are evaluated as moderate with MNTGMLH033 to the east of Newtown evaluated as high. Relevant aspect areas include:

LH051 - this is an area of improved grassland to the west of Newtown. All the criteria are assessed as moderate or unassessed mainly due to the active management by grazing and mowing and the built up area.

LH101 – this aspect area includes the urban area of Newtown. Most of the criteria are assessed as moderate or are unassessed mainly due to the urban area and management for amenity.

LH054 – this is an area of predominantly improved grassland to the south of Newtown. There are small fields and copses including some ancient woodland. All the criteria are assessed as moderate or unassessed indicating the dominance of grazing in this aspect area.

LH033 – this area is made up of pasture and arable fields. All the aspect areas are evaluated as high with the exception of ‘decline rates’ and ‘threat’ which are unassessed.

Visual and Sensory (Volume 2, Figure 4.1c): the urban core of Newtown has not been assessed in terms of LANDMAP. To the north of Newtown the aspect area is evaluated as high, to the west east and south the aspect areas are evaluated as moderate with small sections of larger aspect areas to the south and west evaluated as high. Relevant aspect areas include:

VS212 Llandinam Hill and Scarp Mosaic – this is an area of small field parcels with small woodland copses. The criteria are evaluated as high with the exception of rarity.

VS946 Llandyssil Hill and Scarp Slopes – this is an area of rolling upland grazing. Scenic quality and integrity are evaluated as high, the remaining criteria are moderate.

VS254 Kerry Ridgeway – this is a network of grazed upland farmland running along the ridge. All the criteria are evaluated as high.

VS541 Newtown – this area covers the core of the market town. Scenic quality are rarity are evaluated as moderate, the other criteria are low with an overall evaluation of low.

VS650 River Severn Floodplain – this area of flat open lowland farmland to the east of Newtown has high evaluation for character and rarity but has a moderate evaluation overall.

Historic Landscapes (Volume 2, Figure 4.1d): none of the historic landscape aspect areas within the study area have been evaluated. Relevant aspect areas include:

HL789 Mochdre – this area of irregular fieldscapes to the west of Newtown is probably of medieval origin. This aspect area is evaluated as high.

HL805 Newtown Industrial Area South – this small area is within the built up area of Newtown containing 20th century light industrial and commercial development. This aspect area is evaluated as low.

HL427 Newtown – this aspect area covers the main part of urban Newtown which is a market town of medieval origin. This aspect area is evaluated as high.

HL630 Upper Mule – this large aspect area to the south of Newtown covers irregular fieldscapes in the valley of the River Mule which also contains woodland and nucleated settlement. This aspect area is evaluated as outstanding.

HL620 Middle Severn valley – this relatively narrow aspect area surrounds the River Severn and forms a continuation of HL902 to the west of Newtown. It contains agricultural, regular lowland fieldscapes with non-nucleated settlement. This aspect area is evaluated as outstanding.

Cultural Landscapes (Volume 2, Figure 4.1e): the main core of Newtown is evaluated as high. Surrounding this core the aspect areas are all evaluated as high. Relevant aspect areas include:

CL051 Rural landscapes – this area is largely agricultural with generally high criteria evaluations.

CL020 Newtown – the built up area of Newtown has strong sense of place. Recognition, period, survival and vulnerability are all assessed as high with an overall evaluation of outstanding.

CL052 Roads – this aspect area runs along the communications and transport corridor. The cultural importance of this aspect area includes places and place names, sense of place and leisure/recreation facilities. There is a very strong link to cultural identity. Period, group value and diversity are evaluated as high with an overall evaluation of high.

4.22. Trafnidiaeth Canolbarth Cymru (TraCC) Regional Transport Plan (September 2009)

The Trafnidiaeth Conolbarth Cymru (TraCC) Regional Transport Plan (RTP) is the Transport Plan for the Mid Wales Region, covering the counties of Ceredigion, Powys and part of Gwynedd (the former Meirionnydd district) and includes parts of the Snowdonia and Brecon Beacons National Parks.

The overall vision of the TraCC RTP is:

'To plan for and deliver in partnership an integrated transport system in the TraCC region that facilitates economic development, ensures access for all to services and opportunities, sustains and improves the quality of community life and respects the environment'.

The ten priorities of the RTP are to:

- Reduce the demand for travel
- Minimise the impact of movement of the global and local environment and ensure the highest levels of protection to European Sites.
- Improve safety and security of all transport users.
- Improve travel accessibility to services, jobs and facilities for all sectors of society.
- Improve the quality and integration of the public transport system including the role of community transport
- Provide, promote and improve sustainable forms of travel
- Maintain and improve the existing transport infrastructure (road and rail)
- Ensure travel and accessibility issues are properly integrated into land use decisions.
- Improve the efficiency, reliability and connectivity of movement by all modes of transport within and between Mid Wales and the other regions of Wales and England.
- Deliver a co-ordinated and integrated travel and transport network through effective partnership working.

The RTP is a bidding document which the Welsh Government use to assign funding to transport projects across Wales. The TraCC RTP helps provide the mechanism to deliver the 'local transport measures' which were identified in the Key Stage 2 study to help address the transport

issues within Newtown and meet the Transport Planning Objectives (TPOs) not delivered through the Scheme.

4.23. Powys Unitary Development Plan (Adopted March 2012)

The Powys County Council UDP (adopted March 2012) is the development plan for Powys (excluding the Brecon Beacons National Park) for the period 2001 to mid-2016. It replaces the former structure and local plans and is the basis for determining planning applications, indicating where certain types of development will or will not be permitted. It provides a policy framework where land is allocated for housing, employment and other development needs. It also provides advice on design and the need for the conservation of sensitive environments and historic buildings.

The policies provided in the plan are set out in two parts; Part 1: Strategic Policies and Part 2: Detailed Policies.

The impact the Scheme may have on the UDP housing, employment and public open space allocations are addressed in Section 13 – Community and Private Assets. UDP policies are also considered in other environmental topic chapters within this ES where relevant.

4.24. Powys Local Development Plan (Deposit Draft – July 2014)

The Powys County Council LDP Deposit Draft was published in July 2014. Once fully adopted (December 2015) it will supersede the current Unitary Development Plan (UDP), described above. The requirement for local authorities to produce Local Development Plans was provided under the Planning and Compulsory Purchase Act (2004).

The Powys LDP sets out the Council's polices for the development and use of land up to 2026. The written statement provided the context of the LDP, the LDP's Strategy and a range of polices for making planning decisions. The Scheme is included under Policy T1 – Transport Infrastructure and its location is included within the inset map for Newtown (sheet 48).

The impact the Scheme may have on the Deposit LDP housing, employment and public open space allocations are addressed in Section 13 – Community and Private Assets. Deposit LDP policies are also considered in other environmental topic chapters within this ES where relevant.

5. Air Quality

5.1. Introduction

The purpose of this chapter is to assess the potential effects of the Scheme on both local air quality and greenhouse gas emissions in the wider area. The assessment follows the methodology given in the Design Manual for Roads and Bridges (DMRB) Volume 11 Section 3 Part 1 HA207/07 Air Quality[5.1] (referred to as DMRB HA207/07). This report presents a review of the existing air quality, describes the methodology used to assess the effects of the Scheme during construction and operation and presents the results of the assessment. Mitigation options are considered for any potentially significant adverse effects. A summary of the impacts is shown at the end of this chapter in Table 5.7.1.

5.1.1. General

The Environmental Statement Scoping Report, 2013[5.2] for the scheme concluded that sensitive receptors (locations of relevant public exposure) in the vicinity of the Scheme could be affected during construction and on completion of the Scheme and recommended a detailed level of assessment using the ADMS Roads dispersion model.

This assessment considers both the potential effects on existing receptors in the study area during construction and when the Scheme is open fully. The study area for air quality consists of the area within 200 metres (m) of the Scheme and also any affected roads meeting the traffic change criteria defined in the DMRB HA207/07[5.1].

Traffic data used for this assessment is consistent with the Scoping Report findings, in that there are no affected roads within 200m of any relevant ecological designated site. An assessment of designated sites is therefore not required.

In terms of pollutants assessed, vehicle exhausts contain a number of pollutants including oxides of nitrogen (NO_x), carbon monoxide (CO), hydrocarbons, carbon dioxide (CO_2) and particulate matter (PM). The quantities of each pollutant emitted depend upon the type and quantity of fuel used, engine size, speed of vehicle and abatement equipment fitted. Once emitted, the pollutants disperse and hence are diluted in the ambient air. Pollutant concentrations in the air can be measured or modelled and then compared with ambient air quality criteria.

This assessment focuses in particular on:

- Nitrogen dioxide (NO_2) and PM, for the local air quality assessment, as these pollutants are the most likely to be present at concentrations close to or above the statutory limit values in an urban environment.
- Carbon dioxide (CO_2) for the regional emissions assessment, as this pollutant is a greenhouse gas and is used as an indicator of wider scale (non-local) effects of transport schemes.

National assessments have demonstrated that there is no risk of carbon monoxide, or the hydrocarbons 1,3-butadiene and benzene concentrations exceeding air quality criteria due to emissions from traffic anywhere in the UK [5.10]. The pollutants carbon monoxide, 1, 3-butadiene and benzene are therefore not considered further in the local air quality assessment...

In addition there is the potential for increased dust deposition in areas adjacent to the Scheme during the construction phase. The assessment has identified residential and other sensitive properties that could be at risk of being affected and considered the construction activities to be carried out and their duration.

5.1.1.1. Pollutants

Dust

Dust is the generic term for solid PM that can be suspended in the atmosphere. Dust *per se* is not considered as a local air pollutant but is inevitably encountered in the outdoor environment.

Dust that may deposit in the local area close to a source (such as a construction site) comprises PM between 10 and 75 micrometers (µm) in diameter, the larger size particles settling to the ground within a few tens of metres from the source. Small particles settle more slowly over a larger area and therefore contribute relatively little to the general ambient dust levels. Such particles are also more susceptible to being blown away. Excessive accumulations of dust on exposed surfaces, particularly in residential locations, may cause a perceived loss of amenity and give rise to public complaint.

Dust is defined within the Institute of Air Quality Management's (IAQM) Guidance on the assessment of dust from demolition and construction (referred to as IAQM Construction Dust Guidance)[5.3] as all airborne particulate matter that give rise to soiling (deposited dust) and to human health effects (particulate matter as discussed below).

The IAQM Construction Dust Guidance states that there is evidence that major construction sites can lead to an increase in annual PM_{10} concentrations and the number of exceedances of the short term 24-hour objective for PM_{10}. In addition, demolition and construction activities have the potential to cause higher than normal levels of dust deposition in the surrounding area. Dust emissions from a site may be mechanically generated due to land preparation (e.g. demolition, land clearing and earth moving) or as a result of release from site plant and movement of road vehicles on temporary roads and open ground and haul routes.

NO_2

NO_2 is a secondary pollutant produced by the oxidation of NO. NO and NO_2 are collectively referred to as NO_x. In humans high concentrations NO_2 can cause inflammation of the airways; it also enhances the response to allergens in sensitive individuals. NO does not have any observable effect on human health at the range of concentrations found in ambient air.

PM

PM in vehicle exhaust gases consists of carbon nuclei onto which a wide range of compounds are absorbed. These particles have an effective aerodynamic diameter of less than 10 µm (PM_{10} and smaller size fractions). Diesel engines produce the majority of particulate emissions from the vehicle fleet. About a quarter of primary PM_{10} emissions in the UK are derived from road transport. Finer fractions of particulate matter appear to be associated with a range of symptoms of ill health including effects on the respiratory and cardiovascular systems, on asthma and on mortality. Reviews by the World Health Organisation (WHO) and the Committee on the Medical Effects of Air Pollutants (COMEAP) have suggested exposure to $PM_{2.5}$ (particles less than 2.5 µm in diameter), which typically makes up around two thirds of PM_{10} emissions [5.4] and concentrations, has a stronger association with the observed ill health effects than PM_{10}.

CO_2

CO_2 is a major product of the combustion of carbon-containing materials. CO_2 does not affect human health at ambient levels and so is not significant as a local pollutant but is important for its national and international role in climate change. In 2011 about 26% of the UK CO_2 emissions were produced by road transport [5.5].

5.1.2. Policy Context and Guidelines of Relevance

Dust

There are no statutory quantitative controls or limits on general dust emissions from construction sites. Such emissions are however included in Statutory Nuisance provisions under the Environmental Protection Act 1990 [5.6]. Detection of and requiring action to stop any Statutory Nuisance are responsibilities of the local authority. In the context of the proposed Scheme, dust emissions from demolition and construction works could result in a Statutory Nuisance if not properly controlled. The defence against this is the use of 'Best Practicable Means' (BPM) to control emissions. In practical terms, application of BPM essentially means the managed, diligent application of 'best practice' techniques to minimise emissions in the context of the receiving environment, changing conditions and cost.

Dust levels that are substantially elevated above the norm can cause annoyance. This commonly relates to increased rates of dust deposition on exposed surfaces and / or soiling (discolouration /

contamination), although less commonly the term may relate to levels that are "prejudicial to health", including airborne dust.

5.1.2.1. Air Quality Legislation

There are two types of air quality regulations that apply in Wales:

Regulations implementing mandatory European Union (EU) Directive Limit Values: The Air Quality Standards (Wales) Regulations 2010 [SI 2010 No. 1433 (W.126)][5.7].

Regulations implementing national air quality objectives: Air Quality (Wales) Regulations 2000 [SI 2000/1940 (W.138)][5.8] and the Air Quality (Wales) (Amendment) Regulations 2002 [SI 2002/3182 (W.298)] [5.9].

Limit Values

In 2008, the European Commission adopted Directive 2008/50/EC on ambient air quality and cleaner air for Europe. This directive merged the Air Quality Framework Directive (96/62/EC) and three of the four pollutant specific daughter directives, and introduced new objectives for $PM_{2.5}$. The relevant EU Limit Values in the context of this assessment for the protection of human health are presented in Table 5.1.1.

Air Quality Standards and Objectives

The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS)[5.10] provides details of national air quality standards and objectives for a number of local air pollutants, including NO_2, PM_{10} and $PM_{2.5}$. The standards are set by expert organisations with regard to scientific and medical evidence on the effects of the particular pollutant on health, and define the level of pollution below which health effects are expected to be minimum or low risk even by the most sensitive members of the population. The objectives are targets for air pollution levels to be achieved by a specified timescale, which take account of the costs and benefits of achieving the standard, either without exception or with a permitted number of exceedances. Local authorities have a responsibility (under the Environment Act 1995)[5.11] to review and assess local pollution levels against these objectives. These criteria are defined in Regulations SI 2000/1940 and SI 2002/3182.

However, for some pollutants, such as $PM_{2.5}$, it is recognised that there is no threshold concentration that can currently be determined, below which there are no effects on the whole population's health. An exposure reduction objective for the finer $PM_{2.5}$ fraction has therefore been introduced in the latest version of the strategy. This type of objective is designed to reduce average concentrations throughout an entire urban background area, thus ensuring that the majority of people will benefit, rather than just those who live in a particular hotspot area.

It should be noted that the air quality criteria only apply in locations of 'relevant exposure'. The human health objectives are applicable where members of the public may be exposed to pollutant levels for periods equal to or exceeding the averaging periods set for these criteria. Locations of relevant exposure include building façades of residential premises, schools, public buildings and medical facilities; places of work (other than certain community facilities) are excluded.

The relevant air quality objectives are presented in Table 5.1.1.

Table 5.1.1 Relevant Air Quality Objectives and Limit Values

Pollutant	Criteria	Compliance Date	
		AQS Objectives	EU Limit Values
NO_2	Hourly average concentration should not exceed 200 µg/m^3 more than 18 times a year.	31 December 2005	1 January 2010
	Annual mean concentration should not exceed 40 µg/m^3.	31 December 2005	1 January 2010
PM_{10}	24-hour mean concentration should not exceed 50 µg/m^3 more than 35 times a year.	31 December 2004	1 January2005
	Annual mean concentration should not exceed 40 µg/m^3	31 December 2004	1 January 2005
$PM_{2.5}$	UK (except Scotland): annual mean concentration should not exceed 25 µg/m^3	2020	-
	EU Stage 1 Limit Value: annual mean concentration should not exceed 25 µg/m^3	-	1 January 2015
	EU Stage 2 Limit Value: annual mean concentration should not exceed 20 µg/m^3	-	1 January 2020
	Exposure Reduction: UK urban areas: target of 15% reduction in concentrations at urban background	Between 2010 and 2020	-
	Exposure Reduction: Target of 20% reduction	-	Between 2010 and 2020
Notes: Concentration units are micrograms per cubic metre (µg/m^3)			

5.1.2.2. Planning Policy

Local Air Quality Management

Under Part IV of the Environment Act 1995[5.11] all local authorities are responsible for Local Air Quality Management (LAQM), the mechanism by which the Government's air quality objectives are to be achieved. As part of this LAQM role, local authorities are required to periodically review air quality in their area and to assess the present and likely future air quality against the objectives defined in Regulations. Where a local authority anticipates an objective is expected to be breached within their district, they must designate an Air Quality Management Area (AQMA) and develop an action plan to improve pollution levels. Under the LAQM regime, a local authority is responsible for regular review and assessment of local air quality, reports on which are published following public consultation and review by the Department for Environment, Food and Rural Affairs (DEFRA).

Ecology

The EU has set limit values for the protection of vegetation for NO_x based on the work of the United Nations Economic Commission for Europe (UNECE) and World Health Organisation (WHO); these limit values have been incorporated into the Air Quality Limit Value (Wales) Regulations 2010 [SI 2010 No. 1433 (W.126)][5.7]. The Limit Value for annual mean NOx for the protection of vegetation is 30 µg/m^3.

UK Statutory Nature Conservation Agencies' (Countryside Council for Wales now Natural Resources Wales) policy is to apply the 30 µg/m^3 criterion, on a precautionary basis, as a benchmark, in all internationally designated conservation sites, including 'Ramsar' sites, Special Protection Areas (SPA), Special Areas of Conservation (SAC) and Sites of Special Scientific Interest (SSSI). Assessment of compliance with the limit values for the protection of vegetation is undertaken at locations within 200 m of any road "affected" by the Scheme.

Critical loads for nitrogen deposition have been set by the UNECE that represent (according to current knowledge) the exposure below which there should be no significant harmful effects on

sensitive elements of the ecosystem. The critical loads vary by type of ecosystem. Ranges for critical loads rather than fixed values are used to allow for natural variation, uncertainties about deposition effects and temporal variability of available data.

National and Regional Policy

Planning guidance of general relevance for air quality is found within Planning Policy Wales, 2014[5.12] (PPW). PPW Sections 13.10 to 13.12 refer to improving the quality of air. These sections reference the need to consider effects that proposed developments, and transport demand associated with them, may have on air quality and the effects that air quality may have on proposed developments. The document also states that this should be a material consideration in deciding whether or not to grant planning permission.

The Wales Transport Strategy, 2008 (WTS)[5.13] provides the national transportation policy framework for Wales. One of the long-term strategy outcomes of the WTS is the reduction of the contribution of transport to air pollution and greenhouse gas emissions. The associated Strategic Environmental Assessment (SEA)[5.14] reiterates this commitment and includes the following sub-objectives for local air quality and greenhouse gases which the Scheme should to support:

- Reduce negative effects of transport on local air quality (sub-objective 1.1)
- Avoid the exceedance of the UK National Air Quality Targets (sub-objective 1.2)
- Help achieve Welsh air quality objectives (sub-objective 1.3)
- Help achieve Welsh greenhouse gas emission reduction objectives (sub-objective 2.1)
- Reduce congestion (sub-objective 2.7)

The Wales Spatial Plan[5.14] was published in 2004 by the Welsh Assembly and was updated in 2008 to the Wales Spatial Plan, People, Places, Future. The Plan sets a vision for how each part of Wales should develop sustainably over the next 20 years. The Plan places emphasis on the need to address climate change, through the promotion of sustainable development, waste management and improving air quality.

The Mid Wales Regional Transport Plan 2009 (RTP)[5.15] recognises the importance of environmental protection when considering the development of transport schemes in the Mid Wales region. In particular, the RTP identifies that 'sensitive' improvement works or new highway schemes need to be appropriately considered / assessed and incorporate high quality design principles.

Local Planning Policy

The PCC Council Unitary Development Plan[5.16] (UDP) 2001-2016 (Adopted March 2010), provides the policy framework for directing development across Powys up until 2016. PCC is currently preparing a Local Development Plan (LDP) as required under the Planning and Compulsory Purchase Act (2004). The Deposit LDP Proposals was published for public consultation at the end of July 2014. Once adopted, the LDP will replace the current UDP.

Section 2.1.29 of the UDP recognises that vehicle exhaust emissions are a major contributor to local pollution and greenhouse gas emissions. Strategic Policy UDP SP6 *Development and Transport* states that developments that maintain and improve the transportation infrastructure in Powys will be acceptable, especially where they reduce traffic movements.

General UDP Policy GP1 *Development Control* states that development proposals will only be permitted if the amenities enjoyed by the occupants of nearby or proposed properties shall not be unacceptably affected by levels of noise, dust, odour etc.

UDP Policy T1 *Highway Improvement Schemes* states that support will be given to improvement schemes that benefit the local environment. UDP Policy T2 *Traffic Management* states that traffic management schemes which reduce traffic congestion and improve the local environment will be approved.

Seven specific Transport Planning Objectives (TPOs) have been identified for the Scheme. TPO 2 *Meeting relevant environmental targets* aims to reduce greenhouse gas emissions along Pool Road and New Road by 3% from 2008 levels, by 2018 (in accordance with Wales Transport Strategy).

5.1.2.3. Relevant Guidance

Specific guidance for assessment of effects of road infrastructure schemes on air quality is given in DMRB HA207/07[5.1]. This guidance covers the assessment of impacts of road schemes on local and regional air quality. Supporting Interim Advice Notes (IAN) on future projections of NO_2 (IAN170/12)[5.25], evaluating significant local air quality effects (IAN174/13)[5.26] and risk assessment related to compliance with the EU Directive (IAN175/13)[5.27] have also been produced by the HA for use within England. At the time of writing the Welsh Government (WG) has yet to formally adopt the IANs and as such they are not addressed further.

Additional guidance concerning local air quality is given by DEFRA's Technical Guidance LAQM.TG(09)[5.17]; whilst this primarily addresses LAQM activities, the guidance provides relevant methods concerning treatment and interpretation of data that are not completely addressed by the DMRB.

Guidance relating to new developments, including those requiring new transport infrastructure, has been developed by Environmental Protection UK (EPUK) in conjunction with the IAQM and published in the document 'Development Control: Planning For Air Quality (2010 Update)' [5.18] (referred to as EPUK Development Control Guidance). The guidance provides assessment scoping criteria applicable to proposals affecting road transport, which complement the more specific scoping criteria for road schemes given in the DMRB. The guidance also provides significance criteria for air quality assessment.

Guidance regarding assessment of construction dust is provided by the IAQM Construction Dust Guidance [5.3].

5.2. Methodology

5.2.1. Identification of Baseline Conditions and Sensitivity

The discussion of baseline air quality conditions draws on information provided by PCC, including LAQM reports and local monitoring data, and from DEFRA's UK-AIR website [5.19], which includes background concentration data for NO_2, PM_{10} and $PM_{2.5}$. There are no sources of information relating to baseline conditions for the larger fractions of dust.

Relevant locations with public exposure that are potentially sensitive to NO_2, PM_{10} and $PM_{2.5}$, including residential, medical and educational premises, have been identified from Ordnance Survey MasterMap® data.

5.2.2. Methodology for Construction Impacts

Construction activities have the potential to generate dust, which may have an adverse effect on nearby properties. Dust emissions from construction sites potentially arise from a range of diffuse sources and are termed 'fugitive emissions'. Fugitive dust emissions can lead to a localised increase in dust deposition rates that may potentially cause soiling of cars, windows and other surfaces. Over a period of time, cumulative deposition may become noticeable and cause concern or even nuisance.

There is no standard or prescribed methodology for assessing the effects on air quality from demolition and construction dust emissions. Quantitative assessments are not commonly carried out due to the uncertainties inherent in available emission data for fugitive sources. Generally, a qualitative assessment of risk is undertaken in the context of proposed activities.

Significant local air quality effects due to road traffic may result if there are substantial movements of construction vehicles and/or disruption to general traffic due to traffic management measures (including diversion) over the period of construction. However significant effects would only be expected if such a situation were to occur over periods of one year or more in locations where there is relevant exposure within 200m of affected routes and poor baseline air quality.

For this assessment, construction impacts have been considered in qualitative terms, with reference to the IAQM Construction Dust Guidance [5.3]

The IAQM Construction Dust Guidance provides a methodology for assessing the risk of impacts occurring at receptors due to dust emissions during the construction phase. The method used is

deliberately conservative in order to require a further assessment for most schemes. There are four key steps in the assessment process, as follows:

Step 1 (screening) - Identify the number of human receptors within 350m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on the public highway up to 500 m from the site entrance. Ecological receptors should also be identified within 50m of either the boundary of the site and/or of the route(s) used by construction vehicles on the public highway up to 500 m from the site entrance No further assessment is required if there are no receptors.

'Human' receptors include residential dwellings and industrial/commercial premises that may have a particular sensitivity to dust deposition e.g. vehicle showrooms, food manufacturers, or electronics manufacturers. 'Ecological' receptors include sites with statutory designations e.g. 'Ramsar' sites, SPA, SAC and SSSI as well as non-statutory sites such as local wildlife sites and/or locations with very specific sensitivities e.g. horticultural operations.

Step 2 - Assess the risk of dust effects by considering the area around the site in the context of potential dust impacts and distances to nearby receptors in relation to proposed activities in terms of demolition, earthworks, trackout (mud deposits on the road from road vehicles leaving the site) and construction.

Step 2A - Dust emission classes of 'large', 'medium' and 'small' are used to define the level of risk arising from each site depending on nature and scale of operation.

Step 2B - The sensitivity of the area is defined as 'high', 'medium' and 'low' for dust soiling effects, human health impacts and ecological impacts separately taking into account the sensitivity of receptors, distance of receptors from dust generating activities, background PM_{10} concentrations and other site specifics factors (defined in Tables 2, 3 and 4 of the IAQM Dust Guidance (reproduced in Volume 3 Appendix B.1, Tables B1 to B3).

Tables 6 to 9 in the IAQM Construction Dust Guidance defining the risk of impact based on the dust emission magnitude and sensitivity of area are reproduced in Tables 5.2.1 to 5.2.4 below.

Table 5.2.1 - Risk of Dust Impacts - Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table 5.2.2 - Risk of Dust Impacts - Earthworks

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 5.2.3 - Risk of Dust Impacts - Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 5.2.4 - Risk of Dust Impacts - Trackout[1]

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

[1]Trackout can be defined as the deposition of dust and dirt from the construction site onto the public road network, where it may then be re-suspended by vehicles using the network.

Step 3 - Describe site specific mitigation in terms of the identified risks.

Step 4 - Assess the significance of the dust effects, after site specific mitigation.

5.2.3. Methodology for Operational Impacts Local Air Quality

The requirement for undertaking an air quality assessment for the Scheme was determined based on air quality assessment criteria given in the DMRB HA207/07 [5.1]. A quantitative estimate of the change in air quality must be undertaken where the changes on local roads meet any of the following criteria:

- Daily traffic flow would change by 1,000 Annual Average Daily Traffic (AADT) or more; or
- Heavy duty vehicles (HDV) flows would change by 200 AADT or more; or
- Daily average speed would change by 10 kilometres per hour (kph) or more; or
- Peak hour speed would change by 20 kph or more; or
- Road alignment would change by 5 m or more.

Where the changes due to the Scheme were found to exceed the above criteria, pollutant concentrations were then estimated at representative receptors within 200m of the road edge, and compared with statutory air quality criteria (termed the local air quality assessment). Significance criteria given in the EPUK Development Control Guidance[5.18] have been applied. The criteria enable significance to be determined according to the differences in concentrations estimated for the 'with Scheme' and 'without Scheme' scenarios and take into account any exceedances of air quality criteria that would be created or removed, worsened or lessened.

Following DMRB guidance, the air quality assessment of the effect of these changes in traffic flow, composition and speed has adopted a Detailed rather than Simple approach using detailed dispersion modelling software ADMS-Roads, version 2.4.0. The model uses information on traffic flows, speeds and composition, vehicle emission rates, road alignment and width, and local meteorological data to estimate local air pollutant concentrations.

5.2.3.1. Scenarios

Concentrations were calculated for the following scenarios:

- Base case (2012), used instead of 2013 data to permit verification against available monitoring data;
- Opening year (2017) Do-Minimum (without the Scheme);
- Opening year (2017) Do-Something (with the Scheme);

5.2.3.2. Traffic Data and Road Geometry

Traffic conditions vary throughout the day; hence diurnal profiles have been applied in the model to improve approximation of vehicle emissions in each hour of the year. ATC count data were provided both carriageways for two locations on the A483, A489 and B4568. Average weekday (Monday to Friday), Saturday, and Sunday diurnal profiles were calculated for these road sections and an average diurnal profile was calculated to apply to all other links in the model.

Congestion along the A489 within Newtown town centre was accounted for by reducing average peak period (7am to 7pm) speeds to 15 kph along sections of both Llanidloes Road and New Road.

Ordnance Survey base mapping at 1:1,250 scale was used to define road geometry within Newtown and road widths were taken to be 3.65m per lane

5.2.3.3. Emission Factors

Vehicle exhaust emissions of NO_x and PM_{10} for light duty vehicles (LDV) and heavy duty vehicles (HDV) have been calculated using DEFRA's Emission Factor Toolkit (EFT), version 5.2c [5.20] for each road link in each modelled scenario. The calculation assumed an urban vehicle fleet mix for all modelled road links within Newtown and a rural vehicle fleet mix for links outside of the town (i.e. A489 and B4568 to the west of Newtown, A489 and A483 to the south of Newtown and the A483 to the east of Newtown).

5.2.3.4. Meteorological Data

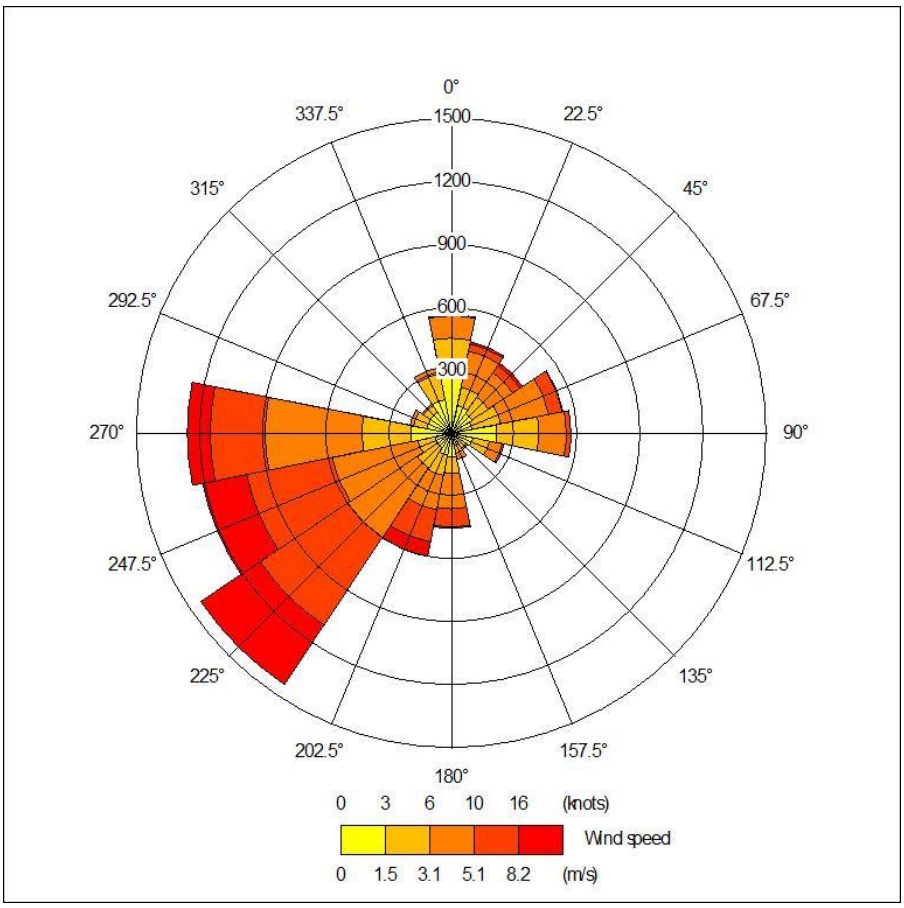
Hourly sequential meteorological data were taken for the nearest suitable weather station, in this case Lake Vyrnwy, with missing cloud data from Shawbury, for the year 2012 (the base year in the assessment). The Lake Vyrnwy weather station is located approximately 28 kilometres (km) to the north of Newtown. The basic data include: date, hour, direction that the wind is blowing from, wind speed, how many eighths ('oktas') of the sky are covered by cloud, and surface air temperature.

A windrose for Lake Vyrnwy weather station is presented in Diagram 5.1 this shows winds are predominantly (i.e. prevailing winds) from the southwest.

When the dispersion model is run, the meteorological data are processed an hour at a time to generate values for other parameters that describe atmospheric turbulence. These data are then used to calculate dispersion and thus estimate pollutant concentrations in ambient air.

Surface roughness coefficients have been defined as 0.5 m for both the weather station and for the study area. The value for the parameter that limits occasions of very stable conditions with minimal thermal turbulence, known as the 'minimum Monin-Obukhov length', was assumed to be as per the model minimum of 10 m. This is representative of a small town with a population of less than 50,000).

Diagram 5.1 Windrose for Lake Vyrnwy Airport Weather Station, 2012



5.2.3.5. Human health receptors

A total of 106 discrete receptors were included in the model. These comprise 94 human health receptors (existing properties, nurseries and health centres) and 11 air quality monitoring locations (for use in the verification of the model). The modelled receptors are presented in Volume 3 Appendix B.1 Table B4 to B6 and are illustrated in Volume 2 Figure 5.1. The height of all human health receptors was set at 1.5 m above ground level to represent breathing height while the height of the monitoring sites were set at 2 or 3 m depending on the reported height in the PCC 2013 Progress Report [5.21].

5.2.3.6. Ecological receptors

The DEFRA "Magic" website[5.24] was used to identify internationally and nationally designated ecological sites in the vicinity of the proposed Scheme (SSSI, SAC, SPA and Ramsar sites).

The Montgomery Canal SAC and SSSI lie approximately 840m to the north east of the Scheme. Designated ecological sites need only be considered in terms of air quality where they fall within 200m of the Scheme or affected road network (ARN) and as such Montgomery Canal SAC and SSSI has not been included as a discrete receptor in the model. Background NOx concentrations at the site are however addressed in the Baseline section. The Montgomery Canal SSSI/SAC site boundary is shown in Volume 2 Figure 5.1.

5.2.3.7. Background Concentrations

The air quality dispersion modelling provides an estimate of the contribution of a road to total pollutant concentrations; it does not take into account the existing background concentrations. A background contribution must therefore be added to the modelled road contribution in order to derive the total pollutant concentration.

Estimates of current and future year background pollutant concentrations in the UK are available on DEFRA UK-AIR website [5.19]. Background estimates are available for one kilometre grid squares throughout the UK for years between 2010 and 2030.

Estimated background concentrations for the years 2010 (background mapping base year), 2012 (assessment base year) and 2017 (Scheme opening year) for NO_2, PM_{10} and $PM_{2.5}$ were obtained from the background mapping provided on the DEFRA UK-AIR website. For a conservative assessment, 'in square' major road source sector contributions have not been removed in locations where these sources have been explicitly represented as sources in the dispersion model. A comparison of the 2012 mapped concentrations and monitored concentrations at urban background concentrations, as detailed in the Baseline section, showed that it was not necessary to adjust the mapped background concentrations.

More detail about the concentrations used in the modelling is provided in the Baseline section.

5.2.3.8. Comparison with Air Quality Criteria

NO_2

To derive total NO_2 concentrations from the modelled road NO_x concentrations, and hence to allow a comparison with the air quality criteria, the method described in DEFRA's Technical Guidance LAQM.TG(09)[5.17] was used. The total annual mean NO_2 is calculated from the modelled road NO_x and background NO_2. The conversion was carried out using the latest (at the time of assessment) 'NO_x to NO_2 conversion spreadsheet' Version 3.2 available from the tools on the DEFRA UK-AIR website [5.23]. In addition to the modelled road NO_x and background NO_2 data, the NO_x to NO_2 conversion spreadsheet requires a local authority area to be specified to determine regional oxidant concentrations, and a traffic mix to determine the proportion of primary NO_2. The local authority area used was Powys County Council and the traffic mix selected was "All other urban UK traffic" for roads within Newtown and "All other rural UK traffic" for roads outside of the town.

As only annual mean NO_2 estimates have been generated by the dispersion model, commentary on potential impacts on hourly mean NO_2 concentrations, which has its own criterion, is possible with reference to DEFRA Technical Guidance LAQM.TG(09) [5.17]. The guidance suggests that if annual mean concentrations of NO_2 do not exceed 60 µg/m³ then it is unlikely that hourly mean concentrations would exceed the criterion set for the hourly mean.

Particulate Matter

To determine total annual mean concentrations of PM_{10} and $PM_{2.5}$ at human health receptors, the modelled road contribution is added to the background concentration to give the total concentration for comparison with the annual mean assessment criterion.

Annual mean PM_{10} concentrations are used to derive the number of exceedances of the 24-hour mean PM_{10} criterion, of which 35 are allowed. The method described in DEFRA Technical Guidance LAQM.TG(09) [5.17] was applied. This method is based on the relationship between the number of 24-hour exceedances of 50 µg/m^3 and the annual mean concentration derived from UK Automatic Network Sites. This is described in Equation 10.1 below:

Equation 10.1 – Calculation of PM_{10} 24-Hour Mean Exceedances

*Number of exceedances of 24-hour mean of 50 µg/m^3 = -18.5 + 0.00145 * a^3 + (206/a)*

Where 'a' = total annual mean PM_{10} concentration

5.2.3.9. Impact significance

Descriptors for magnitude of change and consequent significance of effect due to changes in ambient concentrations of NO_2 and particulate matter are provided in the EPUK Development Control Guidance [5.18]. These criteria, which may be used in the assessment of the annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$, have been used in the interpretation of changes in concentrations of local air pollutants. The changes in magnitude (concentration) may be described as small, medium, large or imperceptible, depending on the change relative to the air quality criterion in Table 5.2.5 below. The description of the change in terms of adverse, beneficial or negligible depends upon the absolute concentration in relation to the air quality criterion of interest (EPUK Development Control Guidance Table 5, replicated in Table 5.2.6 and EPUK Development Control Guidance Table 18 replicated in Table 5.2.7 below).

Table 5.2.5 - Descriptors for Changes in Ambient Concentrations of NO_2 and PM_{10} and $PM_{2.5}$

Magnitude of Change	Annual Mean NO_2/PM_{10}	No. Days PM_{10} > 50 µg/m^3 as 24hr mean	Annual Mean $PM_{2.5}$
Large	Increase/decrease >4 µg/m^3	Increase/decrease > 4 days	Increase/decrease >2.5 µg/m^3
Medium	Increase/decrease 2 - 4 µg/m^3	Increase/decrease 2-4 days	Increase/decrease 1.25 – 2.5 µg/m^3
Small	Increase/decrease 0.4 – 2 µg/m^3	Increase/decrease 1-2 days	Increase/decrease 0.24 – 1.25 µg/m^3
Imperceptible	Increase/decrease <0.4 µg/m^3	Increase/decrease <1 day	Increase/decrease <0.24 µg/m^3

Table 5.2.6 Air Quality Impact Descriptors for Changes in Ambient Annual Mean Concentrations of NO_2, PM_{10} and $PM_{2.5}$ (adapted from EPUK Development Control Guidance)

Absolute Concentration in Relation to Objective	Change in Concentration		
	Small	Medium	Large
Increase with Scheme			
Above AQS Objective with Scheme (PM_{10} and NO_2 >40 µg/m^3, $PM_{2.5}$ >25 µg/m^3)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just below AQS Objective with Scheme (PM_{10} and NO_2 36-40 µg/m^3, $PM_{2.5}$ 22.5-25µg/m^3)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below AQS Objective with Scheme (PM_{10} and NO_2 30-36 µg/m^3, $PM_{2.5}$ 18.75-22.5µg/m^3)	Negligible	Slight Adverse	Slight Adverse

Well Below AQS Objective with Scheme (PM_{10} and NO_2 <30 µg/m^3, $PM_{2.5}$ <18.5 µg/m^3)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above AQS Objective without Scheme (PM_{10} and NO_2 >40 µg/m^3, $PM_{2.5}$ >25 µg/m^3)	Slight beneficial	Moderate Beneficial	Substantial Beneficial
Just below AQS Objective without Scheme (PM_{10} and NO_2 36-40 µg/m^3, $PM_{2.5}$ 22.5-25µg/m^3)	Slight beneficial	Moderate Beneficial	Moderate Beneficial
Below AQS Objective without Scheme (PM_{10} and NO_2 30-36 µg/m^3, $PM_{2.5}$ 18.75-22.5µg/m^3)	Negligible	Slight beneficial	Slight beneficial
Well Below AQS Objective without Scheme (PM_{10} and NO_2 <30 µg/m^3, $PM_{2.5}$ <18.5 µg/m^3)	Negligible	Negligible	Slight beneficial

Table 5.2.7 Air Quality Impact Descriptors for Changes to Number of Days with PM_{10} a Concentration Greater than 50 µg/m^3 (from EPUK Development Control Guidance)

Absolute Concentration in Relation to Objective	Change in Concentration		
	Small	**Medium**	**Large**
Increase with Scheme			
Above AQS Objective with Scheme (>35 days)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just below AQS Objective with Scheme (32-35 days)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below AQS Objective with Scheme (26-32 days)	Negligible	Slight Adverse	Slight Adverse
Well Below AQS Objective with Scheme (<26 days)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above AQS Objective without Scheme (>35 days)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just below AQS Objective without Scheme (32-35 days)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below AQS Objective without Scheme (26-32 days)	Negligible	Slight Beneficial	Slight beneficial
Well Below AQS Objective without Scheme (<26 days)	Negligible	Negligible	Slight beneficial

5.2.4. Methodology for Operational Regional Emissions

Total pollutant emissions were calculated for all links included in the traffic model. Pollutant mass emissions were calculated using daily average traffic flows, speeds, proportion of HDV, link lengths and the emission rates in DEFRA Emissions Factor Toolkit (EFT) version 5.2c.

Annual emissions were calculated for the pollutants NO_x, PM_{10}, and CO_2. In addition, the total vehicle km travelled on each link was calculated. Emissions of carbon monoxide have not been calculated as this pollutant is no longer included in the latest version of the DEFRA EFT.

Emissions were calculated for the base case scenario (2012), and the Do-Minimum (without Scheme) and Do-Something (with Scheme) scenarios in the opening year (2017) and future year (2032).

The change in total emissions and distance travelled as a result of the Scheme in the opening year was compared with the base and Do-Minimum scenarios. The differences between the base, Do-Minimum and the Do-Something scenarios were determined and expressed as a percentage change.

5.2.5. Limitations and assumptions

5.2.5.1. Model Uncertainty

Any air quality dispersion model has inherent areas of uncertainty, including:

- Traffic data;
- Appropriateness of emissions data;
- Simplifications in model algorithms and empirical relationships that are used to simulate complex physical and chemical processes in the atmosphere;
- Appropriateness of background concentrations; and
- Appropriateness of meteorological data.

Uncertainty associated with emissions data has been minimised by using the most recently published (at the time of assessment) data in EFT version 5.2c (January 2013).

Uncertainties associated with model algorithms and empirical relationships have been minimised by using algorithms and relationships that have been independently validated and judged as fit for purpose.

Uncertainty associated with background data has been minimised by using the most recent published (at the time of assessment) background maps based on 2010 monitoring data. The accuracy of the background map data for the local area was also checked by comparing it to relevant monitoring for the base year (2012).

Another uncertainty is with using historical meteorological data to estimate future concentrations. The key limiting assumption is that conditions in the future will be the same as in the past; however, in reality no two years are the same. DEFRA's Technical Guidance LAQM.TG(09)[5.17] reviews a number of studies examining inter-annual variability of meteorological data and the effect on dispersion model output; it is suggested that variability in source contribution should be no more than 30% between any two years.

Given the above, the conclusions drawn in this assessment are considered to be robust.

5.2.5.2. Model Verification

Model verification is the process by which uncertainties in the modelling are investigated and, wherever possible, minimised. The verification step involves comparison of modelled pollutant concentrations at suitable monitoring sites with monitored values that are representative of the base model period (in this case 2012). Verification has been undertaken in accordance with DEFRA's Technical Guidance LAQM.TG(09). Verification is discussed further under the following Operational Phase Effects section before presenting the assessment of local air quality impacts.

5.2.5.3. Sensitivity Test

As it is unclear from UK NO_2 monitoring data as to whether or not downward trends in annual mean concentrations can be assumed at roadside and background sites (at least in the next few years up until 2017), the models for 2017 have been re-run on the assumption that individual vehicle emissions and background concentrations do not change from the base year of 2012. This consideration is in keeping with LAQM guidance, published in April 2012, on projecting NO_2 concentrations [5.22].

5.3. Baseline Conditions

Information on existing air quality conditions in the vicinity of the air quality study area ARN has been drawn from the following sources:

- PCC's most recent local air quality review and assessment reports;
- DEFRA's national air quality archive UK-AIR website;
- Air Pollution Information System (APIS)[5.28]; and
- DEFRA "Magic" website[5.24]

The Scheme lies within the local authority area of PCC. PCC has declared one AQMA, located within Newtown for exceedances of the annual mean AQS objective for NO_2 of 40 µg/m^3. The

AQMA covers two properties near the junction of the A489 (New Road) and the A483 (Dolfor Road) (refer to ES Volume 2, Figure 5.1).

5.3.1. Air Quality Monitoring

Measurements of pollutant concentrations can be made by deploying analytical instruments that measure continuously and record average concentrations over specified time intervals. Simpler sampling devices, such as diffusion tubes, react with pollutants over a longer time period and are subsequently analysed at a laboratory to give an average concentration for the sampling period. National survey results from both types of monitoring are published on DEFRA's UK-AIR website.

DEFRA funds a network of automated continuous monitoring sites (CMS) throughout the UK. The closest site in the network is located at Aston Hill, approximately 18 km to the east of the Scheme and is therefore not considered relevant to the present study. PCC does not currently operate any automatic monitoring sites. During 2006/07 PCC carried out automatic monitoring within Newtown as part of their detailed assessment of air quality along New Road. The CMS was located adjacent to New Road approximately 130m north east of the current AQMA (grid reference 310780, 291269). The average annual mean NO_2 concentration was 34 µg/m^3 demonstrating that the annual mean NO_2 AQS objective was met at this location.

NO_2 can also be monitored passively using diffusion tubes. PCC currently undertakes diffusion tube monitoring at several locations within Newtown (refer to ES Volume 2, Figure 5.1) and Crickhowell. The results of monitoring undertaken at the sites within Newtown are presented in Table 5.3.1 below.

Annual mean NO_2 concentrations at two sites adjacent to New Road (A489) exceeded the annual mean AQS objective in 2012. One of these sites is located within the AQMA and is operated as a triplicate site (three tubes located together to allow for the assessment of precision). The other site is located at kerbside and when correction factors are applied to allow for concentration drop off from the road edge, it is indicated that concentrations at relevant receptors would not exceed the annual mean AQS objective. PCC recently commissioned seven additional diffusion tube monitoring sites along New Road (POW (M) sites 8 to 14). Annual mean concentrations recorded at these sites in 2012 indicate that concentrations are well below the annual mean AQS objective at property facades along New Road confirming that there is currently no requirement to extend the boundary of the existing AQMA (shown in ES Volume 2, Figure 5.1).

The annual mean NO_2 concentration measured in 2012 at Brimmon Road, the only diffusion tube monitoring site not located adjacent to the A489, indicates that concentrations away from New Road are likely to be well below the annual mean AQS objectives.

Table 5.3.1 Bias Adjusted Annual Mean NO_2 Concentrations (µg/m^3)

Site ID	Location	Distance to Kerb	Type	2008	2009	2010	2011	2012
POW(M)1	Eryl, New Road	2.5m	Kerbside	38.1	41.6	51.0	40.6	37.6
POW(M)2	19 New Road	2.5m	Kerbside	41.9	48.5	52.0	44.2	41.5
POW(M)34 &5*	Dollarddun, New Road	1m	Façade (close to the kerb)	42.8	52.2	55.0	41.2	39.8
POW(M)6	45 New Road	1m	Roadside	33.5	39.6	48.0	35.2	35.4
POW(M)7	Brimmon Road	29m	Kerbside	10.3	10.9	n/a	9.9	10.0
POW(M)8	Minawel 1, New Road	5.5m	Façade	-	-	-	-	32.7
POW(M)9	Minawel 2, New Road	5.5m	Façade	-	-	-	-	32.4
POW(M)10	Minffordd, New Road	5m	Façade	-	-	-	-	32.5
POW(M)11	Hendre, New Road	5m	Façade	-	-	-	-	29.9

POW(M)12	19 New Road (2)	6.5m	Façade	-	-	-	-	33.6
POW(M)13	20 New Road	5.5m	Façade	-	-	-	-	33.4
POW(M)14	22 New Road	5.5m	Façade	-	-	-	-	33.8
Notes: Concentrations in bold exceed the 40 µg/m^3 criterion for annual mean NO_2 *Average of triplicate tubes								

5.3.2. Ecological Sites

The APIS website provides modelled estimates of background NOx and nitrogen deposition across the whole of the UK at 5 km resolution, and site specific data for SSSIs, SACs and SPAs. Critical load ranges for specific habitats are also reported on the website. The site specific background NOx concentration and nitrogen deposition for the Montgomery Canal SAC and SSSI are reported as 7.2 µg/m^3 and 45.92 kg/N/ha/yr respectively. The background NOx concentration at the site represents less than a third of the AQS objective for the protection of vegetation of 30 µg/m^3

The critical load range for nitrogen deposition, for the relevant habitat type at Montgomery Canal of floating water-plantain is reported as 3 – 10 kg/N/ha/yr. The reported background nitrogen deposition of 45.92 kg/N/ha/yr is currently more than four times the upper critical load for the relevant habitat. In relation to the existing background concentrations and the site location, over 200m from an affected road, any change in NOx concentrations and nitrogen deposition rates as a result of the Scheme, would be negligible.

5.3.3. Background Concentrations

Background pollutant concentrations for NOx, NO_2, PM_{10} and $PM_{2.5}$ are published on DEFRA's UK-AIR website for every 1 x 1 km grid square covering the UK. The background estimates are available for one kilometre grid squares throughout the UK for years between 2010 and 2030.

Modelled receptors are located across 24 of the 1 x 1 km grid squares. Maximum, minimum and average background concentrations for the base model year 2012 and Scheme opening year of 2017 are given in Table 5.3.2. The highest background concentrations occur in the western area of Newtown where the A489 divides the areas of Maesyrhandir and Nantoer. The lowest background concentrations occur in the far west of the study area in the vicinity of the B4568 and the village of Llanwnog. DEFRA background concentrations are well below annual mean objectives for all pollutants.

Table 5.3.2 2012 and 2017 Annual Mean Background Concentrations (µg/m^3)

Grid Reference	2012 NO_x	2012 NO_2	2012 PM_{10}	2012 $PM_{2.5}$	2017 NO_x	2017 NO_2	2017 PM_{10}	2017 $PM_{2.5}$
Min (302500, 293500)	7.6	5.9	9.7	6.9	6.3	4.9	9.2	6.5
Max (309500, 290500)	27.2	18.4	14.3	10.1	21.3	15.0	13.3	9.3
Average across study area	11.1	8.3	10.6	7.5	9.0	6.8	10.1	7.0

The 2012 DEFRA background mapped concentrations were compared with the 2012 data for the urban background monitoring site located on Brimmon Road. The comparison is presented in Table 5.3.3. The measured results in 2012 are within 10% of the mapped background data for the grid square containing the monitoring site. It is therefore considered appropriate to use the mapped background estimates to characterise background air quality conditions in the study area in 2012 and 2017.

Table 5.3.3 Comparison of Monitored and Mapped NO_2 Concentrations (µg/m^3)

Site	Monitored	Mapped	Monitored – Mapped	Monitored / Mapped
Brimmon Road	10.0	10.8	-0.8	0.9

5.3.4. Summary of Baseline

Air quality monitoring data for the area around the Scheme has been reviewed. PCC has declared an AQMA as a result of exceedances of NO_2 AQS objectives. The AQMA encompasses two properties adjacent to the A489 within Newtown. The Scheme is, located approximately 1 km south of the AQMA. Monitoring data at the nearest diffusion tube site to the Scheme shows annual mean NO_2 concentrations well below the relevant criteria and mapped background concentrations also suggest that there are unlikely to be exceedances in the immediate vicinity of the Scheme alignment. DEFRA mapped background concentrations for PM_{10} and $PM_{2.5}$ also indicate that there are unlikely to be any exceedances of AQS objectives for these pollutants.

A comparison between DEFRA mapped background concentrations and the most relevant background monitoring site indicates that the background maps for 2012 and 2017 are appropriate to use within the assessment.

Background NO_x concentrations at Montgomery Canal SSSI and SAC are less than a third of the critical level, however the nitrogen deposition rate is above the upper critical load value for the relevant habitat type. In the context of existing background values any impact on the site by the Scheme would be negligible.

5.4. Predicted Environmental Effects

5.4.1. Construction impacts

An initial screening assessment was carried out using Ordnance Survey mapping and designated site digital boundary data available from Natural Resources Wales. Volume 2, Figure 5.2 shows the 350m buffer around the Scheme site boundary and 50m buffer around the likely routes to be used by construction vehicles entering and leaving the site up to 500m from the site entrance.

There are a number of human receptors (residential properties) within 350m of the site boundary, predominantly located to the north of the Scheme in Garth Owen and Treowen and adjacent to Mochdre Lane. The nearest human receptor is Lower Brimmon, located on the A489, within 5m of the site boundary. There are no internationally, nationally or locally designated ecological receptors within the 350 or 50m buffers. Further assessment was therefore undertaken in relation to demolition, earthworks, construction and trackout activities and associated impacts on adjacent human receptors only. This is discussed in more detail below.

There would be some demolition works on site to remove the following existing structures:

- Residential property (Gelli) and barn adjacent to the A483 Pool Road;
- Residential property (Kinsale) adjacent to the Middle Dolfor Road; and
- Outbuildings / small Dutch barn north of Lower Brimmon Farm.

The demolition works are likely to have a ‘small’ dust emission class (the total volume of demolished buildings is likely to be less than 20,000 m^3). The nearest human receptor to the demolition works is identified as the residential property (classed as high sensitivity) Ashbrook, approximately 55 m north of the property (Kinsale) due to be demolished on Middle Dolfor Road. In addition, there are a further 6 properties within 100 m of demolition activities.

Earthworks and construction activities can be classified as ‘large’ in terms of the dust emission class (the total site area is greater than 10,000 m^2 and the volume of earth to be moved greater than 100,000 tonnes). The nearest residential property (classed as high sensitivity) to the site is located within 5 m of the site boundary. There are also a further 22 residential properties within 20 m of the site boundary.

Trackout can conservatively be classed as 'large' in terms of the dust emission class (assuming less than 50 offsite HDV movements per day but greater than 100 m of unpaved road on site). The main site entrance would be located across three fields to the south of the Scheme as it passes between Castell-y-Dail and Black Hall farm. There would also be construction traffic accessing the site from the east on the A483 and the west on the A489. There are no high sensitivity human receptors (e.g. residential properties) identified within 50 m of the main access route (A483 Dolfor Road). There are however two residential properties within 50 m of the trackout route on the A483 to the north east of the site. There are also low sensitivity receptors (where human exposure is transient) in the form of public footpaths located adjacent to all three trackout routes.

The dust emission magnitude for each activity is shown in Table 5.4.1 below.

Table 5.4.1 Dust Emission Magnitude for the Site

Activity	Dust Emission Magnitude
Demolition	Small
Earthworks	Large
Construction	Large
Trackout	Large

For both construction and demolition activities the Scheme is considered to be surrounded by a 'high' sensitivity area with regard to dust soiling effects, as there are greater than 10 receptors within 20 m of the proposed works. For demolition and trackout the surrounding area is regarded of 'low' sensitivity as there is less than 10 properties affected, all located at a distance greater than 20 m from the works.

The Scheme is considered to be surrounded by a 'low' sensitivity area with regard to human health impacts for all activities, as there are less than 100 receptors within 20 m of any proposed works and background PM_{10} concentrations are well below 24 µg/m^3 (as per IAQM dust guidance). Table 5.4.2 summarises the sensitivity of the area to human health impacts, dust soiling and ecological impacts taking into account the sensitivity of the receptors, distance to source, background PM_{10} concentrations and overall numbers of affected receptors as described above.

Table 5.4.2 Definition of the Sensitivity of the Area

	Sensitivity of Surrounding Area			
Potential Impact	**Demolition**	**Earthworks**	**Construction**	**Trackout**
Dust Soiling	Low	High	High	N/A
Human Health	Low	Low	Low	Low
Ecological	N/A	N/A	N/A	N/A

Dust from demolition, earthworks, construction and trackout activities may have a potentially significant adverse impact. Mitigation is therefore required to minimise the risk of any adverse impact. A comparison between the sensitivity of the surrounding area and emission magnitude of dust raising activities has been carried out. Table 5.4.3 presents the summary of the dust risk associated with each activity. The most appropriate mitigation measures for the level of risk have been abstracted from the IAQM Dust Guidance. Mitigation measures are presented in the Proposed Mitigation Section 5.5 below.

Table 5.4.3 Summary Dust Risk Table to Define Site-Specific Mitigation

	Risk			
Potential Impact	**Demolition**	**Earthworks**	**Construction**	**Trackout**
Dust Soiling	Negligible	High Risk	High Risk	N/A
Human Health	Negligible	Medium Risk	Medium Risk	Medium Risk
Ecological	N/A	N/A	N/A	N/A

With appropriate mitigation measures in place, any potential significant adverse effects of the works would be minimised so that residual effects would not have a significant impact on adjacent human receptors.

An increase in vehicle movements is expected during the construction period. Construction vehicles mainly consist of deliveries for earthworks with some additional vehicle movements associated with the workers and with other deliveries. The estimated vehicle movements over the 24 months construction period are expected to equate to a daily average of between 20 and 25 HDV and approximately 60 LDV. The increase in vehicle movements would therefore not exceed the traffic change criteria of 200 HDV or 1000 AADT per day given in DMRB HA207/07 and the impact of construction traffic emissions would be negligible.

5.4.2. Operational impacts

5.4.2.1. Local Air Quality Model Verification and Adjustment

It is good practice to compare modelled estimates of pollutant concentrations with real-world monitoring to assess the model's performance for a base year and inform the interpretation of model results for future years. Verification of the 2012 air quality base model has been undertaken with comparison of modelled concentrations against those derived from monitoring at 11 PCC monitoring sites located in the study area (shown in Volume 2, Figure 5.1).

Uncertainty in modelled estimates has been considered by calculating root mean square error (RMSE) and fractional bias statistics. An air quality model can be considered to perform reasonably well where modelled concentrations are within 25% of monitored concentrations in accordance with DEFRA's Technical Guidance LAQM.TG(09). The RMSE should ideally be within 10% of the relevant air quality criterion, but is acceptable where it is within 25% of the relevant air quality criterion. The Fractional Bias (FB) has an ideal value of 0, but is acceptable in the range between +2 and -2.

Firstly, unadjusted modelled estimates of total annual mean NO_2 concentrations have been compared against monitored annual means. Out of 11 comparisons, 4 modelled estimates are within +/- 25% of monitored, as given in Table 5.4.4. Substantial underestimates of more than 25% are indicated for the remaining 9 monitoring sites. None of the comparisons are within +/- 10% of monitored.

Table 5.4.4 Comparison of Modelled and Measured NO_2 Concentrations (µg/m^3)

Site	Measured NO_2	Modelled TotalNO_2	Modelled - Measured	Modelled / Measured	% Difference
POW 1	37.6	23.2	-14.4	0.6	-38.3
POW 2	41.5	23.1	-18.4	0.6	-44.3
POW 3,4 & 5*	39.8	26.3	-13.4	0.7	-33.8
POW 6	35.4	23.3	-12.1	0.7	-34.1
POW 8	32.7	24.8	-7.9	0.8	-24.2
POW 9	32.4	24.8	-7.6	0.8	-23.5
POW 10	32.5	25.3	-7.3	0.8	-22.3
POW 11	29.9	25.3	-4.6	0.8	-15.5
POW 12	33.6	24.0	-9.6	0.7	-28.5
POW 13	33.4	24.9	-8.5	0.7	-25.5
POW 14	33.8	24.7	-9.1	0.7	-26.8

*Triplicate site

For unadjusted modelled estimates of NO_2 compared to monitored concentrations, the RMSE is 10.9 µg/m^3, which is above the recommended value according to DEFRA's Technical Guidance LAQM.TG(09)[5.17] i.e. less than 4 µg/m^3 in relation to the 40 µg/m^3 objective concentration for annual mean NO_2, but not more than 25% of the objective i.e. 10 µg/m^3. The overall performance (based on the majority of comparisons) of the unadjusted model is therefore unacceptable.

Overall, the unadjusted model tends to underestimate total concentrations of NO_2, as indicated by a fractional bias value of 0.35.

The second comparison of modelled estimates of road contributed annual mean NOx with the road NOx component derived from monitoring data is presented in Table 5.4.5. As only diffusion tube data are available for annual mean NO_2 and this analysis requires the estimation of the monitored road NOx component. This is done using DEFRA's NO_2 to NOx calculator. The unadjusted model underestimates concentrations of road NOx by 26 to 64%.

Table 5.4.5 Comparison of Modelled and Measured NOx Concentrations (µg/m³)

Site	Modelled Road NO_x	Measured Road NO_x	Modelled – Measured	Measured/ Modelled	% Difference
POW 1	25.7	59.9	-34.2	2.3	-57.1
POW 2	25.5	70.4	-44.9	2.8	-63.8
POW 3,4 & 5	32.6	65.7	-33.1	2.0	-50.3
POW 6	25.9	54.3	-28.3	2.1	-52.2
POW 8	29.2	47.5	-18.3	1.6	-38.6
POW 9	29.1	46.8	-17.7	1.6	-37.8
POW 10	30.2	47.0	-16.8	1.6	-35.8
POW 11	30.2	40.8	-10.6	1.3	-25.9
POW 12	27.5	49.7	-22.2	1.8	-44.7
POW 13	29.4	49.2	-19.8	1.7	-40.3
POW 14	29.1	50.2	-21.2	1.7	-42.2

Further examination suggests that the data can be divided into distinct groups to improve verification. The modelled road NOx concentrations at sites within 3 m of the road kerb (POW 1,2, 6 and the triplicate tubes 3, 4 & 5) underestimate the monitored road NOx by 50 to 64% whereas diffusion tubes located on building facades slightly further set back from the road edge (POW 8 to 14) underestimated monitored road NOx by 26 to 45%. As such the model has been divided into two groups for adjustment with those located within 3 m of the road kerb separated from those within the reminder of the study area.

Modelled road NOx concentrations can be adjusted by taking the slope of each linear regression line that has been forced through zero, as shown in Diagram 5.2 and Diagram 5.3. The model adjustment factors are:

Within 3 m of road kerb: unadjusted road NOx * 2.2592

All other locations: unadjusted road NOx * 1.6154

Diagram 5.2 Modelled vs. Monitored road contributed NOx before adjustment - Diffusion tubes within 3 m of road kerb

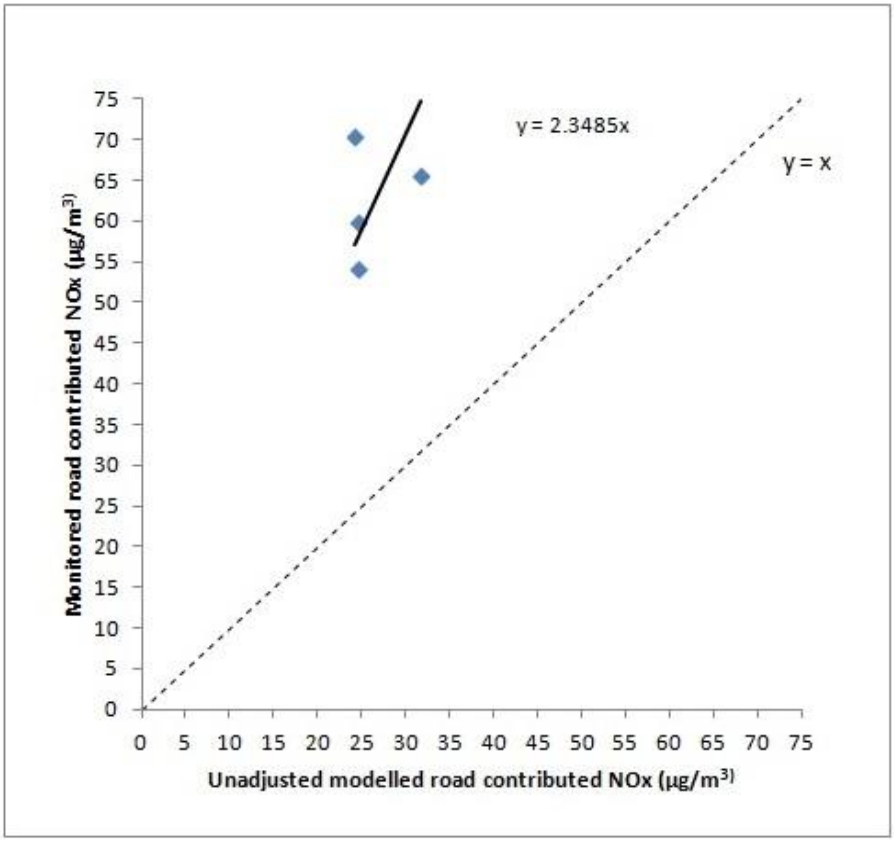
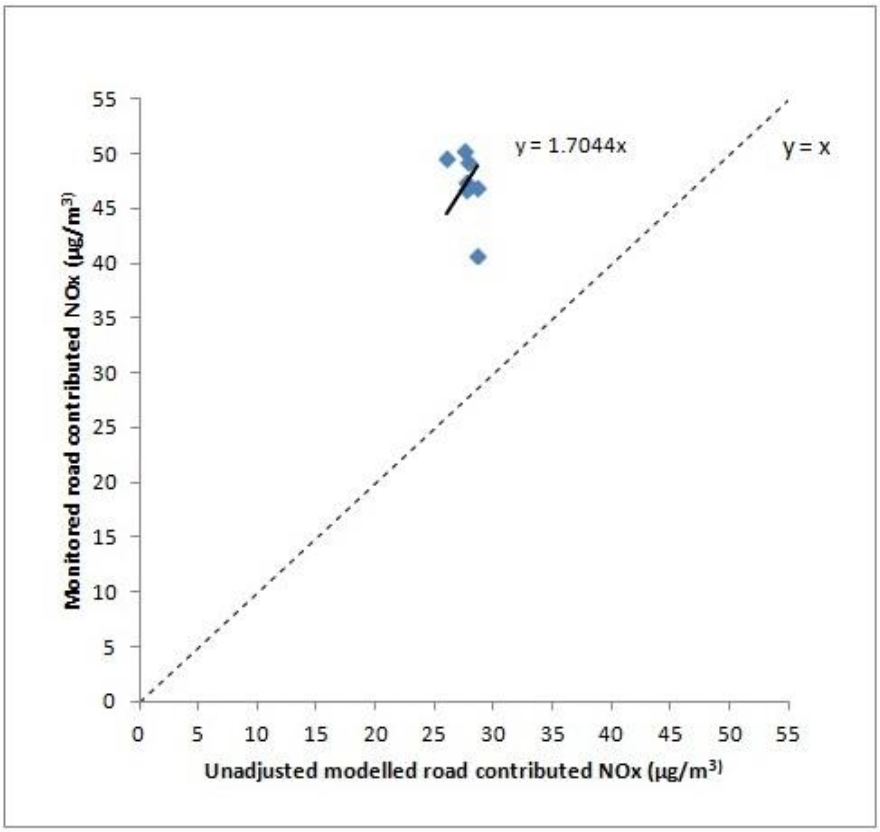


Diagram 5.3 Modelled vs. Monitored road contributed NOx before adjustment - Diffusion tubes greater than 3 m from road kerb



The third comparison of the adjusted modelled estimates of total annual mean NO_2 with monitored concentrations is presented in Table 5.4.6 and Diagram 5.4. All modelled estimated concentrations are within +/-25% of monitored concentrations. As the difference between modelled and monitored concentrations are all within 25%, this suggests that the model is performing sufficiently well at all locations in accordance with DEFRA Technical Guidance LAQM.TG(09)[5.17].

The RMSE for adjusted modelled NO_2 concentrations compared to monitored concentrations is 2.2 µg/m^3. Adjustment has therefore improved overall model performance.

Overall, the adjusted model has tended to very slightly underestimate total concentrations of NO_2, as indicated by a fractional bias value of less than 0.01.

Diagram 5.4 Modelled vs. Monitored annual mean NO_2 after adjustment of modelled road NOx component

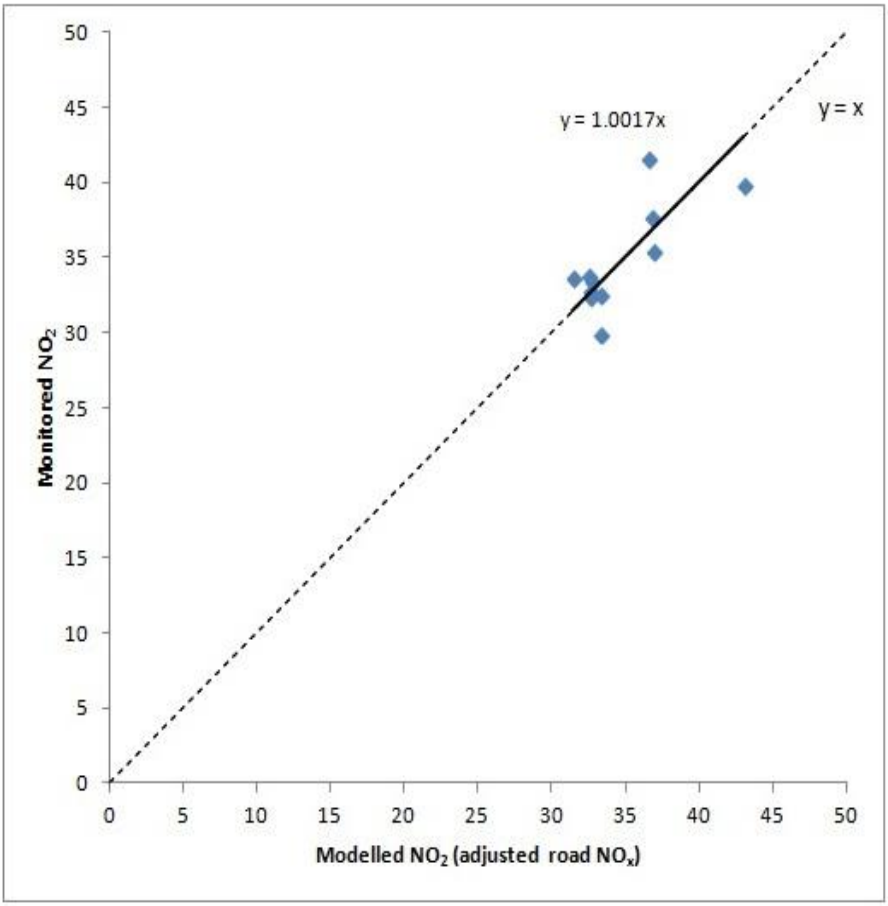


Table 5.4.6 Comparison of Adjusted Modelled and Measured NO_2 Concentrations (µg/m³)

Site	Measured NO_2	Modelled Total NO_2	Modelled - Measured	Modelled / Measured	Difference %
POW 1	37.6	36.9	-0.7	1.0	-1.9
POW 2	41.5	36.7	-4.8	0.9	-11.6
POW 3,4 & 5	39.8	42.7	2.9	1.1	7.3
POW 6	35.4	37.1	1.7	1.0	4.8
POW 8	32.7	32.6	-0.2	1.0	-0.5
POW 9	32.4	32.5	0.1	1.0	0.3
POW 10	32.5	33.2	0.7	1.0	2.2
POW 11	29.9	33.2	3.3	1.1	11.2
POW 12	33.6	31.4	-2.2	0.9	-6.5
POW 13	33.4	32.7	-0.7	1.0	-2.2
POW 14	33.8	32.5	-1.3	1.0	-4.0

Monitoring of particulate matter is not carried out within the study area; therefore the model performance for this pollutant has not been verified.

5.4.2.2. Potential Local Air Quality Impacts

Modelled concentrations at illustrative receptors, selected to represent different locations within the study area, are presented in Table 5.4.7 to Table 5.4.9. The modelled total concentrations and changes in concentrations of annual mean NO_2, PM_{10} and $PM_{2.5}$ for all modelled receptors are provided in Volume 3 Appendix B.1 Tables B4 and B5. The changes in concentrations of annual mean NO_2 and PM_{10} for all modelled receptors are shown in Volume 2 Figure 5.3 and 5.4 respectively.

Modelled concentrations at all receptors are expected to be well below the annual mean PM_{10} and $PM_{2.5}$ AQS objectives both with and without the Scheme in 2017. Modelled concentrations at all but one receptor (Receptor 32 discussed in more detail below) are expected to also be below the annual mean NO_2, AQS objectives both with and without the Scheme in 2017.

The majority of the modelled receptors are predicted to experience a reduction in concentrations of annual mean NO_2. Of the 106 receptors modelled, 28 locations are predicted to experience an increase in terms of annual mean NO_2. The majority of these are located adjacent to the Scheme or along the A489 to the west of Newtown. 23 of the receptors with increases in annual mean NO_2 concentrations have changes that are considered to be 'small' according to EPUK Development Control Guidance criteria (i.e. less than 2 µg/m^3) with the remaining five receptors having increases considered to be 'imperceptible (i.e. less than 0.4 µg/m^3) As total concentrations at all properties shown to experience an increase in annual mean NO_2 with the Scheme are expected to be well below the AQS objectives both with and without the Scheme in 2017 it can be concluded that the overall impact would be 'negligible' at these receptors.

Of the 106 modelled receptors 77 receptors are expected to experience a reduction in concentrations of annual mean NO_2. The decrease in concentrations with the Scheme are considered to be 'imperceptible' (i.e. decrease <0.4 µg/m^3) at two receptors, 'small' (i.e. decrease 0.4 - 2 µg/m^3) at 50 receptors, 'medium' (i.e. decrease 2 - 4 µg/m^3) at 6 receptors and large at 19 receptors (i.e. decrease >4 µg/m^3). The overall impact according to EPUK Development Control Guidance criteria, would be negligible at 59 of the 77 receptors experiencing a decrease in concentrations, 17 would experience a 'slight beneficial' impact and two would experience either a 'moderate' or 'substantial' benefit.

Receptor 32 represents a property located within the PCC AQMA. The receptor is expected to experience a reduction in annual mean NO_2 concentrations of 16.0 µg/m^3. This is considered to be a 'substantial beneficial' impact with concentrations exceeding the annual mean objective for NO_2 without the Scheme and falling to below the annual mean objective for NO_2 with the Scheme.

For the 1-hour mean AQS objective for NO_2, DEFRA advises that if the annual mean NO_2 concentration is less than 60 µg/m^3 the hourly mean objective is unlikely to be exceeded. The maximum annual mean NO_2 modelled at any receptor in either the without Scheme or with Scheme scenario was 43.5 µg/m^3, and as such the 1-hour mean AQS objective is unlikely to be exceeded.

Table 5.4.7 Annual Mean NO_2 Concentrations (µg/m^3)

Receptor	Address	Base 2012	DM 2017	DS 2017	Change	EPUK Change Descriptor	EPUK Impact Descriptor
2	Hazeldene	12.2	9.0	9.2	0.2	Imperceptible	Negligible
10	8 Maesderwen	23.5	17.5	11.9	-5.6	Large Decrease	Slight Beneficial
19	4 Commercial Street	21.6	16.8	15.8	-1.0	Small Decrease	Negligible
24	Old Toll Cottage	15.0	11.0	9.3	-1.7	Small Decrease	Negligible
29	31 New Road	35.7	26.3	15.2	-11.1	Large Decrease	Slight Beneficial
32	Dolarddun	57.4	43.5	27.5	-16.0	Large Decrease	Substantial Beneficial
40	Toll Bar Cottage	45.0	32.9	21.4	-11.5	Large Decrease	Slight Beneficial
50	85 Cledan	16.2	12.5	11.1	-1.4	Small Decrease	Negligible
55	Woodside Cottages	11.8	9.4	10.7	1.3	Small Increase	Negligible
59	Lower Brimmon	12.3	9.8	11.0	1.2	Small Increase	Negligible
66	Hopyard Cottage	14.8	10.7	11.6	0.9	Small Increase	Negligible

70	Bailiff's Cottage	8.8	6.7	5.9	-0.8	Small Decrease	Negligible
85	Castell-y-Dail House	9.7	7.8	9.6	1.8	Small Increase	Negligible
86	The Moorings	29.1	21.8	15.0	-6.8	Large Decrease	Slight Beneficial
AQS objective is 40 µg/m^3 as an annual mean See Table 5.2.1 and Table 5.2.2 for EPUK Development Control Guidance change and impact descriptor criteria.							

In 2017, modelled changes in PM_{10} annual mean concentrations due to the Scheme are all less than 2 µg/m^3 , i.e. 'small' according to EPUK Development Control Guidance criteria. In all cases, the total PM_{10} concentrations are well below the PM_{10} annual mean objective of 40 µg/m^3. As such, all changes at human health receptors are considered to be negligible. Similarly for $PM_{2.5}$, the concentrations at all receptors are well below the objective and changes due to the Scheme would be negligible.

Using the equation 10.1 (as given in section 5.2.3.8), it is calculated that there would be no exceedance of the PM_{10} 24-hour mean standard per year across all receptors in all scenarios. Modelled results therefore indicate there would be no change in the number of exceedances at any modelled receptor. On this basis it can be concluded that the overall impact of the Scheme on the PM_{10} hourly objective would be negligible.

Table 5.4.8 Annual Mean PM_{10} Concentrations (µg/m^3)

Receptor	Address	Base 2012	DM 2017	DS 2017	Change	EPUK Change Descriptor	EPUK Impact Descriptor
2	Hazeldene	10.8	10.2	10.2	<0.1	Imperceptible	Negligible
10	8 Maesderwen	12.6	11.8	11.3	-0.5	Small decrease	Negligible
19	4 Commercial Street	12.7	12.0	11.9	-0.1	Imperceptible	Negligible
24	Old Toll Cottage	10.9	10.3	10.1	-0.2	Imperceptible	Negligible
29	31 New Road	13.4	12.4	11.6	-0.8	Small Decrease	Negligible
32	Dolarddun	14.3	13.2	12.2	-1.0	Small Decrease	Negligible
40	Toll Bar Cottage	16.4	15.2	13.9	-1.3	Small Decrease	Negligible
50	85 Cledan	12.0	11.3	11.2	-0.1	Imperceptible	Negligible
55	Woodside Cottages	11.6	11.0	11.1	0.1	Imperceptible	Negligible
59	Lower Brimmon	10.9	10.3	10.4	0.1	Imperceptible	Negligible
66	Hopyard Cottage	10.8	10.2	10.3	0.1	Imperceptible	Negligible
70	Bailiff's Cottage	10.0	9.5	9.4	-0.1	Imperceptible	Negligible
85	Castell-y-Dail House	10.7	10.1	10.3	0.2	Imperceptible	Negligible
86	The Moorings	13.0	12.2	11.6	-0.6	Small decrease	Negligible
AQS objective is 40 µg/m^3 as an annual mean See Table 5.2.1 and Table 5.2.2 for EPUK Development Control Guidance change and impact descriptor criteria.							

Table 5.4.9 Annual Mean $PM_{2.5}$ Concentrations (µg/m^3)

Receptor	Address	Base 2012	DM 2017	DS 2017	Change	EPUK Change Descriptor	EPUK Impact Descriptor
2	Hazeldene	7.8	7.1	7.1	<0.1	Imperceptible	Negligible
10	8 Maesderwen	9.1	8.1	7.8	-0.3	Small decrease	Negligible
19	4 Commercial Street	9.1	8.1	8.1	<0.1	Imperceptible	Negligible
24	Old Toll Cottage	8.0	7.2	7.1	-0.1	Imperceptible	Negligible
29	31 New Road	9.6	8.4	7.9	-0.5	Small decrease	Negligible
32	Dolarddun	10.2	8.9	8.2	-0.7	Small decrease	Negligible
40	Toll Bar Cottage	11.9	10.4	9.6	-0.8	Small decrease	Negligible
50	85 Cledan	8.6	7.8	7.7	-0.1	Imperceptible	Negligible
55	Woodside Cottages	8.4	7.6	7.7	0.1	Imperceptible	Negligible
59	Lower Brimmon	8.0	7.2	7.3	0.1	Imperceptible	Negligible
66	Hopyard Cottage	7.9	7.1	7.2	0.1	Imperceptible	Negligible
70	Bailiff's Cottage	7.3	6.7	6.6	-0.1	Imperceptible	Negligible
85	Castell-y-Dail House	7.8	7.1	7.2	0.1	Imperceptible	Negligible
86	The Moorings	9.3	8.3	7.9	-0.4	Small decrease	Negligible
AQS objective is 25 µg/m^3 as an annual mean (to be achieved by 2020) See Table 5.2.1 and Table 5.2.2 for EPUK Development Control Guidance change and impact descriptor criteria.							

Summary

The majority of the modelled receptors are predicted to experience a reduction in concentrations of annual mean NO_2. The changes in concentrations of annual mean NO_2 and PM_{10} for all modelled receptors, as shown in Volume 2 Figure 5.3 and Figure 5.4 respectively. Volume 2 Figure 5.3 shows 'small' to' large' decreases in NO_2 concentrations within Newtown and 'small' decreases along the B4568. There are 'small' increases in NO_2 expected adjacent to the Scheme and the A489 to the west of Newtown. Volume 2 Figure 5.4 shows 'small' decreases in PM_{10} concentrations along the A489 within Newtown. All increases in PM_{10} are classed as 'imperceptible'. The changes in concentrations of NO_2, PM_{10} and $PM_{2.5}$ with the Scheme relate to the expected changes in traffic flows with the Scheme, i.e. reductions in traffic within Newtown and an increase in traffic on the A489 west of Newtown. The overall impact on NO_2 is classed as negligible at the majority of receptors, but 17 receptors would experience a 'slight beneficial' impact and two would experience either a 'moderate beneficial' or 'substantial beneficial' impact. The overall impacts on PM_{10} and $PM_{2.5}$ concentrations are classed as 'negligible'.

The impact on concentrations across all receptors and pollutants are classed as either 'negligible' or 'beneficial' (ranging from 'slight' to substantial'). Overall the Scheme has no significant adverse impacts and can be considered beneficial as it improves local air quality within the current AQMA. The overall significance of the changes is classed as of 'major significance' within the PCC AQMA and 'minor significance' for the receptors adjacent to the A489 (Llanidloes Road and New Road) and A483 (Pool Road) within Newtown. All other receptors are expected to experience no significant impact.

Sensitivity Test

The results of the sensitivity test (assuming 2012 emissions and background concentrations as worst case) indicate that total annual mean NO_2 concentrations are on average 32% higher than the main case results.

Modelled concentrations at all but four receptors (Receptors 30, 32, 33 and 40) are below the annual mean NO_2, AQS objectives both with and without the Scheme in 2017 and all these receptors are below the annual mean NO_2 AQS objectives with the Scheme in 2017.

The number of receptors experiencing a 'small' increase in annual mean concentrations of NO_2 would decrease from 23 to 21 whereas those properties experiencing a 'medium' increase would increase from zero to four. The number of receptors experiencing both a 'small' decrease would decrease by 11 whereas those properties experiencing a 'medium' and 'large' decrease would increase by seven and five respectively. All increases in annual mean concentrations of NO_2 would remain 'negligible' whereas receptors experiencing 'moderate' or 'substantial' benefits would increase to two and four respectively. The results of the sensitivity test at all receptors are presented in Volume 3 Appendix B.1 Table B6.

5.4.2.1. Regional Emissions

Total emissions from all roads included in the traffic model have been estimated for NO_x, PM_{10}, and CO_2 in 2012 (base year), and with and without the Scheme in 2017 (opening year) and 2032 (design year). The results are presented in Table 5.4.10. Emissions are shown for the base year 2012 and the without Scheme and with Scheme scenarios in 2017 and 2032. In addition the number of vehicle km travelled is given for each scenario.

In 2017, emissions of all pollutants with the exception of NO_x are expected to increase as a result of the Scheme. Emissions of PM_{10} and CO_2 are expected to increase by 4% and 1% respectively in both 2017 and 2032. In 2017 emissions of NO_X are expected to decrease by 2%. In the future year 2032, there are expected to be a decrease of 1% for NO_x. Although there is an increase in vehicle km travelled with the Scheme in both 2017 and 2032, results are in line with the expected reduction in congestion in Newtown town centre and the free flow conditions expected on the bypass.

Overall, reductions in emissions of NO_x, PM_{10} and CO_2 of 71% and 14%, and 4% respectively are estimated by 2032 when compared with 2012 emissions. This is due to expected improvements in vehicle technologies becoming more prevalent within the vehicle fleet over time as older, more polluting technologies are replaced.

The Scheme specific TPO 2 aims to reduce greenhouse gas emissions along Pool Road and New Road by 3% from 2008 levels, by 2018 (in accordance with Wales Transport Strategy). Available traffic data does not allow us to calculate the change in emissions between 2008 and 2018; however, as presented in Table 5.4.10 total emissions of CO_2 are expected to reduce by 5% between 2012 and 2017 across the modelled road network. Total CO_2 emissions on Pool Road and New Road in isolation are expected to reduce by over 50% between 2012 and 2017. The TPO set for the Scheme in terms of CO_2 reduction within Newtown is therefore expected to be comfortably achieved.

Table 5.4.10 Results of the Calculation of Emissions

Year	Scenario	NO_x (kg/yr)	PM_{10} (kg/yr)	CO_2 (t/yr)	Veh kms travelled / year
2012	Base	61,509	5,096	19,855	105,832,232
2017	Do-Minimum	38,448	4,366	18,704	108,181,999
	Do-Something	37,698	4,534	18,952	113,063,025
	Change with Do-Something	*-750*	*168*	*248*	*4,881,026*
	%Change from Do-Minimum	-2%	4%	1%	5%
	% Change from Base	-39%	-11%	-5%	7%
2032	Do-Minimum	17,755	4,203	18,854	116,521,078
	Do-Something	17,543	4,387	19,088	122,057,997
	Change with Do-Something	-212	183	234	5,536,920
	%Change from Do-Minimum	-1%	4%	1%	5%
	% Change from Base	-71%	-14%	-4%	15%

5.5. Proposed Mitigation

5.5.1. Construction mitigation

Mitigation measures given in the IAQM Dust Guidance[5.3] that are applicable to the Scheme are described for those activities identified as low, medium and high risk as detailed in the construction assessment. These measures should be included within a Dust Management Plan (DMP) which forms part of the Construction Environmental Management Plan (CEMP). Examples of these measures include:

- Plan site layout so that dust causing activities are located as far from receptors as possible.
- Avoid site run off of water and mud.
- Remove materials with the potential to produce dust from site as soon as possible.
- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- All dusty activities should be damped down during dry weather.
- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out.
- Use enclosed chutes, conveyors, and covered skips, where practicable.
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
- Make sure that any stockpiles exist for the shortest possible time.
- Do not build steep sided stockpiles or mounds or those that have sharp changes in shape.
- Whenever possible keep stockpiles or mounds away from the site boundary, sensitive receptors, watercourses and surface drains.
- Wherever possible, enclose stockpiles or keep them securely sheeted.
- Take into account the predominant wind direction when locating stockpiles to reduce the likelihood of affecting sensitive receptors.
- Seed, re-vegetate or turf long term stockpiles to stabilise surfaces. Where re-vegetation is not possible, use hessian, mulches or trackifiers or cover with topsoil as soon as possible.
- Impose an appropriate onsite speed limit.
- Vehicles carrying dusty material should be securely covered before leaving the site.
- Use water- assisted dust sweepers on the access and local roads to remove material tracked out from site.
- Liaison with PCC regarding dust deposition monitoring to begin at least 3 months before work commences.

Stakeholder communication should be implemented through community engagement both before and during work on site and the clear display of contact details for those responsible for dust issues on site. Any complaints and exceptional incidents should be logged along with the appropriate measures taken to reduce emissions.

Daily site management of emission control measures should be undertaken, with visual inspections of activities and control measures carried out every day during dry conditions. Visual inspections should include recording of activities, controls, weather and ground conditions, and observations of surface dust deposits at and beyond the site boundary in the vicinity of receptors.

5.5.2. Operational mitigation

No significant adverse effects are expected to occur as a consequence of the Scheme. No specific mitigation is therefore required.

5.6. Residual Environmental Effects (following mitigation)

5.6.1. Construction impacts

No significant residual effects are expected to occur as a consequence of the Scheme construction assuming that appropriate mitigation measures to prevent and control dust emissions are maintained by the construction contractor.

5.6.2. Operational impacts

No significant adverse residual effects are expected to occur as a consequence of the Scheme after opening. There are likely to be significant beneficial effects at properties adjacent to the A489 (Llanidloes Road) and A483 (New Road and Pool Road) within Newtown.

5.7. Summary and Conclusions

An air quality assessment has been undertaken with consideration of impacts that were identified as being potentially significant in the Environmental Scoping Report, including: impacts from dust and particulates during construction of the Scheme; and operational air quality impacts due to changes in traffic conditions with the Scheme.

Air quality monitoring data for the area around the Scheme has been reviewed. Baseline local air quality conditions in the vicinity of the Scheme are likely to be below relevant air quality criteria however locations adjacent to busy and congested roads in Newtown are currently above annual mean air quality criteria for NO_2 with PCC declaring an AQMA as a result of exceedances of NO_2 AQS objectives at two properties adjacent to the A489 within Newtown. The Scheme is located approximately 1km south of the AQMA.

Increases in traffic associated with construction activities did not meet the criteria for quantitative assessment. The impact of construction traffic on local air quality is therefore likely to be negligible. There are a number of residential properties within 350 m of the Scheme site that could be affected temporarily by dust during construction. The contractor would be required to ensure that effective mitigation is applied to control emissions to avoid any adverse impacts through the CEMP. The impact of construction dust is expected to be negligible, with appropriate mitigation to prevent and control dust emissions. There would be no significant construction phase effects with the Scheme.

The assessment of operational phase air quality impacts indicates that increases and reductions in concentrations of $PM_{2.5}$ and PM_{10} with the Scheme would be 'imperceptible to small' and the overall impact on concentrations would be negligible. In addition there is expected to be no significant adverse operational phase effects on concentrations of NO_2 with the Scheme. There is however expected to be 'slight' to 'substantial beneficial' operational phase effects on concentrations of NO_2 at a number of properties within the centre of Newtown. Properties located within the AQMA are expected to experience a 'substantial beneficial' effect with concentrations likely to reduce below the AQS objective with the Scheme.

The overall significance of the changes is classed as of 'major significance' within the PCC AQMA and 'minor significance' for the receptors adjacent to the A489 (Llanidloes Road) and A483 (New Road and Pool Road) within Newtown. All other receptors are expected to experience no significant impact.

The calculation of mass emissions showed that with the Scheme, pollutant emissions would decrease in line with the reduction in congestion in Newtown town centre and the free flow conditions expected on the bypass. Emissions would generally be expected to decrease in future years compared to the existing situation as a result of more stringent emissions control legislation, with the exception of hydrocarbons which showed an increase in emissions. The Scheme specific objective, TPO 2, which aims to reduce greenhouse gas emissions along Pool Road and New Road by 3% from 2008 levels, by 2018 is expected to be achieved comfortably.

Table 5.7.1 – Summary of Impacts in relation to Air Quality

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation	Notes / Comments
Construction Impacts					
Receptors located adjacent to offline construction activities.	Human health and dust soiling impacts as a result of dust generation during demolition, earthworks, construction and trackout.	Medium risk to human health and high risk of dust soiling.	Negligible	Not Significant	With appropriate mitigation measures in place, any potential significant adverse effects of the works would be minimised so that residual effects would not have a significant impact on adjacent receptors.
Operational Impacts					
Receptors located adjacent to affected road network within Newtown and adjacent to B4568.	Decrease in NO_2, PM_{10} and $PM_{2.5}$ annual mean concentrations	Small to large decreases in NO_2 concentrations within Newtown and adjacent to the B4568. Small decreases in PM_{10} and $PM_{2.5}$ within Newtown	No mitigation required	Slight to substantial benefits to annual mean NO_2 concentrations within Newtown. The overall significance of the changes is classed as of major significance within the PCC AQMA and minor significance for the receptors adjacent to the A489 (Llanidloes Road) and (New Road and Pool Road) within Newtown. All other receptors are expected to experience no significant impact.	
Receptors located adjacent to the Scheme and the A489 to the west of Newtown	Increase in NO_2 annual mean concentrations	Small increases in NO_2 concentrations adjacent to the Scheme and the A489 to the west of Newtown	No mitigation required	No significant impact	

6. Cultural Heritage

6.1. Introduction

This chapter outlines the Scheme in relation to archaeology and cultural heritage. It encompasses standing monuments, historic structures, buried archaeology and areas of heritage value such as historic landscapes, parks and gardens and Conservation Areas.

Any development has the potential to disturb both known remains and undiscovered archaeology. It also has the potential to visually impact upon features and areas for which setting is an essential concern, including Scheduled Ancient Monuments (SAMs), Listed Buildings and Conservation Areas.

The purpose of this chapter is to outline the archaeological and cultural heritage resource relating to the Scheme and its environs, to identify potential constraints to the Scheme, to formulate mitigation measures where an impact is identified, and to quantify any residual effects. A summary of the impacts is provided in Table 6.7.1 at the end of this chapter.

The following tasks were undertaken for this assessment:

- Legislation and policy context review
- Consultation with statutory and non-statutory bodies to identify interests and concerns regarding cultural heritage
- Desk-based study to obtain baseline and historical data
- Site survey and field investigation to augment desk-based baseline data
- Identification of the potential impacts of the Scheme and assessment of their significance
- Formulation of mitigation of potential impacts

6.2. Methodology

The assessment conforms to the methodology defined in the Design Manual for Roads and Bridges (DMRB) (Vol. 11, Section 3, Part 2, Cultural Heritage; HA 208/07).

6.2.1. Study area

The assessment is based upon a study area that extended 200m either side of the original limit of construction. Due to subsequent amendments to the design, the study area is slightly off-centre in places in relation to the final Scheme alignment, notably in the area of Great and Lower Brimmon. However, an adequate buffer from all areas of construction exists at all locations.

A gazetteer of the cultural heritage assets identified within this study area can be found in Volume 3, Appendix C.1.

6.2.2. Information sources

Sources consulted for this assessment comprise: the regional Heritage Environment Record (HER) curated by the Clwyd Powys Archaeological Trust (CPAT); the National Monuments Record (NMR) curated by the Royal Commission for the Ancient and Historical Monuments of Wales (RCAHMW); aerial photographs curated by the Central Register for Aerial Photography in Wales; records and cartographic sources held by the Powys Record Office and Cardiff University Library; and miscellaneous published and ‘grey’ literature. A full list of consulted sources is included in Chapter 18 References.

6.2.3. Site survey and field investigations

Site survey has been ongoing since the 2008/9 Key Stage 2 assessment. The present study included the following staged programme of site survey and field investigation:

- Site walkovers, May 2013 - June 2014, undertaken by the author
- Site walkover, July 2013, undertaken by CPAT

- Watching brief on Geotechnical Investigation trial trenches, September - December 2013, undertaken by CPAT
- Geophysical survey, September 2013 - April 2014, undertaken by Archaeophysica
- Evaluation trenching, October 2013 - June 2014, undertaken by CPAT

The purpose of the fieldwork was:

- to review the current condition of known archaeological sites, features and deposits
- to identify new archaeological sites, features and deposits, or areas that may contain them
- to record archaeological sites, features and deposits
- to assess the vulnerability of archaeological sites, features and deposits
- to assess potential visual impacts

6.2.4. Stakeholders and Consultation

Stakeholders identified for heritage comprise:

- Cadw
- Clwyd Powys Archaeological Trust (Curatorial Division) (CPAT)
- Powys County Council (PCC)

Consultation with these stakeholders has been an ongoing, integral part of this assessment. Responses to the Environmental Scoping Report were received from Cadw and CPAT, while CPAT and Powys County Council made comments on the draft Environmental Statement.

Cadw provided initial comment on the Scheme, requesting that potential impacts upon SAMs, Listed Buildings, Parks & Gardens and registered historic landscapes be assessed.

CPAT confirmed that the broad scope of assessment is in accordance with its previous recommendations made during Key Stage 2 and with the principles of archaeological assessment set out in DMRB and the Institute for Archaeologists' standards and guidance. It subsequently approved the Written Scheme of Investigation for the field investigations, inputting into the methodology and positioning of the geophysical survey, watching brief on GI trial trenches, and archaeological evaluation. Comment was also given in relation to potential impacts on the Listed Buildings within the study area.

PCC commented on the potential impacts upon the setting of Listed Buildings, with particular reference to the ten listed structures in the immediate vicinity of the Scheme.

6.2.5. Assessment Methodology

6.2.5.1. Assessment criteria: value

The value (or sensitivity) of cultural heritage sites is assessed against the criteria that are nationally agreed within the UK. These are set out in the Design Manual for Roads and Bridges (DMRB) Vol. 11 Section 3 Part 2, Annexes 5 and 6 (revised August 2007), and are as follows:

- Very high (international importance): World Heritage Sites including nominated sites on the Tentative List
- High (national importance): SAMs or archaeological sites and remains of comparable quality, assessed using the Secretary of State's criteria; Grade I and Grade II* Listed Buildings; Grade I and Grade II* Parks and Gardens
- Medium (regional importance): archaeological sites and remains which, while not of national importance, fulfil several of the Secretary of State's criteria and are significant remains in the regional context; Grade II Listed Buildings; Grade II Parks and Gardens; Conservation Areas
- Low (local importance): archaeological sites and remains comparable to those listed in UK County Heritage Environment Records (HER) or other sources which are either of very low potential or of minor importance; areas of local importance can be designated by local planning authorities; buildings of special local interest

- Negligible (lesser importance): areas in which investigative techniques have produced negative or minimal evidence of antiquity, or where large-scale destruction of deposits has taken place
- Unknown: this category applies to a site or feature where data are insufficient to allow a judgement to be made on character, age, extent or rarity

SAMs will always be of at least national importance and are protected under the Ancient Monuments and Archaeological Areas Act 1979; setting is rendered a material consideration by Welsh Office Circular 60/96.

The Planning (Listed Buildings and Conservation Areas) Act 1990 defines and provides equal protection for all Listed Buildings, although these buildings are graded in importance, from Grade I (most important), II* and II. Buildings listed at Grade I are considered as being 'of paramount importance to the nation' whilst those listed at II* are of 'outstanding interest'. Such buildings are therefore considered within this assessment to be of national importance. Structures listed at Grade II are usually considered as being of regional importance, although on occasion they may be considered as having either national or local importance.

The assessment of the value of other site-types that are not afforded statutory protection is based upon the expert judgement of the project team. Value is determined by a site's individual importance, by its context within the wider landscape, and by its present condition.

6.2.5.2. Assessment criteria: condition

The condition of individual sites and the general overall condition of surviving remains has a bearing on the value of the sites themselves and on the value that they impart within a wider landscape context. The condition of sites is recorded using the following criteria:

- Intact
- Near intact
- Damaged
- Near destroyed
- Destroyed
- Restored
- Moved (usually finds)
- Not known

6.2.5.3. Significance of Impact

Magnitudes of impact are assessed in the categories high, medium, low and imperceptible, and are described in Table 6.2.1.

Table 6.2.1 Definitions of Magnitude of Impact

High	Impacts that fundamentally change the baseline condition of the receptor, leading to total or major alteration of character or setting
Medium	Impacts that change the baseline condition of the receptor materially but not fundamentally, leading to partial alteration of character or setting
Low	Detectable impacts which do not alter the baseline condition of the receptor materially
Imperceptible	A very slight and barely distinguishable change from baseline conditions, approximating to a "no change" situation
None	No discernible change to the baseline condition of the character or setting of the receptor

Table 6.2.2 is a matrix that combines site value criteria with impact magnitudes. In order to synchronise the cultural heritage assessment with the other parts of this EIA, the value criteria have been simplified. DMRB gives five categories: these have been reduced to a four-point scale that ranges from A (international / national) to D (lesser or low) importance. (The equivalent DMRB criteria are given in italics in Table 6.2.2).

Impacts are either positive or negative, and either significant or not significant. For the purposes of this assessment, moderate and major impacts are considered to be significant.

Table 6.2.2 Matrix for Assessing Significance of Impact

	Value / Sensitivity *(DMRB equivalent)*			
Magnitude	**Lesser/Low (D)** *Negligible*	**Local (C)** *Low*	**Regional (B)** *Medium*	**National/ International (A)** *High / Very High*
High	Minor	Moderate	Major	Major
Medium	Negligible	Minor	Moderate	Moderate / Major
Low	Negligible	Negligible	Minor	Minor / Moderate
Imperceptible	Negligible	Negligible	Negligible	Minor
None	Neutral	Neutral	Neutral	Neutral

6.2.5.4. Assessment of Impacts upon Historic Setting

There is no accepted methodology for the assessment of visual impacts on cultural heritage features, or for 'setting' criteria.[6.1] DMRB does not define an assessment methodology for this aspect, although it offers guidance on study areas for visual impacts. Nevertheless, the principles of historic setting are expressed in a number of planning-related documents, including for Wales the Cadw document *Conservation Principles.*[6.2]

This assessment takes its definitions of 'setting' from Colcutt, who provides a thorough overview of the issue in relation to development.[6.3] While this work does not comprise formal guidance, it is in widespread use by archaeologists and shares the same fundamental principles as more recent guidance, for example that issued by English Heritage as *The Setting of Heritage Assets* (2011; not applicable in Wales).[6.4] Colcutt articulates historic setting under four basic headings:

- Intrinsic visual interest – the visual qualities of the archaeological features themselves as seen from other points

- Topographic setting – the visual relationship of the archaeological features to the surrounding topography and to such major elements, for example, hills and river valleys

- Land use setting – the visual relationship of the archaeological features to the land use and particularly those elements of the current land use which had remained unchanged or were similar to those which existed at the time the features were occupied/in use; and

- Group setting – the visual relationship of the features to other visible archaeological remains in the vicinity, in terms of both contemporary and diachronic ('palimpsest') groupings or patterning

It is notable that Colcutt places emphasis on the visual attributes of the setting of upstanding monuments and standing buildings. In so doing there is a clear distinction between a site's visual relationship with its surroundings, and less tangible associations with its wider environment – that is to say buried features which provide an archaeological context. It is recognised here that some archaeologists contend that the latter also comprises a 'setting' which has the potential to be impacted upon by modern development.

The preceding concepts, principles and guidance have shaped the assessment methodology applied to the Scheme. The assessment process for each asset was as follows:

- To establish whether an asset would have views of the Scheme, or may be viewed in combination with the Scheme.

- To establish the key characteristics of the asset's historic setting. What was its original setting? What was the landscape character at that time? What visual connections would have existed with other contemporary sites?

- To assess the surviving quality of that original, 'historic', setting. To what degree does the original (or subsequent relevant) setting of the asset still persist?

- To consider potential, appropriate mitigation strategies for any impacts arising from the Scheme.[6.5]

6.2.6. Limitations and assumptions

At the outset of this study, the baseline data for cultural heritage was almost entirely derived from desk-based sources, and in the main the identified sites were those that were visible at ground level. The field work undertaken for this study has greatly enhanced this baseline, particularly in terms of the identification of buried archaeological sites. All archaeological field surveys have their limitations, however. Due to practical constraints, it was not possible to obtain geophysical data across the whole of the study area, while the evaluation trenches revealed only a tiny percentage of the total ground that would be taken in by the Scheme. For this reason, it cannot be assumed that all archaeological sites within the study area have been identified.

Nevertheless – and though the risk of unexpected discoveries must always remain – the field work is assumed to have identified the majority of archaeological sites within the corridor of construction. On this basis, the overall character of the cultural heritage resource within the study area (i.e. site types, periods of activity, standard of preservation) is assumed to be well-understood.

6.3. Baseline Conditions

6.3.1. Policy context

The following legislation, policies and guidance have been identified as relevant to the assessment:

- Ancient Monuments and Archaeological Areas Act 1979
- Planning (Listed Buildings and Conservation Areas) Act 1990
- Welsh Office Circular 60/96 Planning and the Historic Environment: Archaeology
- Welsh Office Circular 61/96 Planning and the Historic Environment: Historic Buildings and Conservation Areas
- Welsh Office Circular 1/98 Planning and the Historic Environment: Directions by the Secretary of State for Wales
- A483 (Llandovery to Llanymynech) Route Management Strategy Report – (Draft May 2007): Policy EN4
- Powys Unitary Development Plan, Adopted March 2012 (UDP): Strategic Policy 3(B); ENV11 – Development in Conservation Areas; ENV12 – Permitted Development in Conservation Areas; ENV13 – Demolition in Conservation Areas; ENV 14 – Listed Buildings; ENV 15 – Demolition of Listed Buildings; ENV 17 – Ancient Monuments and Archaeological Sites; ENV 18 – Development Proposals Affecting Archaeological Sites
- Powys Local Development Plan 2011-2026, Deposit Draft (July 2014): LDP Objective 13 – Built Heritage; Policy DM2 – Detailed and Site Specific Planning Matters (paras 4 and 4.2.25).
- Welsh National Transport Plan SEA: Sub-objective 10.1

6.3.2. The archaeological and historical context

The following sections describe the archaeological and historical context of the study area and the known sites within it. Full details are contained in the cultural heritage gazetteer: Volume 3, Appendix C.1. The sites are shown in Volume 2, Figures 6.1a-d.

6.3.2.1. Prehistoric

The River Severn has been an important strategic and communication corridor since prehistoric times. Following the end of the Devensian glaciation, which reached its peak around 13,000 BC, the ice age climate in Britain gave way to wetter and warmer conditions. A landscape of tundra and steppe was replaced by forest, in which deciduous species such as oak and hazel dominated. Much of the Neolithic (4,400-2,300 BC) and Bronze Age (2,300 BC-800 BC) in Wales

is characterised by increasing woodland clearance, but it is suggested that widespread, permanent clearance was not affected until the Iron Age.[6.6, 6.7]

Some of the earliest identified remains within the locality belong to the Late Neolithic or Bronze Age.[6.8] These comprise a round barrow at Castell-y-Dail (PRN 5757) which was excavated in or around 1817 (PRN refers to Primary Record Number of the HER).[6.9] Although the antiquarian report on this site was adequate to demonstrate that the site was indeed a barrow, it provides little other useful information on its form or indeed its precise location. A few other artefacts of this period have been reported, including the stray find of a perforated stone axe hammer from Glandulas Holiday Home Park (Portable Antiquities Scheme Ref. CPAT2B31A0). Despite the lack of supporting data, it is reasonable to assume that the Severn corridor was frequently travelled during the Bronze Age, and that the higher ground was the site of a greater number of barrows than the one example which is presently known.

There is a greater amount of evidence for settlement of the district during the Iron Age. The principal site in the locality is Bryn Banc (just to the north of Newtown), a monument which comprises the earthwork remains of a bivallate (double-ditched) hillfort (SAM MG211; PRN 1038). Another small enclosure survives nearby as a low earthwork (PRN 3719), whilst on elevated ground to the south of Newtown (within the study area) is the defended earthwork known as Castell-y-Dail (PRN 969): all are assumed to be of Iron Age date.[6.10] The place-name Maes-y-Castell, applied to land that is now part of the Fronlas Farm industrial estate, is also suggestive of a defensive site (PRN 1586).

Neither Bronze Age barrows nor Iron Age hillforts existed in isolation, and indeed their presence implies the existence of a substantial local population. Prehistoric settlement sites have thus far proved elusive around Newtown, but the field investigation undertaken for this assessment has yielded a certain amount of evidence for human activity that – in all probability – belong to this period. Several sites have the potential to be of this date, including the complex of ditches at Great Brimmon (NPRN 400768; NPRN refers to National Primary Record Number of the NMR). In all, cases, however, the lack of any artefactual and/or stratigraphic evidence has restricted the interpretation of the evaluated features. Conversely, evaluation of the Y-shaped cropmark at Lower Brimmon, suggested to be the buried remains of a prehistoric field system, has indicated that it is most probably a Medieval or Post Medieval holloway (PRN 4650).

The field evaluation for this study recovered a small number of artefacts of prehistoric date. Pottery sherds from Trench 10 had impressed cord decoration typical of the later Neolithic Peterborough ware tradition, while a single sherd from Trench 7 and four sherds, including a rim, from Trench 18 are also likely to be Neolithic in date. Trench 18 also produced a single sherd of pottery which is perhaps more likely to be Bronze Age in date. Six flints were recovered from Trenches 7, 9, 10 and 18. These included a small blade from Trench 18, while the remainder were flint flakes. Thus, while the field investigation has produced no direct evidence for occupation, in the form of definitely-dated structural features, the existence of these finds, sometimes within stratified deposits, provides an indication of prehistoric activity in three separate areas along the Scheme's route.

6.3.2.2. Roman

There is no known Roman settlement around Newtown,[6.11, 6.12,6.13] although there is the unproven suggestion that a small rectangular enclosure identified from a cropmark on aerial photographs at Hendidly was a Roman fortlet (PRN 5136). However, although the rounded corners of this enclosure look superficially Roman, the date of this site has yet to be proven through excavation.

Nevertheless, the Roman road between the forts at Forden and Caersws is known to pass through Newtown.[6.14,6.15] Doubt remains as to its precise course in many places, and for much of its route through the built-up area of Newtown the HER denotes the road as 'proposed course' or 'course uncertain'. Some proposed routes most notably that within the study area at Maesyrhandir, are completely spurious.

Existing data, confirmed by field work for this assessment, establishes the course of the road as it enters the outskirts of Newtown on the west. Around Glanhafren Hall, the HER shows two possible routes, but since 2006 the exact course has been known, when it was recorded by RCAHMW as a series of parchmarks in pasture: this corresponds to the more southerly alignment on the HER (PRN 11718). In the field to the southeast of Glanhafren Hall the road survives for 300m as a broad, plough-spread agger (a rounded linear bank), which represents the remains of the road embankment above its side ditches (the latter now infilled). Evaluation for the Scheme

proved the road here to be well-preserved, demonstrating two phases of construction with a later phase of resurfacing of possible later Roman, or post-Roman date (Trench 21). This is a rare, and extremely good surviving example of this feature-type: relatively few stretches of Roman road remain visible above ground in Wales, and they are particularly unusual in lowland locations. The road here has high intrinsic value, and also amenity value as a site which can be readily understood by the public.

Eastwards from Glanhafren, the Roman road crossed a small stream near Dulais Bridge, after which point its alignment is no longer apparent at ground level. It has been ploughed out in the field east of the college, and is lost beneath the new college buildings (although prior to their construction it could still be seen in places, immediately south of the railway line). The road is then lost for the next 3km but is known to have existed in the area that is now occupied by the Dyffryn Industrial Estate. The road here is shown on an estate map of 1798 and prior to the construction of the industrial estate a little of its terracing still survived. The course of the road in the intervening kilometres between the college and the Dyffryn Industrial Estate can only be surmised. However, all the evidence points to it being on the south side of the River Severn and probably following a line broadly comparable to the modern A483 and/or the railway line.

The Roman road has recently been confirmed in the eastern part of Newtown, on the site of the Tesco superstore. It was revealed by excavations in 2009, during which over 200m of the road was exposed (PRN 123117)[6.16]. Additionally, during the present assessment the road was confirmed at the eastern end of the Scheme where it survives as a faint earthwork terrace in a pasture field. Geophysics and evaluation trenching demonstrated that below ground the road is relatively well preserved. The metalled surface was 6.2m wide with three phases of construction or resurfacing evident, the uppermost preserving a number of wheel ruts.

The road's course at the extreme eastern limit of the Scheme is not precisely known, as geophysical survey could not be undertaken in the field immediately to the south of Glan Hafren Hall. It may lie within this field, or under the present road. For this reason the assessment of impact at this point (for PRN 47040), given in Table 6.4.1 below, is slightly speculative.

6.3.2.3. Medieval to present

Little is known about settlement in the district during the post Roman era, and although there must surely have been continuity from prehistory through to the Early Medieval period, no archaeological remains have yet come to light. However, the locality was fortified during the early Norman period, and from this date onwards Newtown is considerably better understood in historical terms.[6.17, 6.18, 6.19]

The motte and bailey castle known as Gro Tump to the east of the modern town was probably built in the 1080s to protect the important route alongside the Severn (SAM MG059). Newtown itself was established by Royal Charter in 1279, replacing Welsh-held Dolforwen as the principal settlement and market centre in the district.[6.20] Newtown was soon protected by a new castle, the remains of which can still be found in the core of the modern town (SAM MG160).

As can be shown by study of historic maps, Newtown continued in its role as a modest market town – limited to its medieval boundaries – through to the start of the 19th century. The Industrial Revolution then brought radical change, the development of a mechanised woollen industry transforming the character of the town and increasing its population from under 1,000 in 1801 to 4,500 by 1841.[6.21] Although some good examples of earlier architecture can still be found (primarily 17th and 18th century) most of Newtown's historic buildings belong to this heyday, from the early 19th to early 20th century.[6.22]

By the end of the 19th century the woollen industry was in decline, and for much of the 20th century the town endured considerable economic difficulties. The formation of the Mid Wales Newtown Development Corporation in 1968 effectively reversed this trend, stimulating new residential and industrial development on the outskirts of the 19th century core. The various industrial estates on the southern fringe of the town such as Mochdre, Vastre and Dyffryn all belong to this period, and their construction took place with no formal archaeological monitoring. What lies beneath these areas is therefore largely unknown.

Beyond the built-up area, the landscape remains essentially rural. The tithe maps for Newtown and the adjacent parish of Llanllwchaiarn and Penstrowed show that the field boundaries present in the modern day had been established by the 1840s: with only minor adjustments these survive within, and define, the present pastoral landscape.

Post Medieval activity is indicated by the general spread of finds from the topsoil and ploughsoil within every trench undertaken for the evaluation, presumably being derived from cultivation and the spreading of manure. As noted above in section 6.3.2.1, evidence from Trench 10 is suggestive of a possible holloway of potentially medieval date, which was superseded by a deliberately stoned surface during the 18th or 19th centuries. Evidence from the geophysical survey and evaluation also suggested the presence of a possible field system near Lower Brimmon.

6.3.3. Fieldwork

The following sections provide a summary of the field investigations that were undertaken to augment the desk-based assessment of the Scheme. The full details of these investigations can be found in Volume 3 as Appendices C.2 to C.4, as follow:

- Walkover Survey (Appendix C.2)
- Geophysical Survey (Appendix C.3)
- Watching Brief on Geotechnical Investigation, and Field Evaluation (Appendix C.4)

The location of the test pits observed by the watching brief, and the field evaluation trenches, are shown in Volume 2, Figure 6.2 (a – d), together with the extent of the geophysical survey.

6.3.3.1. Walkover Survey

The walkover survey, conducted in June 2013, identified 23 sites within the study area. These comprised 14 which were recorded by the Key Stage 2 cultural heritage assessment and a further 9 which were previously unknown.

6.3.3.2. Watching Brief on Geotechnical Investigation

A watching brief was conducted intermittently between September and December 2013 to monitor the excavation by machine of test pits and trial trenches as part of a programme of geotechnical investigations. The watching brief was concentrated in four areas of known archaeological interest: one at the western end of the Scheme; one near Castell-y-Dail; one near Great Brimmon; and the fourth at the eastern end of the Scheme.

Forty trial pits and four trial trenches were originally identified as requiring a watching brief, although six trial pits were subsequently cancelled and three were conducted without archaeological monitoring, all with the agreement of the CPAT Curator. In only three cases were archaeological features identified. Trial Pit 29 contained a small, undated pit with frequent charcoal flecks within the fill. A narrow, shallow gully was identified in Trial Pit 30; although no dating evidence was recovered the nature of the fill suggested that this was likely to be relatively modern. Finally, a rough stone surface was identified in Trial Pit 116, pottery from which was of Post Medieval date.

6.3.3.3. Geophysical Survey

At the outset of this study a magnetometry survey was designed that incorporated 75 fields along approximately 6.4km of corridor with an average width of about 150m. In the event, restrictions primarily imposed by topography, and to a lesser extent by land access and crop conditions, reduced the area of survey (see Volume 2, Figure 6.2 a – d).

Geological conditions were conducive to good results, and the survey revealed a considerable number of anomalies that were (or had the potential to be) archaeological, along with other modern man-made structures and natural features.

There were recognisable archaeological monuments in the form of the Roman road, several multiphase enclosures and a holloway. Anomalies identified in two other fields may also be of interest in this regard. Elsewhere there was a thin distribution of ditch fills throughout the study area, most probably relating to former field boundaries and drainage.

6.3.3.4. Evaluation

Sixteen machine-cut evaluation trenches were excavated between October 2013 and June 2014. The locations of these trenches were chosen to investigate features that were known from existing data, or had been identified through the geophysical survey.

Evidence was forthcoming to indicate a range of human activity from the Neolithic period to the present day. The earliest evidence for activity consisted of a few sherds of Neolithic and Bronze Age pottery and flints. Further evidence for later prehistoric activity emerged in the form of a previously unknown enclosure on a hilltop location north of Wern Ddu Lane: although the excavated section of the enclosure ditch produced no direct evidence for dating, a small number of sherds of Romano-British pottery were found within the interior.

The Roman road was confirmed at both the western and eastern end of the Scheme. Elsewhere the evaluation identified a possible holloway of potentially medieval date and an undated field system near Lower Brimmon. Post Medieval activity was indicated by the general spread of finds from the topsoil and ploughsoil within every trench, presumably derived from cultivation.

Although the trenches were positioned in order to evaluate features revealed by the geophysical survey, the presence of previously unidentified archaeological features in a number of trenches (in particular the recovery of prehistoric artefacts) indicated the potential for significant discoveries elsewhere along the route for which there is currently no evidence.

6.3.4. Baseline data

World Heritage Sites
The nearest World Heritage Site is the Pontcysyllte Aqueduct and Canal at Froncysyllte near Llangollen.

Scheduled Ancient Monuments (SAMs)
There are no Scheduled Ancient Monuments (SAMs) within the study area. The nearest SAMs are Newtown Old Church (MG056) and Newtown Castle Mound (MG160) in Newtown's historic core, and Gro Tump medieval motte and bailey castle (MG059) on its eastern outskirts.

Conservation Areas
The historic core of Newtown is designated as a Conservation Area. No part of the Conservation Area is within the study area.

Historic Parks and Gardens
There are no registered Historic Parks or Gardens within the study area. The nearest is Gregynog (PO33), 4km to the north of the study area boundary.

Historic Landscapes
The study area is not within any historic landscape, as described by the Cadw, CCW and ICOMOS UK Register of Landscapes of Special Historic Interest in Wales (1998) or Register of Landscapes of Outstanding Historic Interest in Wales (2001).[6.23, 6.24] The nearest such landscape is Caersws Basin, 1.5km to the west of the study area (HLW P5). The Vale of Montgomery (HLW P2) is 6km to the east.

Listed Buildings
There are 10 Listed Buildings within the study area. All are Post Medieval in age and Grade II-Listed.

Non-statutory sites
Within the study area there are 29 sites listed on the HER database and 6 on the NMR database. In addition, the research for this assessment has identified a further 26 sites.

6.4. Predicted Environmental Effects

6.4.1. Generic effects

Impacts upon the cultural heritage resource are assessed under three basic headings: direct physical (which occur during construction), and indirect physical and visual (which arise from long-term operation).

Permanent construction effects on cultural heritage are as follows:

- Intrusive groundworks that extend down to the level of archaeological features and horizons

- Compression of fragile buried archaeological features
- Damage to or destruction of standing heritage features (whether inhabited buildings or non-occupied structures). This may occur either because of deliberate demolition, or unintentional events

Long term operation has the potential to impact upon cultural heritage features within and outside the development footprint. Operational impacts can take two principal forms: indirect physical and indirect visual. Published non-statutory guidance for Wales usefully characterises these impact types as part of the ASIDOHL methodology (Assessment of the Significance of Impact of Development On Historic Landscapes).[6.25]

Indirect physical effects are categorised as:

- An increased risk of exposure, erosion, disturbance, decay, dereliction or any other detrimental physical change to elements, consequent to development
- Related to the above, the likelihood of increased management needs to maintain elements as, for example, through altered habitats, water levels, increased erosion, new access provision, etc., consequent to development
- The severance, fragmentation, dislocation or alteration of the functional connections between related elements, for example, a field system becomes 'severed' from its parent farmstead by an intervening development
- The frustration or cessation of historic land use practices, for example, it becomes more difficult or impossible to manage an area in a traditional manner as a result of development
- The frustration of access leading to decreased opportunities for education, understanding or enjoying the amenity of elements, consequent to development

Indirect visual effects are categorised as:

- Visual impact on elements from which a development can be seen (considered up to its maximum height). Impacts can be on 'views to' or 'views from' given elements, and should be assessed with particular reference to key historic viewpoints and essential settings. In some cases, key historic viewpoints may no longer be identifiable, but it may be possible to make reasonable assumptions on the basis of archaeological or historical information. Key viewpoints should also include those that have subsequently become acknowledged as such, for example, as depicted in artists' drawings and paintings, or as features on popular routes or trails
- Impact on the visual connections between related elements, by occlusion, obstruction, etc. For example, what might have been an essential line of sight between historically linked defensive sites becomes blocked or impaired by an intervening development
- Conversely, the creation of inappropriate visual connection between elements not intended to be inter-visible originally, by the removal of intervening structures, barriers, shelters, screening or ground
- Visual impact of the development itself considering: (i) its form – the scale, number, density, massing, distribution, etc. of its constituent features; (ii) its appearance – the size, shape, colour, fabric, etc. of its constituent features, in relation to the existing historic character of the area

6.4.2. Construction impacts

Table 6.4.1 lists the sites that would be impacted upon during construction. These comprise the known sites, as identified by the desk- and field-based studies that have informed the baseline for this assessment. However, as the field evaluation demonstrates, sub-surface features may exist which have not been identified by any of the surveys to-date.

Table 6.4.1 Impacts on known sites: construction

Site	Nature of impact	Magnitude of impact	Status	Value	Significance of impact
11718 Roman road from Forden to Caersws	The Roman road bisects the flood compensation pond for 80m between NGRs 308248,290286 and 308195,290227. It would remain intact, except for a short section (c. 5m) which would be excavated for a culvert that links the two halves of the pond	Low	None	Medium	Minor
A22Geophysical Survey: Features 103 and 109 (Possible field boundary)	Road construction would destroy 25m of this feature, severing the surviving portions to the north and south	Medium	None	Unknown (?Low)	Minor
A20 Geophysical Survey: Feature 88 (Linear anomalies)	This structure would be destroyed by the road embankment and adjacent site compound	High	None	Unknown (?Low)	Moderate
A10 Castell-y-Dail leat	This feature would be partially destroyed by the road embankment	Medium	None	Low	Minor
A23 Pit	This structure would be destroyed by road construction	High	None	Negligible	Minor
A24 Gully	This structure would be destroyed by road construction	High	None	Negligible	Minor
A08 Castell-y-Dail building	This structure would be destroyed by road construction	High	None	Low	Moderate
A05 Castell-y-Dail Quarry	This feature would be destroyed by road construction	High	None	Low	Moderate
A26 Geophysical Survey (Possible trackway)	This feature would be destroyed by road construction.	High	None	Low	Moderate
400768 Great Brimmon Enclosure	A significant proportion of this complex of features would be destroyed by road construction and excavation of its cutting	High	None	Medium	Major
A28 Geophysical Survey Features 40-42 (Field boundaries)	The southerly part of this diffuse group of features would be destroyed by road construction.	High	None	Low	Moderate
A27 Geophysical Survey Features 43-48 and 51-53 (Possible field system)	The northerly part of this diffuse group of features would be destroyed by road construction.	High	None	Low	Moderate
A16 Geophysical Survey Feature 34 (Probable enclosure)	This feature would be destroyed by road construction and excavation of its cutting	High	None	Low	Moderate

Site	Nature of impact	Magnitude of impact	Status	Value	Significance of impact
47040 Roman Road from Forden to Caersws (Dyffryn Industrial Estate)	Two discrete sections of the Roman road would be destroyed by road construction, or buried by its embankment. These measure 180m for the main bypass and 50m for the roundabout slip-road. If the Roman road does not coincide with the existing highway at the extreme eastern end of the Scheme, a further section of unknown length (but approx. 100m) may be destroyed or damaged at the tie-in.	Medium	None	Medium	Moderate

6.4.3. Operational impacts

No World Heritage Sites, SAMs, Conservation Areas, Parks and Gardens or registered historic landscapes would have their setting affected by the Scheme.

The Scheme would be constructed near to listed buildings at four locations. These are assessed in turn below, and, although no impact is identified, there is also discussion of one archaeological monument: the hillfort at Castell-y-Dail. This is deemed necessary because of its close proximity to the Scheme.

This section is primarily concerned with visual alterations to setting, and to physical impacts such as landscape severance. It needs to be read in conjunction with the assessment summarised in Chapter 15, which considers the broader, cumulative impacts – namely those arising from air quality and noise.

6.4.3.1. Archaeological sites

6.4.3.1.1. Castell-y-Dail hillfort (PRN 969)

This monument is a former Iron Age hillfort, whose low earthworks encircle the crown of a prominent local summit to the south of Newtown. Its historic setting is predominantly *topographic*, the hillfort's dominance of the surrounding landscape offering the key to its location.

At present the site stands in open countryside. It remains a monument that is easily legible to the visitor – notwithstanding the dense woodland that obscures its eastern end. The key view – and indeed virtually the only place from which it can be seen in its entirety – is that looking northwards from a slightly elevated position on Dolfor Road, around NGR 309500,289575 (Volume 2, Figure 6.3). Elsewhere, the monument is obscured by local screening elements. It is impossible to appreciate it from areas to the north and east, where mature woodland restricts all views towards it.

The construction of the Scheme would not markedly alter the setting of this monument. The road centre line comes within 75m of the fort's earthworks, whilst the cutting of the Scheme would be within just 25m. However, neither would be apparent from within the fort itself, nor from the viewpoint on Dolfor Road, since the road would be considerably lower than the monument and separated from it by the retained mature woodland.

Therefore – and despite the proximity of the Scheme – it is not considered that there would be an effect upon the monument's setting.

6.4.3.2. Listed Buildings

6.4.3.2.1. Glanhafren Hall and associated buildings (17237, 17238, 17239)

Glanhafren Hall is a fine, three-storey Grade II Listed Structure in the Georgian style. It has been suggested that it is a seventeenth-century house that was improved with the addition of a new front in 1810, but all external features belong to the early nineteenth century.[6.26] The hall's

grounds contain several other structures, including the Grade II listed Apple House (a dovecote). Its iron gateway, adjacent to the A489, is also listed at Grade II.

The hall occupies a slight rise in the land – and was presumably deliberately sited there in order to afford it vistas across the estate in which it was centred. Views of the hall have *intrinsic visual interest*, while it also possesses a *land use setting* within its estate, and *group setting* with the adjacent Apple House, gateway and other non-listed structures.

The Penstrowed Tithe Map (1840) shows the hall to have been part of an estate held by a certain Herbert John Arthur (Volume 2, Figure 6.4). All of the fields and woodland surrounding Glanhafren Hall were owned by Arthur, including several on the south side of the road from Newtown (the present A489). The 2nd edition Ordinance Survey map (1901) identifies the two large fields to the south and east of Glanhafren Hall as parkland (261 and 264 on the tithe map); arguably this represents the curtilage of the property, though a wider landscape setting also existed.

The key views from the building are across this land, to the east and south. The Hall has a large number of windows on both of these elevations, with its main entrance on the south side. There is an important physical and visual connection with its gateway, 170m to the south of the Hall, next to the A489 (Volume 2, Figure 6.4). As both the tithe map and 1st edition Ordnance Survey (1885-6) demonstrate, the Hall's current surroundings of pastoral land and woodland are strongly reminiscent of the original historic setting.

The existing A489 is quite modest and screened by hedges. This road would stay in place after the Scheme's construction. The Scheme would be constructed slightly further to the south, the A489 Llanidloes Road Roundabout being 200m from the Hall (refer to Volume 2, Figure 6.4). A flood compensation area which would comprise a grassed depressed area would also be created in the fields to the south-west of the Hall.

The physical setting of the Hall and its associated structures would remain unchanged. The flood compensation area, once excavated, would return to pasture and only fill with water in exceptional circumstances. In visual terms, at ground level within the Hall's curtilage, the situation would also be little-altered. This would particularly be so during the summer months, when the trees in the immediate vicinity of the Hall, and those lining the track to its gateway, provide significant screening in the direction of the Scheme. Accessible views of the hall and its grounds – essentially from the A489 – would also be unchanged.

The principal impact would be from within the house, on southward views from the upper floors. From here, the A489 Llanidloes Road Roundabout would be a highly visible feature, with the road running on an embankment as it approaches from the west. Although not causing any additional landscape severance (the present A489 already delineates the southern extent of the Hall's modern curtilage), the Scheme would be built on pasture that was formerly part of the estate.

The magnitude of impact is assessed as Medium and the significance of impact as Moderate adverse.

6.4.3.2.1. Castell-y-Dail farmhouse (8206)

Castell-y-Dail is a brick-built, cruck-framed farmhouse of nineteenth-century date, though the building is suggested to have earlier origins. The house stands at the southern end of a small lane, and backs onto Castell-y-Dail Wood, which occupies the rising land to the south. The building is an attractive, well-preserved example of its type, and has *intrinsic visual interest*. Its curtilage is very confined, however, being limited to its surrounding garden. The connection to the pastoral land to the northeast and northwest is not particularly obvious (Volume 2, Figure 6.5).

The Scheme would be constructed immediately to the south of the house, such that the building would be 20m from the nearest point of the embankment and 30m from the road itself. The effect, however, is limited, as the intervening tree-screening would leave the house within a visual setting that is essentially unchanged (Volume 2, Figure 6.5). The impact upon both the physical and visual setting is therefore assessed as Neutral. However, note is made of the significant effect from traffic noise (see Table 15.1), albeit one that would be mitigated by the construction of a noise barrier, and which would diminish over time as new planting becomes established.

6.4.3.2.2. Black Hall Farm, attached range and barn (8194, 8195, 8196)

The Black Hall complex of Grade II-listed structures centres on a seventeenth-century farmhouse. The house's range was added in the eighteenth century, while the nearby barn is of probable seventeenth-century date. The farm as a whole sits in a crook of the Dolfor Road, which wraps around and above it on the north, east and south sides. These structures share a *group setting*, whilst they have *landuse setting* within the surrounding pastoral landscape – particularly on the falling ground to the west. The farm also has intrinsic visual interest, and is best viewed from Dolfor Road, for example at NGR 310516,289783 (Volume 2, Figure 6.6).

Dolfor Road is the only infrastructure currently extant near the farm. The Scheme would bring substantial alteration to this situation, running on an east-west alignment 180m north of the main house and 130m from the barn. The new-built road to the east of Dolfor Road would be in cutting and would not be visible from Black Hall. The tie-in to the A483 Dolfor Road Roundabout, also on the eastern side of the existing Dolfor Road, would also have little effect.

The principal impacts relate to the new-built road to the west of Dolfor Road. This would be built on a substantial embankment and would alter the northward prospect from the farm, although only to a limited extent due to the mature trees that fringe the property on its northern side. The house itself lacks northward views, which are blocked by the adjacent barn. The elevated views across the farm from Dolfor Road would be more substantially changed (Volume 2, Figure 6.6). In physical terms, the new road would sever the farm from pastoral land to the north, thus affecting both its historic curtilage and its land-use setting.

The magnitude of impact is assessed as Medium and the significance of impact as Moderate adverse.

6.4.3.2.3. Glan Hafren house and barn (8215, 8216)

Glan Hafren is a Grade II-listed house of mid-seventeenth century origin, with additions of the mid-nineteenth century (Volume 2, Figure 6.7). The adjacent barn is also of seventeenth-century date. The two structures share a *group setting*, while the farm complex as a whole has a *landuse setting* that relates to its place within its surrounding pastoral landscape. The fields surrounding the farm, within the corridor delineated by the present road and the River Severn, may be considered to define its historic curtilage.

The farm has a long-standing relationship with the road exiting Newtown on its eastern side, which has historically provided access to Glan Hafren. At the present time this road runs 170m to the south of Glan Hafren house and is well-screened by a mature hedge. The Scheme would bring substantial change to this situation. The A483 Pool Road roundabout would stand 100m from the house, raised by an embankment on its northern side. The eastern exit from the roundabout would also be on a small embankment, but the western approaches would be in cutting (Volume 2, Figure 6.7).

The farm complex would remain physically intact, and views towards it would not be altered. However, the A483 Pool Road roundabout would extend into the farm's traditional curtilage, thus impacting upon its landuse setting. It would also be clearly visible from the farm, as opposed to the current situation where the road is largely screened. The magnitude of impact is assessed as Medium (i.e. partially altering character and setting) and the significance of impact as Moderate adverse.

Table 6.4.2 Impacts on known sites: operation

Site	Magnitude of impact	Status	Value	Significance of impact
969 Castell-y-Dail hillfort	None	None	Medium	Neutral
17237, 17238, 17239 Glanhafren Hall and associated buildings	Medium	LB II	High	Moderate
8206 Castell-y-Dail Farmhouse	None	LB II	Medium	Neutral
8194, 8195, 8196 Black Hall Farm, attached range and barn	Medium	LB II	Medium	Moderate
8215, 8216 Glan Hafren house and barn	Medium	LB II	Medium	Moderate

6.5. Proposed Mitigation

6.5.1. Principles of mitigation

There is a presumption in favour of preservation in situ of nationally important archaeological remains, whether scheduled or not. In some cases, unscheduled remains of local and regional importance would be considered worthy of preservation in situ. In these cases, the results of the assessment should influence the design of the development in order to protect a monument or remains. Proposals for enhancement may also be identified.

Preservation 'by record' may also be considered as an option for mitigation. For buried archaeology this implies excavation, whilst standing features are recorded by a combination of drawn, photographic and written record. Preservation by record is normally considered a less satisfactory outcome for cultural heritage, since it presupposes loss of, or damage to, the feature in question.

6.5.2. Construction mitigation

Mitigation would comprise a staged approach that would take place both prior to and during construction. It would be followed by a reporting phase, in which the results would be delivered to Cadw, CPAT and RCAHMW, and published if appropriate.

The detailed scope of the mitigation programme, its methodology and reporting, would be agreed through consultation with the Development Control Archaeologist of CPAT. It would be set out within a Written Scheme of Investigation. In outline, the mitigation would comprise the following:

Excavation of the following known sites:

- 11718: Roman road (western end of the Scheme). This would be undertaken at the location of the linking culvert for the flood compensation pond, and at adequate locations to determine its precise alignment within this field.
- A22: Geophysical Survey Features 103 and 109 (possible field boundary)
- 400768: Great Brimmon Enclosure
- A16: Geophysical Survey Feature 34 (probable enclosure)
- 47040: Roman Road (eastern end of the Scheme). This would be undertaken at all locations where a direct impact would occur. Excavation would be preceded by geophysical survey in the field to the south of Glan Hafren, which would determine the precise alignment of the Roman road at this location, therefore determining whether there would be an impact in this location.

Recording of the following sites:

- A08: Castell-y-Dail building
- A05: Castell-y-Dail Quarry

Watching brief: known sites

This would be undertaken for known sites which are judged to be of low potential. The watching brief would be undertaken during soil stripping; adequate time within the construction programme would be allowed for investigation of these sites.

- A22: Geophysical Survey Features 103 and 109 (possible field boundary)
- A20: Geophysical Survey Feature 88 (linear anomalies)
- A26:Geophysical Survey (possible trackway)

- A28: Geophysical Survey Features 40-42 (field boundaries)
- A27: Geophysical Survey Features 43-48 and 51-53 (possible field system)

Watching brief: general

This would apply to areas where soil stripping and excavation takes place, unless scoped out during consultation.

Contingencies for the discovery of archaeology. In the event that the watching brief reveals archaeological remains, these remains would be subject to appropriate investigation, ensuring adequate preservation by record.

No mitigation is proposed for sites A10, A23 and A24. For the first of these, no meaningful investigation or recording can be proposed. Sites A23 and A24 were investigated at the time of their discovery during the GI watching brief.

Archaeological supervision during setting out of works

There would be archaeological supervision during the setting out of the flood compensation pond at the western end of the Scheme. This would ensure that the unexcavated berm separating the north and south ponds would exactly follow the line of the Roman road.

6.5.3. Operational mitigation

The Scheme design includes a number of measures to lessen its visual impacts through hard and soft landscaping, and through a minimal lighting strategy, in which only roundabouts are to be illuminated, using full cut-off lights (i.e. unidirectional and with minimal light spill). These measures limit the impact of the Scheme on most of the Listed Buildings discussed above, and their effect has been considered in the assessment of impacts in section 6.4.3.2 above. Specifically, the roundabouts near both Glanhafren Hall, and Glan Hafren house and barn (at the west and east ends of the Scheme respectively), are designed with minimum lighting, while a noise fence would be in place behind Castell-y-Dail farmhouse. These measures recognise and have responded to the impacts on the cultural heritage resource through the design development.

Although impacts would remain, as identified in section 6.4.3.2 above, no further mitigation is proposed because all measures that are deemed to have a meaningful effect are already in place as an integral part of the design. Additional measures were considered, above all the planting of tree screens between the Scheme and the building groups at Glanhafren Hall, Black Hall Farm and Glanhafren house and barn. However, these were not felt to be appropriate, as they would introduce visual barriers into settings that have historically been within open countryside, and in the case of Glanhafren hall would occlude traditional site-lines.

6.6. Residual Environmental Effects (following mitigation)

6.6.1. Construction impacts

As outlined above, the direct physical impacts of the Scheme during construction would be mitigated via ‘preservation by record’. As such, elements of the archaeological resource would be lost, and therefore the mitigation proposed does not ameliorate the impact in its entirety. *Table 6.6.1* summarises the residual impacts.

Table 6.6.1 Residual impacts: Construction

Site	Status	Value	Significance of impact (without mitigation)	Significance of impact (after mitigation)
11718 Roman road from Forden to Caersws	None	Medium	Minor	Negligible
Geophysical Survey: Features 103 and 109	None	Unknown (?Low)	Minor	Negligible

Site	Status	Value	Significance of impact (without mitigation)	Significance of impact (after mitigation)
A20 Geophysical Survey: Feature 88 (Linear anomalies)	None	Unknown (?Low)	Moderate	Minor
A10 Castell-y-Dail leat	None	Low	Minor	Minor
A23Pit	None	Negligible	Minor	Negligible
A24 Gully	None	Negligible	Minor	Negligible
A08 Castell-y-Dail building	None	Low	Moderate	Minor
A05 Castell-y-Dail Quarry	None	Low	Moderate	Minor
A26 Geophysical Survey (Possible trackway)	None	Low	Moderate	Minor
400768 Great Brimmon Enclosure	None	Medium	Major	Minor
A28 Geophysical Survey Features 40-42 (Field boundaries)	None	Low	Moderate	Minor
A27 Geophysical Survey Features 43-48 and 51-53 (Possible field system)	None	Low	Moderate	Minor
A16 Geophysical Survey Feature 34 (Probable enclosure)	None	Low	Moderate	Minor
47040 Roman Road from Forden to Caersws (Dyffryn Industrial Estate)	None	Medium	Moderate	Minor

6.6.2. Operational impacts

There would be no further mitigation during the operational phase of the Scheme and therefore the impacts remain as described in Table 6.4.2 above.

6.7. Summary and Conclusions

The district around Newtown preserves a cultural heritage resource that spans later prehistory to the Post Medieval era. The study area is quite typical of the area as a whole, in that the baseline of known sites, prior to detailed field investigation, was quite sparse. The investigation undertaken as part of the design development of the Scheme, however, has revealed a number of archaeological sites and indicates the potential for others to survive. The present data indicate that these sites are of medium (i.e. regional) or low (local) value.

The impact of the Scheme on the cultural heritage resource would be limited. It would be confined to a physical impact upon a small number of known archaeological sites, and impacts upon the setting of Listed Buildings at three locations. Mitigation for the physical impacts upon archaeology would successfully reduce these to a minor or negligible (i.e. non-significant) magnitude. The Scheme design already incorporates measures that lessen the potential impacts on residential properties, including on listed buildings that are within its immediate vicinity. Nevertheless, residual moderate, and therefore significant, impacts arising from the operation of the Scheme, would continue to apply to three of these listed building groups.

The Scheme would not conflict with any legislation, policy or guidance that pertains to cultural heritage.

Table 6.7.1 – Summary of Impacts in relation to Cultural Heritage

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation	Notes / Comments
Construction Impacts					
11718 Roman road from Forden to Caersws	The Roman road bisects the flood compensation pond. 5m of the road would be excavated away for a culvert that links the two halves of the pond	Low	Imperceptible	Negligible	Archaeological excavation to be undertaken at this location
A22 Geophysical Survey: Features 103 and 109 (Possible field boundary)	Road construction would destroy 25m of this feature, severing the surviving portions to the north and south	Medium	Low	Negligible	Archaeological excavation to be undertaken at this location
A20 Geophysical Survey: Feature 88 (Linear anomalies)	This structure would be destroyed by the road embankment and adjacent site compound	High	Medium	Minor	Watching brief to be undertaken during construction
A10 Castell-y-Dail leat	This feature would be partially destroyed by the road embankment	Medium	Medium	Minor	No mitigation proposed
A08 Castell-y-Dail building	This structure would be destroyed by road construction	High	Medium	Minor	Building recording prior to demolition
A05 Castell-y-Dail Quarry	This feature would be destroyed by road construction	High	Medium	Minor	Archaeological recording prior to demolition
A26 Geophysical Survey (Possible trackway)	This feature would be destroyed by road construction.	High	Low	Minor	Watching brief to be undertaken during construction
400768Great Brimmon Enclosure	A significant proportion of this complex of features would be destroyed by road construction and excavation of its cutting	High	Low	Minor	Archaeological excavation to be undertaken at this location
A28 Geophysical Survey Features 40-42 (Field boundaries)	The southerly part of this diffuse group of features would be destroyed by road construction.	High	Medium	Minor	Watching brief to be undertaken during construction
A27 Geophysical Survey Features 43-48 and 51-53 (Possible field system)	The northerly part of this diffuse group of features would be destroyed by road construction.	High	Medium	Minor	Watching brief to be undertaken during construction

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation	Notes / Comments
A16 Geophysical Survey Feature 34 (Probable enclosure)	This feature would be destroyed by road construction and excavation of its cutting	High	Low	Minor	Archaeological excavation to be undertaken at this location
47040 Roman Road from Forden to Caersws (Dyffryn Industrial Estate)	Two discrete sections of the Roman road would be destroyed by road construction, or buried by its embankment. These measure 180m for the main bypass and 50m for the roundabout slip-road.	Medium	Low	Minor	Archaeological excavation to be undertaken at this location
Operational Impacts					
17237, 17238, 17239 Glanhafren Hall and associated buildings	Indirect (visual) impact	Medium	Medium	Moderate	No mitigation proposed (but see Section 6.5.3 for design measures already built into the Scheme)
8194, 8195, 8196 Black Hall Farm, attached range and barn	Indirect (visual) impact	Medium	Medium	Moderate	No mitigation proposed (but see Section 6.5.3 for design measures already built into the Scheme)
8215, 8216 Glan Hafren house and barn	Indirect (visual) impact. Physical intrusion into the farm's traditional curtilage	Medium	Medium	Moderate	No mitigation proposed (but see Section 6.5.3 for design measures already built into the Scheme)

7. Landscape

7.1. Introduction

7.1.1. General

This Chapter describes the assessment of the predicted impact of the Scheme on the landscape character and visual amenity of the study area. It sets out the policy context, the methodology of the assessment and defines the study area through definition of a zone of visual influence (ZVI). This is followed by an assessment of the existing baseline conditions, for both landscape and townscape character and for visual amenity. The impact assessment then considers the nature and scale of predicted impacts arising from the Scheme, potential mitigation measures and the significance of residual impacts. A summary of the impacts is provided in Table 7.6.1 at the end of this chapter.

7.1.2. Policy context

The following polices and plans are concerned with, or make reference to, the landscape and its protection.

Environment Strategy for Wales, 2006

The Environment Strategy for Wales was published in 2006 and outlines the Welsh Assembly Government's long-term strategy for the environment of Wales, for the 20 years up to 2026. It provides a framework within which to achieve an environment, which is clean, healthy, biologically diverse and valued by the people of Wales.

Welsh Office Circulars and National Assembly for Wales Circulars

Welsh Office Circulars and National Assembly for Wales Circulars provide procedural guidance that interprets and explains a particular piece of legislation. The Welsh Office Circulars and National Assembly for Wales Circulars that may be pertinent to the Scheme are as follows:

- WOC 60/96 Planning and the Historic Environment: Archaeology
- WOC 61/96 Planning and the Historic Environment: Historic Buildings and Conservation Areas
- WOC 1/98 Planning and the Historic Environment: Directions by the Secretary of State for Wales
- WOC 11/99 Environmental Impact Assessment (EIA)
- NAWC 31/01 Countryside and Rights of Way Act 2000
- NAWC 23/01 New Guidance for Local Planning Authorities on European Protected Species and Changes in Licensing Procedures

Planning Policy Wales is the Welsh Government's principal statement of national land use policy and was first adopted in March 2002. Planning Policy Wales version 7 was published in July 2014. The first four chapters of the statement introduce the planning system, the principles of planning for sustainability, the plan led system and mechanisms for controlling development. The later chapters (5 to 13) set out policy on all key land use topics, some of which have relevance to the Newtown Bypass, particularly Chapter 5, Conserving and Improving Natural Heritage and the Coast, and Chapter 8, Transport.

Wales Transport Strategy (2008)

A series of route objectives have been established within the Wales Transport Strategy. These are listed under the headings Social, Economy and Environment. Under the last of these are the following objectives, with implications for landscape issues:

Outcome 11: The sustainability of the transport infrastructure. Increase the use of more sustainable materials in our country's transport assets and infrastructure

Outcome 15: The local environment. Reduction in the individual and cumulative impact of transport on communities and the built and natural environment

Outcome 16: Our heritage. The choice and design of transport measures to have a neutral impact, or where appropriate, enhance Wales' natural and built heritage

Outcome 17: Biodiversity. Improve the impact of transport on biodiversity

Powys Adopted Unitary Development Plan 2001-2016 (UDP)

The relevant policies in terms of landscape issues and the Scheme are as follows:

Strategic Policies:

UDP SP 3 – Natural, Historic and Built Heritage

A. In order to safeguard the natural heritage of Powys, development proposals will be expected to take account of the need to protect, conserve and wherever possible enhance sites and features of importance for their aesthetic, amenity, biodiversity, ecological, geological, nature conservation, physio-geographical and scientific value.

B. Proposals for development should seek to protect, conserve and wherever possible enhance sites and features of historic and built heritage importance including those of archaeological, architectural, heritage conservation and historic interest.

Detailed Policies:

ENV2 – Safeguarding the Landscape

Proposals for the development and use of land should take account of the high quality of the landscape throughout Powys and be appropriate and sensitive to the character and surrounding landscape. Where appropriate, account will also need to be taken of the special qualities or reasons for designation of the Brecon Beacons and Snowdonia National Parks. Proposals, which are acceptable in principal should:

1. Contain appropriate measures to ensure satisfactory integration into the landscape;

2. Not unacceptably adversely affect features of importance for nature conservation or amenity; and

3. Not result in significant damage to ancient and semi-natural woodlands and should seek to conserve native woodlands, trees and hedgerows.

ENV8 – Tree Preservation Orders

A. Trees, groups of trees and woodlands of amenity value that make a particular contribution to the landscape or that are noted for their beauty or local rarity will be protected. Proposals for development that unacceptably adversely affect trees that are the subject of a tree preservation order will be refused.
B. Where necessary to maintain the character of a conservation area, trees will be protected. In order to maintain the character of the conservation area, proposals for development that unacceptably adversely affect the trees will be refused.
C. Applications to fell or carry our work on trees, which are the subject of a tree preservation order, will be approved if the work is necessary for public safety or to secure the future of the trees themselves by appropriate management measures.

ENV9 – Woodland Planting

New planting, restocking, natural regeneration and management of existing broad-leaved woodlands in appropriate locations will be encouraged. Proposals for the commercial, recreational or conservation development of broad-leaved or coniferous

Woodland including the planting of appropriate native broadleaved species in existing copses, woodlands, and hedgerows, will be favoured providing that:

1. Proposals are compatible with and properly managed in an integrated fashion with agriculture and other countryside uses and do not adversely affect the viability of farm holdings;

2. Proposals are designed to a high standard and do not adversely affect the quality of the landscape;

3. Wherever possible, existing broad-leaved trees and hedgerows, woods or ancient semi-natural woodlands are retained, protected and incorporated into proposed schemes;

4. Nature conservation areas are protected;

5. Sites of archaeological or historic importance are protected;

6. The integrity of extensive wild, open and undeveloped tracts of land and other upland landscape, which it is important to conserve in its own right, for landscape conservation, nature conservation, recreation or grazing purposes remains unaffected;

7. Water resources and the aquatic environment, including groundwater resources and fisheries, are safeguarded and that adverse impact resulting from the effects of coniferous afforestation on run-off and water quality is avoided, with particular reference to acidification and sedimentation;

8. The proposals include a detailed long term plan for the protection and the management of woodlands, trees and/or hedgerows, including provisions for nature conservation and access for nature conservation, sport and recreation; and

9. Where practical, substantial proportions of broad-leaved trees are included within and around mainly coniferous plantations.

ENV11 – Development in Conservation Areas

1. Proposals for the development within or adjoining a conservation area should be of high quality design and should preserve or enhance the character or appearance of that area. Inappropriate developments that would significantly detract from that character will be opposed.

2. Full applications will be required for development proposals within or adjoining conservation areas.

ENV12 – Permitted Development in Conservation Areas

Where permitted development rights have been removed from certain classes of development in a conservation area by the making of a direction, proposals for development that would, individually or cumulatively, adversely affect the character of the conservation area will be refused.

ENV13 – Demolition in Conservation Areas

Planning permission will only be granted for development involving demolition of an unlisted building in a conservation area where neither the character nor appearance of the area will be harmed. Where necessary a planning condition will be imposed to ensure that a contract has been let for replacement development before any demolition is permitted to take place. Where the structures make a positive contribution to the character or appearance of the conservation area, account will be taken:

1. Whether it is capable of retention or repair for a beneficial use;
2. Whether the proposed replacement, if any would make a similar or greater positive contribution to the preservation or enhancement of the character or appearance of the area;
3. Whether it is necessary for reasons of over-riding public interest, including safety.

ENV 19 – Amenity Open Spaces

Within settlements, proposals for development which would lead to the partial or complete loss of amenity open space identified on the proposals map, will be refused unless alternative open space of equivalent recreational or amenity value to the community and to the setting and character of the settlement can be provided.

DC3 – External Lighting

Proposals involving external lighting will not be permitted where would cause:

1. A nuisance or hazard to highway users;
2. Unacceptable levels of light pollution, especially in the countryside;
3. Harm to the character and appearance of any building or the surrounding environment;
4. Adverse impact on wildlife.

Special consideration will be given to those proposals essential for public safety.

Powys Local Development Plan (LDP)

The Powys Local Development Plan 2011 - 2026 Deposit Draft (July 2014) will, once fully adopted, replace the Powys UDP. The protection of the landscape and consideration of landscape and visual effects of development are covered by the two Development Management Policies (DM1 & 2) with the relevant sections as follows:

Policy DM1 - Strategic Planning Matters

All proposals for development must not compromise, or unacceptably adversely affect, either on their own or in combination with existing or approved development, the following:

11. The characteristics and special qualities of Powys landscape and adjacent protected landscapes (National Parks and Areas of Outstanding Natural Beauty).

Para 4.2.15 describes the criteria for the above as follows:

Powys' landscape is one of its most important assets and is a product of its natural history and geology and the influence of human activity. Maintaining the distinctiveness of Powys' landscape is an important factor in safeguarding the quality of its environment and ensuring the economic well-being of the area. It can help in attracting inward investment and employment opportunities, the tourism industry, and in providing an attractive setting in which local people can live and work. Proposals for development will also be considered against the impacts they might have on the special qualities or the reasons for designation of the adjoining National Parks, and Areas of Outstanding Natural Beauty.

Policy DM2 – Detailed and Site Specific Planning Matters

In addition to the requirements set out in National Guidance, all proposals for development will be permitted where they comply with the following:

3. Proposals shall protect, positively manage and wherever possible enhance biodiversity and geodiversity interests to produce a net gain for the county including the enhanced connectivity of habitats.

4. Proposals shall protect, conserve and wherever possible enhance sites and features of historic and built heritage importance and contribute to preserving local distinctiveness, sense of place and setting.

13. The design, layout size, scale, mass and materials of the development shall complement and where possible enhance the character of the surrounding area and support community safety and crime prevention. Adequate amenity and / or open space shall be provided.

Paras 4.2.24, 25 and 42 describe the criteria for the above as follows:

Biodiversity and Geodiversity. Development proposals should plan positively for biodiversity and geodiversity. For further information refer to the Biodiversity Supplementary Planning Guideline.

Built heritage and local distinctiveness. All development, including proposals for demolition, must have regard to the context or place in which it is proposed. Important built heritage features and characteristics, whether listed or not, that make every place distinct will be protected.

Design. The appearance of a development, its scale and its relationship to its surroundings are key considerations when determining a planning application. Early consideration of design, well in advance of any planning application, is essential to achieving good design. TAN12 provides further guidance.

7.2. Methodology

7.2.1. Study Approach

A Stage 3 (or Detailed level) Landscape assessment was carried out in accordance with, or with reference to, the following guidance and current best practice:

- The Design Manual for Roads and Bridges (DMRB), Volume 10 Environmental Design[7.1]
- DMRB Volume 11 Environmental Assessment, Section 2 Part 5 Landscape Effects[7.2]
- The Guidelines for Landscape and Visual Impact Assessment (GLVIA), Third Edition, 2013[7.3] as published by the Landscape Institute (LI) and Institute of Environmental Management and Assessment (IEMA)
- Interim Advice Note (IAN) 125/09(W) Supplementary guidance for users of DMRB Volume 11 'Environmental Assessment'[7.4]
- IAN 135/10 Landscape and Visual Effects Assessment[7.5] which is currently guidance in England and was adopted in Wales following the preparation of this assessment

Together these documents provide a methodology and process to assess the potential landscape effects arising from the Scheme.

The assessment includes consideration of the following:

- Landscape Character Effects – Impacts on the quality and character of the landscape within the study area, outside the urban boundary

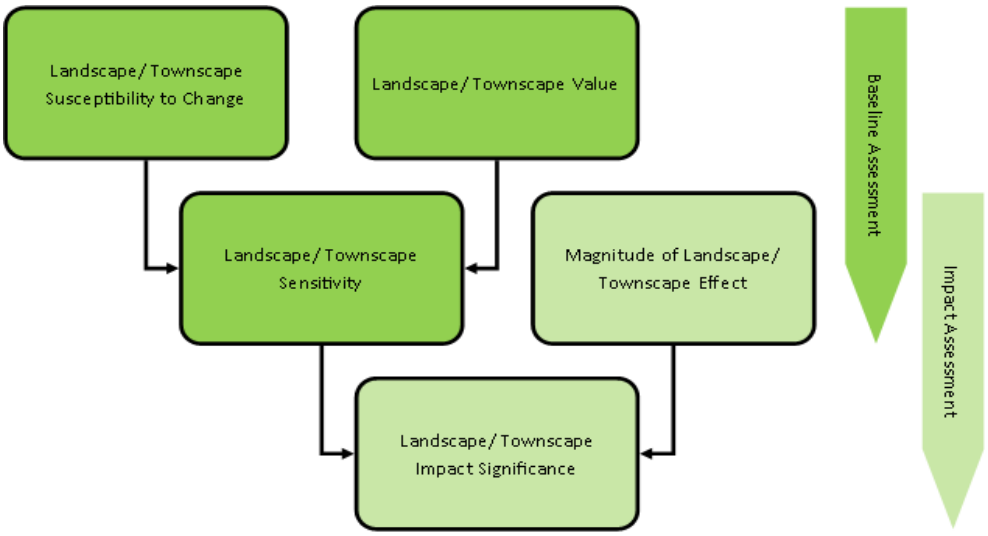
- Townscape Character Effects – Impacts on the quality and character of the townscape within the urban areas of Newtown

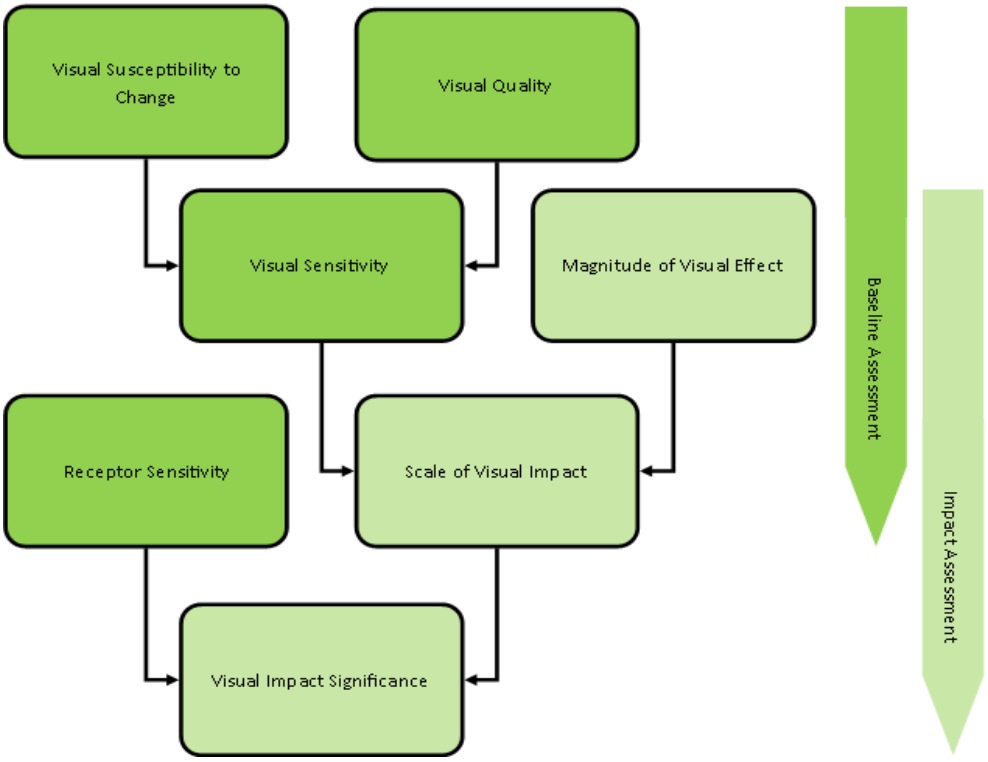
- Visual Effects – Impacts on the visual amenity of identified key views, public rights of way and residential receptors

The assessment was carried out through a combination of field survey and desktop study. Reference was made to the following sources of information:

- A483/A489 Newtown Bypass Key Stage 2 Study – Parsons Brinckerhoff
- All Wales LANDMAP Study

The flowchart below shows the steps employed in the baseline and impact assessment process, for Landscape/Townscape and Visual effects. A detailed explanation of the methodology follows.





7.2.2. Zone of Visual Influence

The study area boundary for landscape effects was established through the definition of a Zone of Visual Influence (ZVI). It was determined that a manual approach to this exercise would be more appropriate than the use of a Digital Terrain Model (DTM) due to both the defined valley form of the study area and the ongoing Scheme development with respect to vertical alignment. The ZVI was achieved through first walking the Scheme centreline and noting the extent of visible area. This boundary was then adjusted to take account of proposed earthworks and structures, as well as a 4m traffic height. The observer height was taken as 1.8m above ground level, in accordance with DMRB. Where the potential viewing distance would be extensive the ZVI boundary reflects a distance limit of potential significance, taking account of prevailing topography and viewing positions relative to the Scheme.

Once established the ZVI was used as the study boundary for the assessment of landscape, townscape and visual impacts. Refer to Volume 2, Figure 7.4.

7.2.3. Landscape/Townscape Baseline

The landscape baseline was based initially on data from the LANDMAP Information System published by Countryside Council for Wales (now Natural Resources Wales (NRW)). The LANDMAP process uses Geographical Information Systems (GIS) to store and manage data collected on five evaluated aspect topic layers; Geological Landscapes, Landscape Habitats, , Historic Landscapes, Cultural Landscapes and Visual & Sensory . For each of these topic layers the landscape is evaluated and divided into geographical units known as aspect areas. A data set is developed for each area that describes, classifies and evaluates its quality based upon an all-Wales set of criteria.

The Visual & Sensory aspect describes the topography, land cover and form of the landscape, along with an assessment of its visual quality and sensory characteristics. These elements are those that contribute most directly to an area's landscape and visual character and therefore it is those which most informed the definition of landscape character areas within the study area boundary.

As with the Key Stage 2 study the LANDMAP Visual & Sensory aspect areas were taken as the starting point and modified in reference to the other LANDMAP aspects. The character areas were then subdivided to a suitable scale to allow appropriate assessment of landscape effects arising from the Scheme. The resulting landscape character areas are distinguished through their physical and perceptual qualities, including topography, aspect, land cover, exposure and visual context. Refer to Volume 2, Figure 7.5 and 7.6.

In a similar manner the urban area of Newtown were subdivided into areas of similar characteristics, which act together to create a particular urban character, sense of place, identity and pattern of built form. These areas are based on those defined in the Key Stage 2 Study, reviewed to reflect interim changes and adjusted where necessary to provide an appropriate scale for the Scheme assessment. Refer to Volume 2, Figure 7.7 and 7.8.

Each landscape and townscape character area is described and then assigned two key measures. The first is its Susceptibility to Change, in particular its capacity to accommodate change arising from the type of scheme development proposed without undue consequences for the maintenance of the baseline situation. This is described using a three point scale, as Table 7.2.1 below:

Table 7.2.1 – Landscape/ Townscape Susceptibility to Change

LOW	Effects from the type of scheme proposed can be accommodated with only a minor, or no, change to the baseline landscape/ townscape character
MEDIUM	Effects from the type of scheme proposed are likely to lead to a moderate change in the baseline landscape/ townscape character
HIGH	Effects from the type of scheme proposed are likely to cause a major change to the baseline landscape/ townscape character

The second measure to be assigned is Value. As there are no formally designated landscapes within the study area this was determined through the particular elements contributing to landscape character, and with reference to the LANDMAP data. As recommended by DMRB a five point scale was employed, with separate criteria for Landscape and Townscape, as follows:

Table 7.2.2 – Landscape/ Townscape Value

	Landscape	Townscape
EXCEPTIONAL	Strong landscape structure; A harmonious combination of complementing components; Distinct landscape characteristics, identity or patterns; Landmark features worthy of retention; Strong positive sense of place; No detractive elements	Architecturally unique/landmark features worthy of retention; Locally distinctive/use of local materials; High build quality; High historic value; Distinct local character, identity or patterns; Positive impact on wider context; Excellent condition; No detractive elements
VERY GOOD	Strong landscape structure; Composed of generally harmonious components; Distinct landscape characteristics, identity or patterns; Identifiable features worthy of retention; Occasional or minor detractive elements	Identifiable features worthy of retention; Locally distinctive/use of local materials; Good build quality; Some historic value; Distinct local character, identity or patterns; No negative impact on wider context; Very good condition; Occasional detractive elements
GOOD	Distinguishable landscape structure; Comprised of generally complementing components; Identifiable landscape characteristics, identity or patterns; Some detractive elements	Appropriate architectural style/ materials; Average build quality; No historic value; Identifiable character, identity or patterns; Good condition; Some detractive elements
ORDINARY	Weak landscape structure, including some complementing components; Remnant or weak indication of landscape characteristics, identity or patterns; No identifiable features worthy of retention; Frequent detracting elements	Inappropriate architectural style/ materials; Low build quality; Weak character, identity or patterns; Reasonable condition; Frequent detractive elements
POOR	Degraded or damaged landscape structure; No complementing components; No identifiable landscape characteristics, identity or patterns; Extensive detracting elements	Detractive architectural style/ materials; Poor build quality; Degraded/damaged character, identity or patterns; Poor condition; Extensive detractive elements; Negative impact on wider context

The Susceptibility to Change and Value measures were then combined using the matrix below to provide a measure of Sensitivity for each Landscape or Townscape Character Area.

Table 7.2.3 – Landscape/ Townscape Sensitivity

Susceptibility to Change		VALUE				
		EXCEPTIONAL	**VERY GOOD**	**GOOD**	**ORDINARY**	**POOR**
	HIGH	High	High	Medium	Medium	Low
	MEDIUM	High	Medium	Medium	Low	Low
	LOW	Medium	Medium	Low	Low	None

7.2.4. Visual Baseline

The establishment of a visual baseline followed a similar process, but based on a series of selected views, under the following categories:

- **Representative views**: illustrating typical views from public locations
- **Valued views**: views which are noted as valued by the public, such as known viewpoints, visitor attractions and popular leisure destinations
- **Linear views:** representing views seen from routes including roads, railways, public footpaths and bridleways.

A number of views were selected to provide an appropriate coverage and a range of view types and distances from the Scheme. The locations of these views are illustrated on Volume 2, Figure 7.9.

Each view is described, in both its winter and summer forms, and identifying key elements, patterns, character, night-time appearance and degrees of movement. Each is then assigned two measures. As with the landscape baseline the first is Susceptibility to Change, meaning the degree to which a view is able to accept the change likely to arise from the type of scheme proposed without its particular qualities and characteristics being altered. As before a three point scale is applied, as follows:

Table 7.2.4 – Visual Susceptibility to Change

LOW	Effects from the type of scheme proposed can be accommodated with only a minor, or no, change to the baseline view
MEDIUM	Effects from the type of scheme proposed can be accommodated with only a minor, or no, change to the baseline view
HIGH	Effects from the type of scheme proposed are likely to cause a major change to the baseline view

The second measure to be established for each view is Quality. A five point scale is applied, describing the visual quality of each view, as follows:

Table 7.2.5 – Visual Quality

VERY ATTRACTIVE	The view is comprised of harmonious elements, in a balanced composition, with a degree of visual interest or contrast and no significant detracting elements.
ATTRACTIVE	The view is comprised of harmonious elements, in a balanced composition, with very few detracting elements.
MODERATE	The view is mainly comprised of harmonious elements, with some detracting components.
POOR	The view is comprised of unrelated elements with little composition, and a number of detracting factors.
VERY POOR	The view is dominated by discordant and detracting elements.

The measures of Susceptibility to Change and Quality are then combined in accordance with the following matrix to provide an assessment of Sensitivity for each view.

Table 7.2.6 – Visual Sensitivity

Susceptibility to Change		**QUALITY**				
		VERY ATTRACTIVE	**ATTRACTIVE**	**MODERATE**	**POOR**	**VERY POOR**
	HIGH	High	High	Medium	Medium	Low
	MEDIUM	High	Medium	Medium	Low	Low
	LOW	Medium	Medium	Low	Low	None

In addition the range of likely visual receptors for each view is identified, with reference to their activity and therefore their own sensitivity to change. This is included in the impact assessment to reflect the significance of changes to different people.

7.2.5. Affected Properties

The assessment of effects on residential properties is carried out separately. For the baseline condition a list of Affected Properties has been developed, with properties grouped together where appropriate. Each property or group is described in terms of its location, distance from the Scheme, and the nature and quality of the current visual amenity.

This information is presented in tabular form as the Visual Impact Schedule (VIS) and illustrated on Visual Impact Drawings (VID), Volume 2, and Figure 7.11.

7.2.6. Landscape and Townscape Impact Assessment

For landscape, townscape and visual effects the impact assessment is derived from identifying a Magnitude of Effect affecting each character area or view. This Magnitude measure for landscape effects takes account of scale, extent and reversibility, and uses a four point scale defined as follows, being either adverse or beneficial:

Table 7.2.7 – Magnitude of Landscape/ Townscape Effect

SUBSTANTIAL	Total loss or major alteration of/ enhancement to key elements, features or characteristics of the landscape/ townscape.
MODERATE	Partial loss of or alteration or partial enhancement to one or more key elements / features / characteristics of the landscape/townscape.
SLIGHT	Minor loss of or alteration or enhancement, or short-term major change, to one or more key elements / features / characteristics of the landscape/townscape.
NEGLIGIBLE/ NO CHANGE	No loss or alteration, to one or more key elements / features / characteristics of the landscape/townscape and / or no introduction of new elements / features / characteristics.

The Sensitivity measure is then cross-referenced with the Magnitude of Effect for each Landscape and Townscape Character Area to give an Impact Significance, based on a five point scale as below and either adverse or beneficial. The 'negligible/ no change' level of the magnitude scale is not included for significance evaluation as it would not constitute an impact, and would therefore not have any significance.

Table 7.2.8 – Landscape/ Townscape Impact Significance

		Landscape/ Townscape Sensitivity		
		HIGH	**MEDIUM**	**LOW**
Scale of Magnitude	**SUBSTANTIAL**	Substantial	Major	Moderate
	MODERATE	Major	Moderate	Minor
	SLIGHT	Moderate	Minor	Not Significant

This process is carried out for each of the following stages, with the assessed Magnitude of Effect adjusted as appropriate:

- Construction Phase - taking account of likely construction operations and effects
- Year 1 following completion - completed Scheme but with no effective landscape mitigation from planting
- Year 15 (Winter) - established mitigation without leaf cover
- Year 15 (Summer) - established mitigation in leaf

7.2.7. Visual Impact Assessment

For visual impact the process is very similar, combining the Visual Sensitivity measure with the Magnitude of Effect for each view, and doing so for each of the four Scheme stages described above. The Magnitude of Effect criteria are as follows and either adverse or beneficial:

Table 7.2.9 – Magnitude of Visual Effect

SUBSTANTIAL	Proposals form a significant and immediately apparent part of the view that significantly adversely / beneficially affects its overall character.
MODERATE	Proposals form a visible and recognisable new adverse or beneficial element within the overall scene and may be readily noticed by the observer or receptor, having an effect on the character of the view.
SLIGHT	Proposals constitute only a minor component of the view, which could be missed by the casual observer or receptor, beneficial or adverse, having little effect on the nature of the view.
NEGLIGIBLE/NO CHANGE	No part of the development, or traffic associated with it, is discernible or is at such a distance that it is scarcely apparent.

The Magnitude of Visual Effect is then combined with Sensitivity, to provide a Scale of Visual Impact, as Table 7.2.10. This is then subject to a further step to identify Significance. Here the different sensitivities of visual receptors are taken into account, thereby recognising that people are more or less sensitive to change depending on their activity. For example residents or people appreciating the visual context of the landscape for recreation are of a high level of sensitivity, road users would be of medium sensitivity and people working in the landscape would be of low sensitivity. The Receptor Sensitivity and Scale of Visual Impact values are combined as Table 7.2.11 to give the Visual Impact Significance. It should be noted that the 'Not Significant' category is not carried forward to this stage.

Table 7.2.10 – Scale of Visual Impact

		Visual Sensitivity		
		HIGH	**MEDIUM**	**LOW**
Scale of Magnitude	**SUBSTANTIAL**	Substantial	Major	Moderate
	MODERATE	Major	Moderate	Minor
	SLIGHT	Moderate	Minor	Not Significant

Table 7.2.11 – Visual Impact Significance

		Scale of Visual Impact			
		SUBSTANTIAL	**MAJOR**	**MODERATE**	**MINOR**
Receptor Sensitivity	**HIGH**	Substantial	Substantial	Major	Moderate
	MEDIUM	Substantial	Major	Moderate	Minor
	LOW	Major	Moderate	Minor	Not Significant

As for the landscape assessment the visual impact assessment process is carried out for the Scheme's visual impact at relevant stages: during construction; Year 1 after completion, Year 15 (Winter) and Year 15 (Summer).

7.2.8. Visual Impact on Affected Properties

The Visual Impact Schedules (VIS) established in the baseline stage is completed with an evaluation of how the visual amenity of each property would be affected by the Scheme. This is also illustrated on the Visual Impact Drawings (VID) showing the degree of visual impact at Year 1 after completion, Year 15 (Winter) and Year 15 (Summer), Refer to Volume 2, Figures 7.11a-b.

The visual change for properties is categorised as follows, being either adverse or beneficial in each case:

Table 7.2.12 – Degree of Visual Impact on Affected Properties

SUBSTANTIAL	Where the Scheme would cause a significant deterioration (or improvement) in the existing view.
MODERATE	Where the Scheme would cause a noticeable deterioration (or improvement) in the existing view.
SLIGHT	Where the Scheme would cause a barely perceptible deterioration (or improvement) in the existing view.
NEGLIGIBLE/ NO CHANGE	No discernible deterioration (or improvement) in the existing view.

7.2.9. Limitations and assumptions

The assessment of the Zone of Visual Influence of the Scheme is influenced on occasions by weather conditions and the resulting changes in visibility. However this is overcome by repeated assessments in differing conditions and seasons.

Similarly illustrative photographs of character and key views are subject to variance of light, shadows, visibility and vegetation. However this in itself illustrates the dynamic nature of the landscape and visual character. The provision of both winter and summer photographs for the key views further illustrate the changing nature. The baseline assessment of character and key views was carried out in the field and is not dependant on photographs.

For the establishment of the ZVI the observer height was taken as 1.8m above ground level, in accordance with DMRB, and for impact assessment the maximum traffic height was assumed as 4m above road level.

7.3. Baseline Conditions

7.3.1. Landscape Structure

The landscape of Newtown and its surrounding area is largely defined by a broad river valley form but includes a variety of landscape types and elements, such as urban settlement, agricultural field patterns, woodland, hedgerows and the River Severn. Linear features in the form of transport corridors, both highway and railway, cut through the landscape. Refer to Volume 2 Figures 7.1 and 7.2a-b.

In general terms the study area topography follows a valley pattern, but with subtly undulating valley slopes and minor side valleys providing a finer grain. Land cover is also quite varied with agricultural functions such as grazing and arable use, and woodland blocks and copses. Field boundaries range from substantial tree lined hedgerows to post and wire fences. Refer to Volume 2, Figures 7.3a-d.

Properties reflect the mixed urban and rural character with both dense town development and fine individual properties in the open landscape. Refer to Townscape Section 7.3.5 and Appendix D.2.

The historic context of the study area landscape and townscape is set out in Section 6.3.2 of the Cultural Heritage chapter, whilst the habitat context is set out in the Nature Conservation chapter, in Sections 8.3.2 and 8.3.3.

The existing landscape components can be described as follows:

Land Use Types

- Farming: Predominantly grazing/ pastureland
Some arable
- Settlement: Dense development in Newtown
Dispersed settlement of houses and individual farms
- Industry: Concentrated industrial estates – Mochdre and Vastre

Woodlands and Plantations

- Correspond to valley watercourses
- Some coniferous plantation but predominantly mixed broadleaf
- Mochdre Dingles SSSI to south-west
- Penstrowed Quarry SSSI to west

Field Systems, Hedges and Trees

- Predominantly mature, managed hedgerows
- Regular, medium scale field pattern, some larger to south-east
- Good hedgerow and tree cover
- Veteran trees with historic and cultural value within the landscape

Rivers, Watercourses and Water Bodies

- River Severn, Britain's longest river, cuts through Newtown centre on east-west alignment with several watercourses feeding into it
- Drains associated with farming
- No significant water bodies
- Montgomery Canal east of Newtown

Roads, Footpaths, Rights of Way

- Numerous PROWs including the Severn Way, one of the longest waymarked walking trails in Britain
- A483/A489 – main routes through Newtown
- B4568 follows river valley bottom on north side of river
- Railway as above, on south side of river
- Network of narrow lanes, some very steep and generally in good condition with high hedges

Settlements, Buildings, Farms

- Kerry, to the south-east, is the nearest substantial settlement, with Caersws to the west
- Aberhafesp to the west and Stepaside to the south-west are moderate housing developments but with no supporting facilities
- Numerous dispersed farm settlements
- Glandulas Holiday Home Park at western edge of Newtown
- Dominant traditional materials are stone and brick but recent development is eroding the rural character and individuality, which is strong in the historic centre of Newtown. Surrounding industrial estates comprise large buildings with extensive visible roof areas. Farmhouses and outbuildings are generally in good condition, with some converted into dwellings.

Landscape Characteristics

- Contrast between open valley of River Severn and enclosing surrounding topography
- Open rural setting in close proximity to Newtown

7.3.2. Zone of Visual Influence

A Zone of Visual Influence (ZVI), representing the limit of visibility, was established for the Scheme through a combination of site assessment and desk-study. Refer to Volume 2, Figure 7.4.

The ZVI is largely defined by the strong valley topography, with the northern and southern boundaries following the upper edge of the valley sides. The location of the Scheme along the southern valley side, and the intervening slope profile, results in sections of the urban area being outside the ZVI. The eastern and western ZVI boundaries result from the Scheme tie-ins to existing levels and the flat valley floor.

For the remainder of the landscape effects baseline and impact assessment the ZVI boundary provides the study area.

7.3.3. Landscape Designations/ Studies

No formal landscape designations apply to the study area. Other forms of designation within the study area boundary are as follows:

- Newtown Conservation Area
- Penstrowed Quarry Site of Special Scientific Interest (SSSI)
- Mochdre Dingles SSSI
- Montgomery Canal SSSI and Special Area of Conservation

A landscape assessment study has been carried out using the LANDMAP Information System published by CCW (now NRW). The LANDMAP process uses Geographical Information Systems (GIS) to store and manage data collected on five evaluated aspect topic layers:-

- Geological Landscapes
- Landscape Habitats
- Historic Landscapes
- Cultural Landscapes
- Visual and Sensory Landscapes

For each of these topic layers the landscape is evaluated and divided into geographical units known as aspect areas. A data set is developed for each area that describes, classifies and evaluates its quality based upon an all-Wales set of criteria.

The Visual & Sensory aspect describes the topography, land cover and form of the landscape, along with an assessment of its visual quality and sensory characteristics. These elements are those that contribute most directly to an area's landscape and visual character.

The Visual and Sensory Aspect Areas within the site boundary are: MNTGM-VS212, VS254, VS465, VS541, VS650, VS865, VS899 and VS946. Refer to Volume 2, Figure 4.1c. The following provides a summary of each of these V&S areas, with full detail set out for all five aspects and the areas which coincide with each of the landscape character areas set out in Appendix D.1.

VS212 Llandinam Hill and Scarp Mosaic

- Mosaic farmland character with wooded stream courses.
- A network of small field parcels within strongly defined hedgerow with tree boundaries. Mixed deciduous woodland lines many of the watercourses running down slope and creates a distinct visual identity for the area.
- Scenic Quality = High
- Overall Evaluation = High. The aspect displays a fine example of the small wooded and mosaic field pattern that is an integral part of Montgomeryshire's landscape character in the eastern and central areas.

VS254 Kerry Ridgeway

- Open upland grazing character with pockets of mixed woodland associated with watercourses.
- An open and broad expanse of upland grazing with dominant open skies and wind exposure. Occasional attractive views over Church Stoke farmland and rolling lowland farmland to the north and dramatic upland grazing views to the south. The ridgeway is a continuation of the ridgeway that forms the southern boundary of Montgomeryshire District and of the historic drovers' route leading to Bishops Castle.
- Scenic Quality = High
- Overall Evaluation = High

VS465 Stepaside

- Dispersed settlement.
- Dispersed outer settlement of Newtown, no centre and amenities. Relatively modern development, uniform, generally single storey and bungalow development with little reference to local vernacular detailing/traditional building materials. Strong visual link with Newtown.

- Scenic Quality = Low
- Overall Evaluation = Moderate. No distinct focus but no specific detractors.

VS541 Newtown

- Urban.
- Thriving market/commercial town lying within the River Severn flood plain with which it has a strong visual, functional and physical link. Close relationship with the river which flows through the centre of the town. Principal commercial and business development within Montgomeryshire.
- Scenic Quality = Moderate
- Overall Evaluation = Low. The original market town character has been degraded by bland characterless modern housing and industrial developments.

VS650 River Severn Flood Plain

- Flat, open lowland farmland.
- A significant, open valley/vale with a patchwork of medium to large field parcels, many displaying established field boundaries of managed and overgrown hedgerows with numerous hedgerow trees. Predominantly arable with some lowland dairy farming.
- Scenic Quality = Moderate
- Overall Evaluation = Moderate. Small areas within the aspect as a whole display some outstanding qualities, however this is lessened by association with urban areas and busy road.

VS865 Caersws River Bowl

- Flat, open lowland farmland.
- An extensive area of lowland agricultural land and the upper level of the River Severn (Afon Hafren) valley, enclosed by a ring of higher ground giving 360 degree views of upland encircling the viewer. The area is formed by the meeting of three valleys. Unusual topographical feature of an expansive open area “bowl” surrounded by higher ground.
- Scenic Quality = Moderate
- Overall Evaluation = Moderate. Unusual topography but not a particularly significant aesthetic or scenic quality – an area that is travelled through rather than a destination.

VS899 Tregynon Rolling Hills

- Hillside and scarp slopes mosaic.
- An extensive area of rolling hillsides and pasture land with gently sloping sides and rounded tops. Views across the area are generally from a succession of rolling ridges and due to the size of the area long distance views are limited/insignificant.
- Scenic Quality = High
- Overall Evaluation = High. An extensive area of well-defined traditional farming landscape, high aesthetic qualities with well-defined field boundaries and wooded areas and limited intrusion by modern development.

VS946 Llandyssil Hill and Scarp Grazing

- Hillside and scarp slopes grazing.
- An area of rolling upland grazing centred on an intricate patchwork of small field parcels bounded by treed hedgerows. The majority of the area is of a more open nature with larger grazed and cultivated fields and dispersed settlements/farmsteads.
- Scenic Quality = High
- Overall Evaluation = Moderate. Typical example of mixed arable and livestock farming that is evident throughout the study area. Displays an extensive patchwork of small to medium-sized fields that are good examples of this aspect type but are suffering from some loss of character.

From the initial Visual & Sensory aspect areas the boundaries were adjusted in response to the other Landmap aspects. Each of the Landscape Habitats, Geological and Historic aspects

resulted in adjusted boundaries, whilst the Cultural aspect had no effect on the area boundaries. Refer to Volume 2, Figure 4.1 illustrates each of the five aspect areas in combination with the final landscape character areas.

7.3.4. Landscape Character Assessment

From a combination of the LANDMAP aspect areas, under each topic, and site assessment thirteen landscape character areas were defined, representing areas of like type and characteristics. These character areas are illustrated in Volume 2, Figure 7.5.

Each character area is described below and assigned measures of Susceptibility to Change and Landscape Value in accordance with Tables 7.2.1 and 7.2.2. In turn this provides a measure of Landscape Sensitivity, as set out in Table 7.2.3. Photographs supporting the assessment can be found in Volume 2 Figures 7.6a-c.

1. Northern Rolling Hills / Slope

A mixed pattern of agricultural fields, managed hedgerows, small woodland copses and scattered farm settlements and isolated properties. An undulating landform with incised stream valleys and a regular network of minor roads. Field sizes range from small to medium. A mix of property types and ages, often in small clusters. Views dependant on topography and outlook, particularly where the wider context is apparent. Fields grazed by sheep and cattle.

Susceptibility to Change:	Medium
Landscape Value:	Very Good
Landscape Sensitivity:	Medium

2. Northern Scarp Slope

A distinctive steep slope providing a backdrop to Newtown - medium/large grazed fields with managed hedgerow boundaries. Telecommunication masts associated with a farm (type house) mark the ridgeline before the land falls to the north. Important relationship with urban edge, where an abrupt edge is defined through land cover and the steep slope.

Susceptibility to Change:	High
Landscape Value:	Very Good
Landscape Sensitivity:	High

3. Eastern River Corridor

An attractive river corridor with generally wooded banks, becoming more open to the east. Linear hedgerows reflect the river banks with a cycle route on the northern side. Flat floodplain areas vary in width, characterised by relatively large fields and rough grassland. Open pastureland lies between the river and A483 with other land cover including a vineyard and water treatment works.

Susceptibility to Change:	Medium
Landscape Value:	Good
Landscape Sensitivity:	Medium

4. *Llanllwchaiarn*

Primarily modern settlement of detached houses set on valley slopes overlooking the Severn. An attractive church and cemetery in association with older dwellings, with woodland trees providing more cover to the lower areas and beyond the upper northern boundary. South-facing slope aspect an important component of the landscape character.

Susceptibility to Change:	Medium
Landscape Value:	Good
Landscape Sensitivity:	Medium

5. Valley Mouth

Fairly complex landscape in terms of topography, comprised of a narrow stream valley opening out to the west, adjoining the larger east-west Severn valley. Sense of separation from the wider landscape although land cover fairly typical with grazed fields and wooded boundaries. Some large individual trees.

Susceptibility to Change:	Medium
Landscape Value:	Good
Landscape Sensitivity:	Medium

6. Enclosed Valley

A small narrow east/west valley with the edge of Newtown development on its northern edge. Attractive grazed fields and hedgerow boundaries. Sense of enclosure and separation from the wider landscape. Dominated by farm settlements.

Susceptibility to Change:	High
Landscape Value:	Very Good
Landscape Sensitivity:	High

7. Plateau

Distinctive relatively level plateau set between two steep, north-facing valley slopes. Fairly large grazed fields with a number of farms. Crossed by the A489 and a minor road at Tyn-y-Green. Character influenced by the backdrop of steep slopes to the south.

Susceptibility to Change:	High
Landscape Value:	Very Good
Landscape Sensitivity:	High

8. Undulating Slopes

A complex of small valleys and rises with a distinctive character. Mature trees, woodland blocks and hedgerows create field boundaries, often associated with streams. Large farm units dominating field pattern, with the elevated farm buildings of Bryneira central to the area.

Susceptibility to Change:	High
Landscape Value:	Very Good
Landscape Sensitivity:	High

9. Confluence

A very complex junction of two valley forms meeting a scarp slope. Combination of rural field patterns and urban influence of adjacent industrial and residential development. Dominated by its topography with steep slopes and abrupt changes in level. Valley floor is mainly grassland with horse and sheep grazed upper slopes. Suburban houses and gardens ranged along scarp slope. Very strong sense of place.

Susceptibility to Change:	Medium
Landscape Value:	Good
Landscape Sensitivity:	Medium

10. South Western Valley Slopes

Undulating large scale north facing valley slopes with a mixed pattern of woodland and field cover. Numerous individual and clustered properties amongst the varying topography and cover. Fairly abrupt junction between the valley slope and the largely level river corridor.

Susceptibility to Change:	High
Landscape Value:	Very Good
Landscape Sensitivity:	High

11. Southern Scarp Slope

Very distinctive, abrupt landscape form, with a steep scarp slope forming the upper valley side. Generally large and open grazed fields but with some deciduous woodland cover. Extensive views to the north from this area and influences the character of Newtown below providing the southern context. Individual scattered trees throughout with dispersed properties and farm buildings.

Susceptibility to Change:	High
Landscape Value:	Exceptional
Landscape Sensitivity:	High

12. South Eastern Valley Slopes

A mosaic of grazed fields and woodland copses, characterised by a mixed topography, generally forming north facing valley sides, with scattered trees.

Susceptibility to Change:	Medium
Landscape Value:	Very Good
Landscape Sensitivity:	Medium

13. Western River Corridor

Relatively large fields either side of the River Severn corridor, with mixed bankside trees and scrub vegetation. The river itself gently meanders through the valley floor with some steeply incised banks.

Susceptibility to Change:	High
Landscape Value:	Very Good
Landscape Sensitivity:	High

Table 7.3.1 below summarises the resulting Landscape Sensitivity assessments, which will be taken forward to the Landscape Impact Assessment.

Table 7.3.1 – Landscape Character Area Sensitivity

Landscape Character Area	Landscape Sensitivity			
	High	Medium	Low	None
1 Northern Rolling Hills/Slopes		●		
2 Northern Scarp Slope	●			
3 Eastern River Corridor		●		
4 Llanllwchaiarn		●		
5 Valley Mouth		●		
6 Enclosed Valley	●			
7 Plateau	●			
8 Undulating Slopes	●			
9 Confluence		●		
10 South Western Valley Slopes	●			
11 South Scarp Slope	●			
12 South Eastern Valley Slopes		●		
13 Western River Corridor	●			

From this it can be seen that the landscape of the study area is in the upper range of sensitivity to the type of changes proposed by the Scheme. This is a result of the strongly rural character of the landscapes and the generally harmonious range of contributing elements.

7.3.5. Townscape Character Assessment

Newtown is situated in the Upper Severn Valley at a bridging point on the Severn. It was protected by a motte and bailey fortification with defensive banks extending to the north and east to meet the river and for 500 years the town remained within these boundaries. The town's relationship with surrounding hill farms led to its importance in the hand-loom manufacture of flannel in the 18th century. Mechanisation led to the town's population decline from the mid-19th century but the efforts of the Development Board for Rural Wales have led to more recent prosperity.

The core of the old town sits within a broad loop of the River Severn and was subject to severe damage at times of flood. The network of streets surrounding this area retains much of the original market town character. Two major floods in the 1960s led to the old town being protected with a major flood prevention scheme. The area was made a new town under the 1965 New Towns Act.

In 1968 there were plans to double the size of the town and large new housing estates were established at Trehafren, Treowen and Vaynor. Light industrial development is situated at Dyffryn, Vastre and Mochdre industrial estates (the latter was extended in 1980s/90s) and now the town provides the principal commercial and business development within Montgomeryshire.

Newtown has an east-west alignment along the river, with the main road and railway line running parallel to the south. The predominantly east-west traffic flow bypasses the centre of the town, leaving the casual visitor with little idea of the centre's historic character. The designation as a new town and subsequent development has degraded this character. Modern housing materials and industrial developments make little reference to the original red brick/Victorian/market town character of the town centre and there is little distinctiveness in modern/infill development.

Newtown's historic core has two Conservation Areas, one in the town centre itself and the other on the north side of the river, in the Penygloddfa area. There are 206 listed buildings within the study area, predominantly in the historic town centre but seven of them are in close proximity to the Scheme. Refer to Volume 2, Figure 7.7.

The existing townscape components can be described as follows:

Land Use Types

- Retail — Shopping areas in centre of town
  Supermarket developments east and west of town centre
- Residential — Newtown centre surrounded by residential development
- Industry — Industrial estates to east south and west of town edges
- Education — Primary schools around outer edge of town centre
  Newtown High School on southern town edge
  Coleg Powys to western town edge
- Historic Core — Consists of superior historic buildings of specific local character

Communication Corridors

- Roads — A483/A489 – main east-west route through Newtown
  A483 and A489 – routes leading to the south
- Footpaths — Riverside access in town centre
- Railway — Station to south of town centre

Rivers, Watercourses and Water Bodies

- River Severn — Flows through historic town centre
  Open, green corridor has a strong influence on surrounding character

Townscape Characteristics

- Contrast between historic town centre and surrounding residential development
- Open rural setting to Newtown
- East-west linear orientation due to valley form, river corridor, road and rail network

From site assessment thirty three townscape character areas were identified, of like type and character. The entire urban area is covered by the townscape character areas, although some lie outside the defined ZVI. However all are include for completeness. Volume 2, Figure 7.7 indicates the townscape character areas, with illustrative photographs on Figures 7.8a to e.

For the detailed results of the Townscape baseline assessment refer to Volume 3, Appendix D.2.

However Table 7.3.2 below summarises the resulting Townscape Sensitivity assessments, which will be taken forward to the Townscape Impact Assessment.

Table 7.3.2 – Townscape Character Area Sensitivity

	Townscape Sensitivity			
Townscape Character Area	**High**	**Medium**	**Low**	**None**
1 North Longbridge	●			
2 Bryn Lane & Infirmary		●		
3 Milford Road		●		
4 Dolerw Park	●			
5 Resr and Football Ground		●		
6 Civic Offices		●		
7 Old Town Centre	●			
8 Central River Corridor		●		
9 Eastern River Corridor	●			
10 Station and Pryce Buildings	●			
11 Canal Road-Sycamore Drive			●	
12 Canal Road Terrace	●			
13 New Housing Development			●	

14 Dyffryn Industrial Estate				●
15 Cemetery, Sports Ground		●		
16 Vastre Industrial Estate				●
17 Pool Road – West			●	
18 Heol Treowen Estate			●	
19 Heol Treowen – West			●	
20 Newtown High School and			●	
21 Garth Owen Estate		●		
22 Maesyrhandir Estate			●	
23 Heol Vaynor Estate		●		
24 Dolerw Park – West		●		
25 Powys College			●	
26 Mochdre Industrial Estate			●	
27 Glandulas Drive		●		
28 Maesyrhandir Green		●		
29 New Road – East		●		
30 New Road – West		●		
31 A489			●	
32 Milford			●	
33 Lon Cerddyn Estate			●	

This assessment indicates a mixed pattern of sensitivity within the Townscape Character Areas to the type of development proposed.

7.3.6. Visual Baseline Assessment

The study area is characterised by its generally high visual quality, resulting from a diversity of attractive landscape and urban features.

The town enjoys an attractive rural backdrop to views. It is these views that give Newtown its distinctive sense of place. The quality of the views from within the town is affected by the local development, with older areas being more responsive to the topography. Although much of the recent development has been higher up the valley sides, the layout and density already affects available views, generally restricting them to edge properties or glimpses through gaps between properties.

Beyond the urban edge views tend to be long and/or panoramic, as a result of the broad valley topography. The rural context characterises views, whilst the town and river corridor provide a focus.

A number of key views have been selected as representative of typical or important views within the study area, as a baseline against which to assess the potential visual impact of the Scheme.

The locations of key views are indicated on Volume 2, Figure 7.9 and illustrated in photographs shown in Volume 2, Figures 7.10a to w.

The key views are described below, along with a measure of their Susceptibility to Change and Visual Quality, in accordance with Tables 7.2.4 and 7.2.5. From this the Visual Sensitivity is derived and also indicated, as Table 7.2.6, along with the relevant visual receptors for each view. This information will then be taken forward to the Visual Impact Assessment.

1. View from Pen-y-shwa Lane to the south (Volume 2, Figure 7.10a)

A particularly attractive view across the broad valley including varying topography but with a harmonious field/hedgerow pattern. Newtown is just visible but is not detrimental to the view. There is a strong sense of place and the high proportion of broadleaf vegetation adds seasonal variation. From this distance artificial lighting in the town has little night-time impact providing only a glow.

Susceptibility to Change:	High
Visual Quality:	Attractive
Visual Sensitivity:	High
Receptors:	Residents, Walkers

2. *View from the Severn Way and bridleway L4A (253/L4a), west of Bryn House (Figure Volume 2, 7.10b)*

The view is across improved agricultural fields towards Newtown and to the Southern Scarp Slope beyond. There are well maintained hedgerow boundaries with mature trees. The fragmented edge of Newtown reduces its visual impact on long views and its position within the valley means that attention is drawn to the hills beyond. Large scale roof lines of industrial estate buildings are clearly visible to the south west and are very detractive in aesthetic and scale. Regular field patterns give a harmonious feel to the view, with a quite strong sense of place. At night there is little lighting apparent, mainly concentrated in the visible Mochdre Industrial Estate and adjacent housing.

Susceptibility to Change:	High
Visual Quality:	Very Attractive
Visual Sensitivity:	High
Receptors:	Walkers

3. *View from PROW FP3 (253/L3)east of Bryn House (Volume 2, Figure 7.10c)*

A dramatic view from the steep hill adjacent to the town's northern edge, looking across to the southern valley slopes, and including a panoramic view of the urban core. An attractive view clearly showing the town in its rural setting as well as many of the more attractive grouped and individual buildings. The field patterns and woodland blocks characterise the valley sides, and visually link to the viewing position. Some of the larger industrial buildings introduce minor detractive elements. The night-time view includes extensive lighting throughout the town.

Susceptibility to Change:	Medium
Visual Quality:	Attractive
Visual Sensitivity:	Medium
Receptors:	Walkers

4. *View from the junction of Bryn Gardens and Bryn Street (Volume 2, Figure 7.10c)*

A view along the line of Bryn Street from the elevated housing area north of the town centre. The focus of the view is the tall Pryce Buildings in the town centre, with dense red-brick housing providing the foreground, and a backdrop of the southern valley slopes. This view again reinforces the contrast and sharp boundary between the urban area and its rural setting of fields, hedges and woodland. The night-time view again includes extensive lighting throughout the town.

Susceptibility to Change:	Medium
Visual Quality:	Attractive
Visual Sensitivity:	Medium
Receptors:	Residents, Road Users

5. View looking south from Coed-y-Ffridd (Volume 2, Figure 7.10d)

This view from an elevated road extends across the eastern part of Newtown to the southern valley slopes. The urban area shows an irregular layout and mix of buildings, with the recently developed Tesco supermarket being relatively dominant. The extent of tree coverage associated with the River Severn corridor is noticeable, whilst the historic building core is seen at the right-hand edge of the view. As with other views from the northern side of the town, the southern valley slopes dominate as the backdrop and form the horizon. Fields, hedges and woodland cover create a countryside setting. At night the extensive artificial lighting within the town is heavily apparent.

Susceptibility to Change:	Medium
Visual Quality:	Attractive
Visual Sensitivity:	Medium
Receptors:	Residents, Road Users

6. View from Llanfair Road entering Newtown (Volume 2, Figure 7.10e)

This view is glimpsed but available at several points as the road drops down the valley slope into Newtown. Over and between the roadside hedges the view extends across and along the valley, including the town centre and the countryside setting beyond. The high Pryce Buildings within the town provide a focus, whilst the overall view sets the town within an extensive rural landscape. At night the lit town is seen within the dark context of the surrounding countryside.

Susceptibility to Change:	Medium
Visual Quality:	Moderate
Visual Sensitivity:	Medium
Receptors:	Road Users

7. View from Primrose Drive, Llanllwchaiarn (Volume 2, Figure 7.10e)

From within a modern housing development this view is dominated by the foreground buildings and the tree line associated with the Montgomery Canal. However the backdrop to the view is formed by the southern valley slopes, with the linear form of Newtown discernible along the valley floor. Lighting within the housing development dominates the nigh-time view, albeit within a dark countryside context.

Susceptibility to Change:	Medium
Visual Quality:	Moderate
Visual Sensitivity:	Medium
Receptors:	Residents, Road Users

8. View from PROW FP28 (253/L28) along the southern edge of Porthouse Wood (Volume 2, Figure 7.10f)

From a woodland edge this view looks southwest, through trees and over hedges, across the river valley, without the Severn being apparent. The western edge of Newtown is visible to the right of the view, around the Gro and the contemporary Control Technologies building, whilst centrally the warehouse-style Wool Producers building is very apparent. However the view is rural in nature with the countryside field patterns, hedges and woodland being the dominant character. At night the only significant lighting is that associated with the areas of urban development.

Susceptibility to Change:	High
Visual Quality:	Attractive

Visual Sensitivity:	High
Receptors:	Walkers

9. View from the A489 approaching Newtown from the west (Volume 2, Figure 7.10f)

This view along the road is approximately a driver's view as they approach Newtown. Still within the countryside the road is lined by hedgerows with grazed fields beyond and wooded slopes nearby to the right. In the far distance the high valley sides can be seen. The rising ground either side of the view creates a narrow view dominated by the road corridor and its frequent traffic. There is no significant artificial lighting within this view at night-time.

Susceptibility to Change:	Low
Visual Quality:	Moderate
Visual Sensitivity:	Low
Receptors:	Road Users

10. View from the A489 leaving Newtown heading west. (Volume 2, Figure 7.10g)

This view along the road is approximately a driver's view as they leave Newtown. With nearby wooded hills and undulating valley sides beyond this view provides a strong awareness of the countryside context. The formal avenue planting on the drive to Glanhafren Hall introduces a slight parkland feeling which contributes further to its harmonious composition. Again no significant lighting is apparent at night, other than headlights.

Susceptibility to Change:	Medium
Visual Quality:	Attractive
Visual Sensitivity:	Medium
Receptors:	Road Users

11. View from PROW FP2 (251/8) west of Glandulas Holiday Home Park (Volume 2, Figure 7.10h)

From elevated ground adjacent to the caravan park this view looks east, along the river valley, towards Newtown. The view is predominantly rural in character, but with the urban edge visible in the distance. However it is dominated by the Glandulas Holiday Home Park itself, with the regular forms of the caravans arranged across the foreground. This detracts from the otherwise naturalistic scene. Lighting within the Holiday Home Park is largely restricted to low level bollards, but the distant lights of Newtown also visible in the dark wider context.

Susceptibility to Change:	High
Visual Quality:	Moderate
Visual Sensitivity:	Medium
Receptors:	Walkers

12. View from Chapel Close, Stepaside (Volume 2, Figure 7.10i)

This view looks to the north-east from a small group of bungalows on the eastern edge of Stepaside. The foreground and wider context of the view comprises fields, hedgerows and woodland blocks on gently undulating slopes. In the distance Newtown sits lower in the landscape on the valley floor, with a backdrop of the northern valley slopes. The larger buildings in Mochdre Industrial Estate are particularly noticeable. The night-time lighting effect comes from both the Stepaside street lighting and that associated with the industrial estate and Newtown in the distance, all within an unlit countryside setting.

Susceptibility to Change:	High
Visual Quality:	Attractive

Visual Sensitivity:	High
Receptors:	Residents

13. View from Mochdre Bridge, Mochdre Lane (Volume 2, Figure 7.10j)

From the existing bridge crossing over Mochdre Brook this view looks north-east along Mochdre Lane towards the group of houses at Glandulas Drive. The view is dominated by the trees and woodland associated with the Brook and the steep bank to the lane above, although there would be further views in winter months. The utilitarian nature of the bridge safety barrier detracts from the otherwise small-scale, rural character.

Susceptibility to Change:	High
Visual Quality:	Moderate
Visual Sensitivity:	Medium
Receptors:	Residents, Road Users

14. View from footpath south of Heol Pengwern (Volume 2, Figure 7.10j)

This view is from within a large housing development of mixed property types and ages, and is restricted by boundary fences and buildings. The background to the view is the high ridgeline at the top of the southern valley slopes, a rural element within a strongly urban scene. Lighting associated with the housing estate dominates at night.

Susceptibility to Change:	Medium
Visual Quality:	Poor
Visual Sensitivity:	Low
Receptors:	Residents

15. View from green space at Maesyrhandir (Volume 2, Figure 7.10k)

The viewing position is in the green corridor between a dense housing area and Mochdre Industrial Estate, looking south. The view is dominated by the large-scale industrial buildings and associated fencing, lighting, car parks and infrastructure, although with the countryside backdrop of fields and woodland beyond. The lighting associated with the industrial estate roads and units characterise the night-time view.

Susceptibility to Change:	Low
Visual Quality:	Moderate
Visual Sensitivity:	Low
Receptors:	Residents, Walkers

16. View from footpath crossing the hill north of Lon Ceirios (Volume 2, Figure 7.10L)

This view is from the publicly accessed fields on the hill between two housing areas, and Lon Ceirios and Lon Cerddyn, a popular dog-walking route. The view looks south across the housing area, Leisure Centre and High School, towards the southern valley slopes. The mid-ground includes the wooded hill adjacent to Garth Owen and the large buildings of the Mochdre Industrial Estate. As elsewhere the countryside backdrop provides a strong rural context to the urban foreground. The urban area is lit at night, seen against the dark countryside setting.

Susceptibility to Change:	Medium
Visual Quality:	Moderate

Visual Sensitivity:	Medium
Receptors:	Walkers

17. View from the hill south of Garth Owen (Volume 2, Figure 7.10m)

This view looks south from an elevated position immediately adjacent to Mochdre Industrial Estate, used by the public for recreation. The position provides a panoramic viewpoint encompassing several of the industrial units as well as properties on Dolfor Road, and the fields between. The rising ground of the valley side is immediately behind the nearest industrial unit, with further high ground beyond. Much of the view consists of natural elements, such as fields, hedges, trees and woodland, although offset by the urban nature of the industrial buildings and contemporary materials. The topography tightly encloses the estate character and provides an abrupt boundary of urban to rural.

Susceptibility to Change:	High
Visual Quality:	Moderate
Visual Sensitivity:	Medium
Receptors:	Walkers

18. View from Newtown High School entrance looking along Cedewain (Volume 2, Figure 7.10n)

From the school entrance this view looks south through the Garth Owen housing area, along Cedewain. The backdrop to the view is the hill to the south of the existing A483, with the higher southern valley slopes beyond. As with many views this provides a rural background to an urban scene. The night-time view includes the urban street-lighting, with the dark countryside beyond.

Susceptibility to Change:	Medium
Visual Quality:	Moderate
Visual Sensitivity:	Medium
Receptors:	Pupils, Road Users

19. View looking south from Middle Dolfor Road (Volume 2, Figure 7.10n)

Looking along the very narrow valley known as The Dingle this view is highly constrained by the vegetated valley sides. Garden boundaries and property frontages create a sub-urban character within the enclosed scene. In winter the view is less constrained by vegetation but still restricted by topography. Without street-lighting the night-time view is lit only from the scattered buildings.

Susceptibility to Change:	High
Visual Quality:	Moderate
Visual Sensitivity:	Medium
Receptors:	Residents, Road Users

20. View looking north from Middle Dolfor Road (Volume 2, Figure 7.10n)

Feeling slightly less narrow and deep than the previous example this view is nonetheless still restricted by topography and vegetation, with the road squeezing between scattered properties. As above, seasonal changes would affect the view, given the influence of deciduous vegetation on its character. Similarly at night the view would be largely dark.

Susceptibility to Change:	High
Visual Quality:	Moderate
Visual Sensitivity:	Medium
Receptors:	Residents, Road Users

21. View from Ceiriog, Heol Treowen (Volume 2, Figure 7.10o)

Looking over a boundary hedge this view faces south-east across a side valley to Great Brimmon Farm. This view is entirely rural in nature, despite being from the edge of a dense housing area, illustrating the abrupt nature of the urban/ rural boundary around Newtown. The mixed pattern of field boundaries and woodland creates a harmonious scene with the farm at its centre. At night no significant lighting is apparent within the view.

Susceptibility to Change:	High
Visual Quality:	Attractive
Visual Sensitivity:	High
Receptors:	Residents

22. View from PROW FP14 (253/N14), south of Heol Treowen (Volume 2, Figure 7.10p)

From the farm access track this view looks across an enclosed side valley, around Great Brimmon Farm and beyond to Upper Brimmon. The pattern of grazed fields, hedgerows and woodland characterises the view, with the land rising up to a dramatic horizon formed by the upper valley slopes. The farm houses and outbuildings create a visual focus, appropriate within the context, whilst overhead power lines detract from the attractiveness of the view. Night-time lighting is limited to that associated with the farms.

Susceptibility to Change:	High
Visual Quality:	Attractive
Visual Sensitivity:	High
Receptors:	Walkers

23. View from PROW FP14 (253/N14), Upper Brimmon Farm (Volume 2, Figure 7.10q)

From the track near Upper Brimmon Farm this view looks north across the side valley to the residential area around Heol Treowen. Due to the topography the main area of Newtown cannot be seen, only the upper edge of the southern housing areas. The separated character of the small valley is reinforced by the housing edge beyond, and the pattern of fields, hedge boundaries and woodland. In the far distance the valley slopes can be seen to the north of the town. As above power lines are detractive elements within the view, as is the mixed quality housing on the near horizon. Lighting associated with the urban edge is seen within the night-time view.

Susceptibility to Change:	High
Visual Quality:	Moderate
Visual Sensitivity:	Medium
Receptors:	Residents, Walkers

24. View from Cefn-y-faesdre to Upper Blackhill road, looking north (Volume 2, Figure 7.10r)

An extremely dramatic panoramic view from this elevated position on the top edge of the valley side. The level difference provides an exciting view of the landscape below, the urban core of Newtown and its surrounding development, as well as extensive views to the far distance. There is a distinct feeling of separation from the scene below, due to distance and level. This view provides a clear illustration of the relationship of Newtown to its extensive countryside setting. At night the lit urban development contrasts with the dark landscape around.

Susceptibility to Change:	Medium
Visual Quality:	Very Attractive

Visual Sensitivity:	High
Receptors:	Walkers, Road Users

25. View from Newtown Cemetery, looking south (Volume 2, Figure 7.10s)

The view from the cemetery is dominated by the character of the place itself, the headstones, flowers and planting, but the background of the southern valley slopes creates an attractive context. However the large retail and industrial buildings on Pool Road detract from the visual context. Being within the town street lighting is very apparent in the night time scene.

Susceptibility to Change:	Medium
Visual Quality:	Moderate
Visual Sensitivity:	Medium
Receptors:	Visitors, Mourners

26. View from PROW FP22 (253/N22)/ Wern Ddu Lane (Volume 2, Figure 7.10t)

This view from a field gate on Wern Ddu Lane looks south-west across grazed fields towards the existing A489, and along public footpath FP22. The wider valley form can be seen with the wooded upper southern slopes to the left and the northern slopes in the distance to the right. Glimpses of buildings in Newtown can be seen although most of the town is hidden by the break of slope. A series of field hedges and individual mature trees extend into the distance, along with a number of overhead wires. At night the only lighting is that associated with the town in the valley below.

Susceptibility to Change:	High
Visual Quality:	Attractive
Visual Sensitivity:	High
Receptors:	Walkers, Road Users

27. View from A489 Kerry Road (Volume 2, Figure 7.10u)

Looking north towards Newtown this view illustrates a point of arrival to the town. The break in slope on the southern valley sides is laid out below, with Lower Brimmon Farm in the centre of the scene. Beyond the farm the road drops quickly to the edge of Newtown, but this is screened by topography. Only the northern side of the town, where it extends up the valley sides, can be seen, along with the fields and woodland blocks above. The mid-ground of this scene includes a mix of field types, hedges and individual mature trees. The night-time view is dark other than the lights in the distance in Newtown.

Susceptibility to Change:	High
Visual Quality:	Attractive
Visual Sensitivity:	High
Receptors:	Road Users

28. View from Upper Dolfor Road looking south (Volume 2, Figure 7.10u)

The view along this narrow lane is enclosed by hedgerows and garden planting beyond. Individual property frontages can be seen but only glimpses on the adjacent fields where levels allow. The more distant background view is to the upper valley sides, fields and woodland. The roadside hedge is dense and the lane sunken relative to the adjacent fields, ensuring that the extent of winter views would be very similar, despite the loss of leaf cover. There are no street lights along the lane and the only lighting is from adjacent properties.

Susceptibility to Change: High

Visual Quality: Moderate

Visual Sensitivity: Medium

Receptors: Residents, Road Users

29. View from A483 Pool Road heading east (Volume 2, Figure 7.10v)

This view is as seen by drivers leaving Newtown as they pass the large Wool Producers building on the right, an urban/ rural boundary, although on this side of the town that is an indistinct zone. The focus of the view is a group of large, mature trees associated with properties on the right and left of the road, although the houses themselves are screened by vegetation. In winter the buildings are more obvious. A large barn on the right, along with fields and hedgerows define a countryside character. To the right the topography climbs to the valley top, whilst to the left the ground levels out to the river floodplain, although this is largely hidden by the roadside hedge. At night the only lighting is from the nearby properties.

Susceptibility to Change: Medium

Visual Quality: Moderate

Visual Sensitivity: Medium

Receptors: Road Users

30. View from A483 Pool Road heading west (Volume 2, Figure 7.10w)

This view is close to View 29 but heading towards Newtown. From this approach the grouped properties north and south of the road are more apparent, due to the open foreground field and the bend in the road. The large mature trees are again a central feature, in particular two tall Cedars which stand out as ornamental species in the landscape. The open field to the right is large and relatively flat, and although the river is not apparent the view has more of a floodplain character than views elsewhere, where the valley form is dominant. The view of the properties and their associated trees, creates a point of arrival from the countryside to the town, particularly as beyond the bend more industrial scale buildings line the road. As with View 29, the only lighting in this scene is that associated with the properties.

Susceptibility to Change: Medium

Visual Quality: Moderate

Visual Sensitivity: Medium

Receptors: Road Users

Table 7.3.3 below summarises the resulting Key View Sensitivity assessments, which will be taken forward to the Visual Impact Assessment.

Table 7.3.3 – Key View Visual Sensitivity

Key View	Visual Sensitivity			
	High	Medium	Low	None
1 From Pen-y-shwa Lane to the south	●			
2 From the Severn Way west of Bryn House	●			
3 From PROW FP3 east of Bryn House		●		
4 From Bryn Gardens/ Bryn Street		●		
5 Looking south from Coed-y-Ffridd		●		
6 From Llanfair Road entering Newtown		●		
7 From Primrose Drive, Llanllwchaiarn		●		
8 From PROW FP28 south of Porthouse Wood	●			

9 From A489 into Newtown from west			●	
10 From A489 leaving Newtown heading west		●		
11 From west of Glandulas Holiday Home Park		●		
12 From Chapel Close, Stepaside	●			
13 From Mochdre Bridge, Mochdre Lane		●		
14 From footpath south of Heol Pengwern			●	
15 From green space at Maesyrhandir			●	
16 From the hill north of Lon Ceirios		●		
17 From the hill south of Garth Owen		●		
18 From Newtown High School entrance		●		
19 Looking south from Middle Dolfor Road		●		
20 Looking north from Middle Dolfor Road		●		
21 From Ceiriog, Heol Treowen	●			
22 From PROW FP14, south of Heol Treowen	●			
23 From PROW FP14, Upper Brimmon Farm		●		
24 From Cefn-y-faesdre to Upper Blackhill Rd	●			
25 From Newtown Cemetery, looking south		●		
26 From PROW FP22/ Wern Ddu Lane	●			
27 From A489 Kerry Road	●			
28 From Upper Dolfor Road looking south		●		
29 From A483 Pool Road heading east		●		
30 From A483 Pool Road heading west		●		

This pattern of Visual Sensitivity assessments indicates that the generally attractive views available within the study area are sensitive to the type of changes proposed by the Scheme.

7.4. Predicted Environmental Effects

As described in Sections 7.2.6 and 7.2.7 above the baseline conditions for landscape, townscape and visual amenity have been employed in the assessment of impact significance arising from the Scheme. This will consider each stage of the Scheme as follows:

- Construction Phase - taking account of likely construction operations and effects
- Year 1 following completion - completed Scheme but with no effective landscape mitigation
- Year 15 (Winter) - established mitigation without leaf cover
- Year 15 (Summer) - established mitigation in leaf

This process was carried out for landscape and townscape, using the defined character areas, and then for visual amenity, considering the selected key views. This was followed by an assessment of visual impact on affected properties.

7.4.1. Landscape Impact Significance

From the assessment of baseline conditions a measure of Landscape Sensitivity was established for each landscape character area. In considering the Scheme proposals an assessment of the Magnitude of Landscape Effect on each character area was carried out, applying the criteria in Table 7.2.7.

This considers both direct and indirect effects on the landscape. Indirect landscape effects are those which result from a change to the visual context of a character area. This is only relevant where the visual context is a key element of an area's landscape character. Effects can also be adverse or beneficial, detracting from or enhancing the existing character.

Night-time effects are also considered, with the introduction of both Scheme lighting and traffic headlights, which could be significant depending on the existing pattern of artificial lighting and darkness.

The matrix set out in Table 7.2.8 is then applied, cross referencing the Landscape Sensitivity and Magnitude of Effect measures to define a measure of Landscape Impact Significance for each character area.

1. Northern Rolling Hills / Slope

The Scheme would have no direct effect on the study area landscape north of the Severn. However the northern valley side's panoramic visual context informs its character, particularly that to the south, reinforcing the landform and its wider rural setting. During construction and before landscape mitigation measures become established the linear nature of the Scheme following the valley side would be discernible from across the valley, within that part of the area's visual context. Once the earthworks and structures become visually integrated through vegetation cover the Scheme would be negligible in its effect on the area's visual context and therefore its character.

Landscape Sensitivity: Medium

Phase	***Magnitude of Landscape Effect***	***Landscape Impact Significance***
Construction:	Slight Adverse	Minor Adverse
Year 1:	Slight Adverse	Minor Adverse
Year 15 (Winter):	Negligible/ No Change	None
Year 15 (Summer):	Negligible/ No Change	None

2. Northern Scarp Slope

As above this area would have no direct effects arising from the Scheme, but its visual context would be similarly affected. However this is a smaller character area with a greater proportion influenced by the visual context to the south. Consequently the introduction of a linear feature on the opposite valley side would be quite apparent, as would traffic movements and the night-time effects of lighting. As mitigation planting becomes established the leaf-cover would screen much of this change in the area's visual context.

Landscape Sensitivity: High

Phase	***Magnitude of Landscape Effect***	***Landscape Impact Significance***
Construction:	Slight Adverse	Moderate Adverse
Year 1:	Slight Adverse	Moderate Adverse
Year 15 (Winter):	Slight Adverse	Moderate Adverse
Year 15 (Summer):	Negligible/ No Change	None

3. Eastern River Corridor

The eastern tie-in of the Scheme to the existing A483 falls within this area and therefore has a direct impact. A junction arrangement with an overbridge and roundabout includes significant earthworks and structures, contrary to the open, flat floodplain character which prevails in the landscape. However the flat character of the landscape somewhat limits the extent of character change. Landscape mitigation includes a false cutting, slackened side slopes and woodland planting to screen views of from the wider landscape and nearby properties. Once established the mitigation planting would provide a degree of integration with the southern valley slopes, effectively moving the boundary of the character area.

Landscape Sensitivity: Medium

Phase	***Magnitude of Landscape Effect***	***Landscape Impact Significance***
Construction:	Moderate Adverse	Moderate Adverse
Year 1:	Moderate Adverse	Moderate Adverse
Year 15 (Winter):	Slight Adverse	Minor Adverse
Year 15 (Summer):	Slight Adverse	Minor Adverse

4. *Llanllwchaiarn*

The Scheme has no direct impact on the landscape character area, but affects the visual context of the northern elevated parts. However it only changes the distant southern backdrop, which represents only a minor element of the landscape character. The most noticeable changes would result from construction traffic, cranes and exposed soils.

Landscape Sensitivity: Medium

Phase	***Magnitude of Landscape Effect***	***Landscape Impact Significance***
Construction:	Slight Adverse	Minor Adverse
Year 1:	Negligible/ No Change	None
Year 15 (Winter):	Negligible/ No Change	None
Year 15 (Summer):	Negligible/ No Change	None

5. Valley Mouth

Passing through this character area the Scheme would have a direct impact, with the road overlaid on the rolling topography. With a combination of cutting and embankment the Scheme creates a contrary landform, cuts across field patterns and introduces development into a currently rural landscape with a sense of separation. Whilst mitigation planting would reduce landscape impacts over time the introduction of development would be a permanent change.

Landscape Sensitivity: Medium

Phase	***Magnitude of Landscape Effect***	***Landscape Impact Significance***
Construction:	Substantial Adverse	Major Adverse
Year 1:	Substantial Adverse	Major Adverse
Year 15 (Winter):	Moderate Adverse	Moderate Adverse
Year 15 (Summer):	Moderate Adverse	Moderate Adverse

6. Enclosed Valley

This area has a strong character with a sense of separation from the wider landscape, which the Scheme would cut through, with major embankments through the valley floor. This would physically divide the area and disrupt the current tranquillity, introducing movement, noise and night-time lighting. Mitigation would include graded out earthworks and planting, which would soften but not remove adverse permanent changes.

Landscape Sensitivity: High

Phase	***Magnitude of Landscape Effect***	***Landscape Impact Significance***
Construction:	Substantial Adverse	Substantial Adverse
Year 1:	Substantial Adverse	Substantial Adverse
Year 15 (Winter):	Substantial Adverse	Substantial Adverse
Year 15 (Summer):	Substantial Adverse	Substantial Adverse

7. Plateau

A less enclosed area but still separated from Newtown the Scheme would cut across the pattern of field boundaries and introduce development along the length of the plateau form, with the associated traffic movement. At night the new roundabout would be lit, representing a significant change in the existing dark countryside. Earthworks through this area would be a combination of

low embankments and cutting, allowing more integration with the existing topography. Mitigation planting would re-establish field boundaries and provide screening of traffic and embankment forms.

Landscape Sensitivity: High

Phase	*Magnitude of Landscape Effect*	*Landscape Impact Significance*
Construction:	Substantial Adverse	Substantial Adverse
Year 1:	Substantial Adverse	Substantial Adverse
Year 15 (Winter):	Moderate Adverse	Major Adverse
Year 15 (Summer):	Moderate Adverse	Major Adverse

8. Undulating Slopes

The Scheme would introduce a major change in this landscape. However it would take the form of a deep cutting, which whilst contrary to the complex rolling topography would be limited in its wider impact following the establishment of mitigation planting. The cutting and boundary hedges would also enclose movement and lighting effects.

Landscape Sensitivity: High

Phase	*Magnitude of Landscape Effect*	*Landscape Impact Significance*
Construction:	Substantial Adverse	Substantial Adverse
Year 1:	Substantial Adverse	Substantial Adverse
Year 15 (Winter):	Moderate Adverse	Major Adverse
Year 15 (Summer):	Moderate Adverse	Major Adverse

9. Confluence

The Scheme access into Newtown would directly impact on this area with a significant cutting through the slopes on its southern side, and a low embankment crossing the valley floor providing a link to Mochdre Industrial Estate. The enclosed valley form would be disrupted by these incongruous landforms, however the existing A483 already passes through this area and therefore the Scheme would not result in additional traffic effects within the character area. Mitigation would include treatment of the existing road corridor to prevent unnecessary duplication of boundaries. With time the impact of the cutting and embankment would be softened by the maturing hedgerows and woodland.

Landscape Sensitivity: Medium

Phase	*Magnitude of Landscape Effect*	*Landscape Impact*
Construction:	Substantial Adverse	Major Adverse
Year 1:	Substantial Adverse	Major Adverse
Year 15 (Winter):	Moderate Adverse	Moderate Adverse
Year 15 (Summer):	Moderate Adverse	Moderate Adverse

10. South Western Valley Slopes

The Scheme impacts on this large character along its northern edge, where it abuts the river corridor and the urban edge of Newtown, although this junction is an important contributor to its character. The proposal introduces a strongly linear form, cutting across the slopes, with a combination of cuttings and embankments, some substantial. It pushes the urban development character into the countryside, including night-time headlights effects, although over time the mitigation planting would reduce this effect. In places constructed slopes would be graded out and returned to agriculture, in order to integrate the Scheme into the prevailing topography.

Landscape Sensitivity: High

Phase	Magnitude of Landscape Effect	Landscape Impact
Construction:	Substantial Adverse	Substantial Adverse
Year 1:	Substantial Adverse	Substantial Adverse
Year 15 (Winter):	Moderate Adverse	Major Adverse
Year 15 (Summer):	Moderate Adverse	Major Adverse

11. Southern Scarp Slope

The Scheme has no direct impact upon this area. However the panoramic visual context of this upland landscape is a key part of its character, and the Scheme would fall within that context, disrupting the clear division between the countryside setting and Newtown itself. In time the mitigation planting would soften the effect to some degree, integrating the Scheme with the rural setting, such that the change in visual context would be insignificant in the overall landscape character of the area.

Landscape Sensitivity: High

Phase	Magnitude of Landscape Effect	Landscape Impact
Construction:	Slight Adverse	Moderate Adverse
Year 1:	Slight Adverse	Moderate Adverse
Year 15 (Winter):	Negligible/ No Change	None
Year 15 (Summer):	Negligible/ No Change	None

12. South Eastern Valley Slopes

As above there would be no direct impact from the Scheme on this area, with only its visual context being changed. However the Scheme would be more remote from much of this character area and apparent only within a small proportion of its visual setting, although the slopes are orientated towards it. The embankment and structures over the railway and the A483 would be the most visible element of the Scheme. Over time the mitigation planting would reduce this effect.

Landscape Sensitivity: Medium

Phase	Magnitude of Landscape Effect	Landscape Impact Significance
Construction:	Slight Adverse	Minor Adverse
Year 1:	Slight Adverse	Minor Adverse
Year 15 (Winter):	Negligible/ No Change	None
Year 15 (Summer):	Negligible/ No Change	None

13. Western River Corridor

Whilst the Scheme would directly impact on this area it would do so only on its southern edge, where it ties in to the existing A489. The character of the area is driven by the river and valley floor landform, neither of which would be significantly disrupted by the proposals, particularly once the landscape mitigation planting establishes, integrating the Scheme with the adjacent slopes.

Landscape Sensitivity: High

Phase	Magnitude of Landscape Effect	Landscape Impact Significance
Construction:	Slight Adverse	Moderate Adverse
Year 1:	Slight Adverse	Moderate Adverse
Year 15 (Winter):	Negligible/ No Change	None
Year 15 (Summer):	Negligible/ No Change	None

In summary the Scheme would introduce significant adverse effects where it directly impacts on the landscape. Whilst the mitigation measures would soften and reduce aspects of its intrusion into the rural setting the residual impacts would still represent a negative change. The pattern of impact significance is summarised in Table 7.4.1 below.

Table 7.4.1 – Summary of Landscape Impact Significance

Landscape Character Area	Landscape Impact Significance (Adverse)			
	Constructio	Year 1	Winter Yr	Summer Yr
1 Northern Rolling Hills/Slopes	Minor	Minor	None	None
2 Northern Scarp Slope	Moderate	Moderate	Moderate	None
3 Eastern River Corridor	Moderate	Moderate	Minor	Minor
4 Llanllwchaiarn	Minor	None	None	None
5 Valley Mouth	Major	Major	Moderate	Moderate
6 Enclosed Valley	Substantial	Substantial	Substantial	Substantial
7 Plateau	Substantial	Substantial	Major	Major
8 Undulating Slopes	Substantial	Substantial	Major	Major
9 Confluence	Major	Major	Moderate	Moderate
10 South Western Valley Slopes	Substantial	Substantial	Major	Major
11 South Scarp Slope	Moderate	Moderate	None	None
12 South Eastern Valley Slopes	Minor	Minor	None	None
13 Western River Corridor	Moderate	Moderate	None	None

7.4.2. Townscape Impact Assessment

As with landscape the townscape assessment considers the defined character areas, applying their Townscape Sensitivity assessments to an assessed Magnitude of Townscape Effect. As before impacts are assessed for each phase of the Scheme development.

Since the Scheme would not pass through any of the Townscape Character Areas only indirect effects on visual context are considered. The detailed results of this assessment are set out in Volume 3, Appendix D.2.

In summary the Scheme indirectly affects some townscape character areas through changes to their visual context. However in all but one cases this is only significant during the construction phase and the early stages of operation, with landscape integration through planting progressing as vegetation matures. The pattern of impact significance is summarised in Table 7.4.2 below.

Table 7.4.2 – Summary of Townscape Impact Significance

Townscape Character Area	Townscape Impact Significance (Adverse)			
	Construction	Year 1	Winter	Summer Yr
1 North Longbridge	Moderate	Moderate	None	None
2 Bryn Lane & Infirmary	Minor	Minor	None	None
3 Milford Road	None	None	None	None
4 Dolerw Park	None	None	None	None
5 Resr and Football Ground	Minor	Minor	None	None
6 Civic Offices	None	None	None	None
7 Old Town Centre	None	None	None	None
8 Central River Corridor	None	None	None	None
9 Eastern River Corridor	None	None	None	None
10 Station and Pryce Buildings	None	None	None	None
11 Canal Road-Sycamore Drive	None	None	None	None
12 Canal Road Terrace	None	None	None	None
13 New Housing Development	None	None	None	None

Townscape Character Area	Townscape Impact Significance (Adverse)			
	Construction	Year 1	Winter	Summer Yr
14 Dyffryn Industrial Estate	None	None	None	None
15 Cemetery, Sports Ground and Golf Course	Minor	Minor	None	None
16 Vastre Industrial Estate	None	None	None	None
17 Pool Road - West	None	None	None	None
18 Heol Treowen Estate	Not Significant	Not Significant	None	None
19 Heol Treowen - West	Not Significant	Not Significant	None	None
20 Newtown High School and Leisure Centre	Not Significant	Not Significant	None	None
21 Garth Owen Estate	Minor	Minor	None	None
22 Maesyrhandir Estate	Not Significant	Not Significant	None	None
23 Heol Vaynor Estate	None	None	None	None
24 Dolerw Park - West	None	None	None	None
25 Powys College	None	None	None	None
26 Mochdre Industrial Estate	Minor	Not Significant	None	None
27 Glandulas Drive	Moderate	Moderate	Minor	Minor
28 Maesyrhandir Green Corridor	Moderate	Minor	None	None
29 New Road - East	None	None	None	None
30 New Road - West	None	None	None	None
31 A489 Corridor	None	None	None	None
32 Milford	None	None	None	None
33 Lon Cerddyn Estate	None	None	None	None

7.4.3. Visual Impact Assessment

The approach to visual impact assessment is much as for landscape and townscape, through consideration of the selected key views. For each view the Visual Sensitivity is cross-referenced with Magnitude of Visual Effect, as Table 7.2.9, to provide a measure of Scale of Visual Impact in accordance with Table 7.2.10. This is then considered with Receptor Sensitivity to provide an assessment of Visual Impact Significance, as Table 7.2.11.

1. *View from Pen-y-shwa Lane to the south*

Distance from
Scheme centreline: *2,950m*
Orientation: *South*
Field of view: *90°*
OS Reference: *102 936*

The Scheme would be visible in this panoramic view, but in the lower extent of the far slopes, just over the top of the hedge. A large proportion of the Scheme length would be seen, but would be quickly softened by establishing mitigation planting. This would also screen traffic and scheme lighting which would be more apparent in early phases.

Visual Sensitivity: High

Receptor Sensitivity: High (Residents, Walkers)

Phase	*Magnitude of Visual Effect*	*Scale of Visual Impact*
Construction:	Slight Adverse	Moderate Adverse
Year 1:	Slight Adverse	Moderate Adverse
Year 15 (Winter):	Negligible/ No Change	None

Year 15 (Summer):	Negligible/ No Change	None
Phase	*Visual Impact Significance (Receptor Sensitivity – High)*	
Construction:	Major Adverse	
Year 1:	Major Adverse	
Year 15 (Winter):	None	
Year 15 (Summer):	None	

2. *View from the Severn Way and bridleway L4A, west of Bryn House*

Distance from
Scheme centreline: *1,985m*
Orientation: *South*
Field of view: *180°*
OS Reference: *093 921*

Almost the entire length of the Scheme would be visible within this panoramic view, although at some distance. The southern valley slopes are the focus of this scene, with only a small proportion taken up by the urban areas of Newtown. The Scheme would introduce a strongly linear component into the view, contrary to the complex pattern of fields, woodland and topography, which would detract from the rural nature of the panorama.

Visual Sensitivity: High

Receptor Sensitivity: High (Walkers)

Phase	***Magnitude of Visual Effect***	***Scale of Visual Impact***
Construction:	Moderate Adverse	Major Adverse
Year 1:	Moderate Adverse	Major Adverse
Year 15 (Winter):	Slight Adverse	Moderate Adverse
Year 15 (Summer):	Slight Adverse	Moderate Adverse
Phase	***Visual Impact Significance (Receptor Sensitivity – High)***	
Construction:	Substantial Adverse	
Year 1:	Substantial Adverse	
Year 15 (Winter):	Major Adverse	
Year 15 (Summer):	Major Adverse	

3. *View from PROW FP3 east of Bryn House*

Distance from
Scheme centreline: *1,690m*
Orientation: *South-east*
Field of view: *140°*
OS Reference: *103 921*

Another panoramic view, including most of the urban area of Newtown, with the southern valley slopes beyond. The Scheme, visible across most of the field of view, would alter the clear urban/rural boundary, pushing it up the valley side. As mitigation softens the earthworks and structures, and screens traffic, the impact would be lessened to a point where the Scheme is not easily perceived.

Visual Sensitivity: Medium

Receptor Sensitivity: High (Walkers)

Phase	Magnitude of Visual Effect	Scale of Visual Impact
Construction:	Slight Adverse	Minor Adverse
Year 1:	Slight Adverse	Minor Adverse
Year 15 (Winter):	Negligible/ No Change	None
Year 15 (Summer):	Negligible/ No Change	None
Phase	**Visual Impact Significance (Receptor Sensitivity – High)**	
Construction:	Moderate Adverse	
Year 1:	Moderate Adverse	
Year 15 (Winter):	None	
Year 15 (Summer):	None	

4. View from the junction of Bryn Gardens and Bryn Street

Distance from Scheme centreline: *1,480m*
Orientation: *South-east*
Field of view: *50°*
OS Reference: *106 921*

The Scheme would only be visible in the right side of the view as the intervening topography of a minor valley would screen the centre of the view. Where visible the Scheme would only be just beyond the urban edge and therefore would not be easily perceived. During construction the wider working corridor and high equipment such as cranes would be more easily seen.

Visual Sensitivity: Medium

Receptor Sensitivity: High (Residents), Medium (Road Users)

Phase	Magnitude of Visual Effect	Scale of Visual Impact
Construction:	Slight Adverse	Minor Adverse
Year 1:	Negligible/ No Change	None
Year 15 (Winter):	Negligible/ No Change	None
Year 15 (Summer):	Negligible/ No Change	None
Phase	**Visual Impact Significance (Receptor Sensitivity – High)**	**Visual Impact Significance (Receptor Sensitivity – Medium)**
Construction:	Moderate Adverse	Minor Adverse
Year 1:	None	None
Year 15 (Winter):	None	None
Year 15 (Summer):	None	None

5. View looking south from Coed-y-Ffridd

Distance from Scheme centreline: *1,040m*
Orientation: *South-southeast*
Field of view: *90°*
OS Reference: *113 919*

The Scheme would cross through most of the width of this view, although as above the central section would be hidden by topography. However the route west of Kerry Road would be particularly apparent as it crosses the scarp slope, clearly distinct from the urban edge. As mitigation vegetation matures the Scheme would become less apparent.

Visual Sensitivity: Medium

Receptor Sensitivity: High (Residents), Medium (Road Users)

Phase	***Magnitude of Visual Effect***	***Scale of Visual Impact***
Construction:	Moderate Adverse	Moderate Adverse
Year 1:	Moderate Adverse	Moderate Adverse
Year 15 (Winter):	Slight Adverse	Minor Adverse
Year 15 (Summer):	Slight Adverse	Minor Adverse
Phase	***Visual Impact Significance (Receptor Sensitivity – High)***	***Visual Impact Significance (Receptor Sensitivity – Medium)***
Construction:	Major Adverse	Moderate Adverse
Year 1:	Major Adverse	Moderate Adverse
Year 15 (Winter):	Moderate Adverse	Minor Adverse
Year 15 (Summer):	Moderate Adverse	Minor Adverse

6. View from Llanfair Road entering Newtown

Distance from Scheme centreline: 1,990m
Orientation: South
Field of view: 45°
OS Reference: 110 928

The elevation of the viewpoint means that much of the Scheme would be visible in the countryside beyond Newtown, separated from the urban edge. Part of the character of this view is the sharp distinction between urban and rural, which would be undermined by the visibility of the Scheme. In time the mitigation planting would provide greater integration with the rural landscape, but at night the angle of view would mean that traffic lights would continue to be apparent.

Visual Sensitivity: Medium

Receptor Sensitivity: Medium (Road Users)

Phase	***Magnitude of Visual Effect***	***Scale of Visual Impact***
Construction:	Moderate Adverse	Moderate Adverse
Year 1:	Moderate Adverse	Moderate Adverse
Year 15 (Winter):	Slight Adverse	Minor Adverse
Year 15 (Summer):	Slight Adverse	Minor Adverse
Phase	***Visual Impact Significance (Receptor Sensitivity –***	
Construction:	Moderate Adverse	
Year 1:	Moderate Adverse	
Year 15 (Winter):	Minor Adverse	
Year 15 (Summer):	Minor Adverse	

7. View from Primrose Drive, Llanllwchaiarn

Distance from Scheme centreline: 950m
Orientation: South-southwest
Field of view: 30°
OS Reference: 123 926

The Scheme would pass through the background of this view, particularly noticeable where it crosses the scarp slope, in the centre of the view, immediately above the tree tops. As before the Scheme would introduce development into the rural element of the scene. The construction phase and earthworks would be the most visually apparent.

Visual Sensitivity: Medium

Receptor Sensitivity: High (Residents), Medium (Road Users)

Phase	***Magnitude of Visual Effect***	***Scale of Visual Impact***
Construction:	Moderate Adverse	Moderate Adverse
Year 1:	Moderate Adverse	Moderate Adverse
Year 15 (Winter):	Slight Adverse	Minor Adverse
Year 15 (Summer):	Slight Adverse	Minor Adverse
Phase	***Visual Impact Significance (Receptor Sensitivity – High)***	***Visual Impact Significance (Receptor Sensitivity – Medium)***
Construction:	Major Adverse	Moderate Adverse
Year 1:	Major Adverse	Moderate Adverse
Year 15 (Winter):	Moderate Adverse	Minor Adverse
Year 15 (Summer):	Moderate Adverse	Minor Adverse

8. View from PROW FP28 along the southern edge of Porthouse Wood

Distance from Scheme centreline: *690m*
Orientation: *South-west*
Field of view: *40°*
OS Reference: *130 926*

In this attractive view the Scheme would be seen in two areas, in the far distance to the right of the view, and on the left side where the route crosses the fields behind the large Wool Merchants building. In the middle of the view the Scheme would be hidden by high ground, and therefore the main components of the scene would be unaffected. The closest section of the Scheme would be in cutting or at-grade, and therefore mitigation planting would be effective in screening and integrating the proposal, once established.

Visual Sensitivity: High

Receptor Sensitivity: High (Walkers)

Phase	***Magnitude of Visual Effect***	***Scale of Visual Impact***
Construction:	Slight Adverse	Moderate Adverse
Year 1:	Slight Adverse	Moderate Adverse
Year 15 (Winter):	Negligible/ No Change	None
Year 15 (Summer):	Negligible/ No Change	None
Phase	***Visual Impact Significance (Receptor Sensitivity – High)***	
Construction:	Major Adverse	
Year 1:	Major Adverse	
Year 15 (Winter):	None	
Year 15 (Summer):	None	

9. View from the A489 approaching Newtown from the west

Distance from
Scheme centreline: 40m
Orientation: East-northeast
Field of view: 80°
OS Reference: 081 901

The Scheme would lie in the field immediately to the right of this view, with the existing road reduced to a footpath and river access track. Mitigation woodland planting would integrate the new road with the existing slope behind. During construction the machinery and earth movements in the fields would be a minor detractor from the view. Once completed this effect would lessen and in time the Scheme would lead to an improvement in this view.

Visual Sensitivity: Low

Receptor Sensitivity: Medium (Road Users)

Phase	***Magnitude of Visual Effect***	***Scale of Visual Impact***
Construction:	Slight Adverse	Not Significant
Year 1:	Slight Adverse	Not Significant
Year 15 (Winter):	Slight Beneficial	Not Significant
Year 15 (Summer):	Slight Beneficial	Not Significant
Phase	***Visual Impact Significance (Receptor Sensitivity –***	
Construction:	Not Significant	
Year 1:	Not Significant	
Year 15 (Winter):	Not Significant	
Year 15 (Summer):	Not Significant	

10. View from the A489 leaving Newtown heading west.

Distance from
Scheme centreline: 20m
Orientation: West-southwest
Field of view: 150°
OS Reference: 084 902

The Scheme would affect the left hand side of this view, with the road, a roundabout and the realigned A489 all being within the adjacent field. The view currently has a countryside context, but would become more developed and visually complex. The existing road would be reduced in width as an access, but would be retained. The construction and early operational years would have a greater visual effect than in later years when the mitigation planting becomes established.

Visual Sensitivity: Medium

Receptor Sensitivity: Medium (Road Users)

Phase	***Magnitude of Visual Effect***	***Scale of Visual Impact***
Construction:	Substantial Adverse	Major Adverse
Year 1:	Substantial Adverse	Major Adverse
Year 15 (Winter):	Moderate Adverse	Moderate Adverse
Year 15 (Summer):	Moderate Adverse	Moderate Adverse
Phase	***Visual Impact Significance (Receptor Sensitivity –***	
Construction:	Major Adverse	
Year 1:	Major Adverse	

Year 15 (Winter):	Moderate Adverse	
Year 15 (Summer):	Moderate Adverse	

11. View from PROW FP2 west of Glandulas Holiday Home Park

Distance from
Scheme centreline: 210m
Orientation: East-northeast
Field of view: 100°
OS Reference: 082 899

The Scheme would cut across this view between the nearer and further caravan groups and then cut into the hill on the right. In the view it would then be seen again in the distance along the lower valley slopes and then in a deep cutting through a far hill. The most intrusive element would be the cutting through the near hill, contrary to the prevailing topography. The continuation of the route in the distance would affect the view in depth. Mitigation planting would screen the cutting in particular, once established, although the linear form would remain apparent.

Visual Sensitivity: Medium

Receptor Sensitivity: High (Walkers)

Phase	***Magnitude of Visual Effect***	***Scale of Visual Impact***
Construction:	Substantial Adverse	Major Adverse
Year 1:	Substantial Adverse	Major Adverse
Year 15 (Winter):	Moderate Adverse	Moderate Adverse
Year 15 (Summer):	Moderate Adverse	Moderate Adverse
Phase	***Visual Impact Significance (Receptor Sensitivity – High)***	
Construction:	Substantial Adverse	
Year 1:	Substantial Adverse	
Year 15 (Winter):	Major Adverse	
Year 15 (Summer):	Major Adverse	

12. View from Chapel Close, Stepaside

Distance from
Scheme centreline: 400m
Orientation: North-east
Field of view: 100°
OS Reference: 084 896

Whilst the Scheme would pass across all of the area covered by this view it would be largely hidden by intervening topography. A small glimpse of the more distant sections would be seen to the right of the view, between mature individual trees. As mitigation becomes mature even these views would become less perceptible.

Visual Sensitivity: High

Receptor Sensitivity: High (Residents)

Phase	***Magnitude of Visual Effect***	***Scale of Visual Impact***
Construction:	Slight Adverse	Moderate Adverse
Year 1:	Slight Adverse	Moderate Adverse

Year 15 (Winter):	Negligible/ No Change	None
Year 15 (Summer):	Negligible/ No Change	None
Phase	***Visual Impact Significance (Receptor Sensitivity – High)***	
Construction:	Major Adverse	
Year 1:	Major Adverse	
Year 15 (Winter):	None	
Year 15 (Summer):	None	

13. View from Mochdre Bridge, Mochdre Lane

Distance from
Scheme centreline: 40m
Orientation: North-east
Field of view: 90°
OS Reference: 087 898

This view would be dominated by the new underbridge crossing the valley, the brook and the lane. The structure would be above the natural line of sight but would entirely change the character of the view. Whilst mitigation planting would soften the abutment areas the greatest change in the view would result from the main bridge structure, the beam, parapet and columns, which would not be screened.

Visual Sensitivity: Medium

Receptor Sensitivity: High (Residents), Medium (Road Users)

Phase	***Magnitude of Visual Effect***	***Scale of Visual Impact***
Construction:	Substantial Adverse	Major Adverse
Year 1:	Substantial Adverse	Major Adverse
Year 15 (Winter):	Substantial Adverse	Major Adverse
Year 15 (Summer):	Substantial Adverse	Major Adverse
Phase	***Visual Impact Significance (Receptor Sensitivity – High)***	***Visual Impact Significance (Receptor Sensitivity – Medium)***
Construction:	Substantial Adverse	Major Adverse
Year 1:	Substantial Adverse	Major Adverse
Year 15 (Winter):	Substantial Adverse	Major Adverse
Year 15 (Summer):	Substantial Adverse	Major Adverse

14. View from footpath south of Heol Pengwern

Distance from
Scheme centreline: 1,130m
Orientation: East-southeast
Field of view: 70°
OS Reference: 091 907

The Scheme would be barely perceptible within this view, affecting only the high ground seen over the house roofs, where a cutting would change the hill profile. During construction this would be more apparent with high equipment such as cranes, but on completion the change would be negligible.

Visual Sensitivity: Low

Receptor Sensitivity: High (Residents)

Phase	Magnitude of Visual Effect	Scale of Visual Impact
Construction:	Slight Adverse	Not Significant
Year 1:	Negligible/ No Change	None
Year 15 (Winter):	Negligible/ No Change	None
Year 15 (Summer):	Negligible/ No Change	None
Phase	**Visual Impact Significance (Receptor Sensitivity – High)**	
Construction:	Not Significant	
Year 1:	None	
Year 15 (Winter):	None	
Year 15 (Summer):	None	

15. View from green space at Maesyrhandir

Distance from
Scheme centreline: *520m*
Orientation: *South-southeast*
Field of view: *160°*
OS Reference: *097 903*

This panoramic view looks over and between the industrial estate buildings to the countryside slopes beyond, where the Scheme would cut through woodland and fields. The route would be seen in small sections, between intervening buildings vegetation, but would combine to appear as a new linear feature in the view, weakening the rural backdrop to the industrial estate.

Visual Sensitivity: Low

Receptor Sensitivity: High (Residents, Walkers)

Phase	Magnitude of Visual Effect	Scale of Visual Impact
Construction:	Moderate Adverse	Minor Adverse
Year 1:	Moderate Adverse	Minor Adverse
Year 15 (Winter):	Slight Adverse	Not Significant
Year 15 (Summer):	Slight Adverse	Not Significant
Phase	**Visual Impact Significance (Receptor Sensitivity – High)**	
Construction:	Moderate Adverse	
Year 1:	Moderate Adverse	
Year 15 (Winter):	Not Significant	
Year 15 (Summer):	Not Significant	

16. View from footpath crossing the hill north of Lon Ceirios

Distance from
Scheme centreline: *910m*
Orientation: *South-southeast*
Field of view: *100°*
OS Reference: *099 909*

The Scheme would be clearly visible across much of this view, other than a section screened by the hill south of Garth Owen, cutting through the countryside just beyond the urban boundary. However there would be little green space visible between the existing built edge and the Scheme and therefore the perceived town fringe would be slightly pushed out. During construction the scale of the development would be clearly perceived, reducing over time with mitigation.

Visual Sensitivity: Medium

Receptor Sensitivity: High (Walkers)

Phase	Magnitude of Visual Effect	Scale of Visual Impact
Construction:	Moderate Adverse	Moderate Adverse
Year 1:	Slight Adverse	Minor Adverse
Year 15 (Winter):	Negligible/ No Change	None
Year 15 (Summer):	Negligible/ No Change	None
Phase	**Visual Impact Significance (Receptor Sensitivity – High)**	
Construction:	Major Adverse	
Year 1:	Moderate Adverse	
Year 15 (Winter):	None	
Year 15 (Summer):	None	

17. View from the hill south of Garth Owen

Distance from
Scheme centreline: *190m*
Orientation: *South-southeast*
Field of view: *160°*
OS Reference: *103 903*

The Scheme would be clearly visible in much of this view, including the mainline, the side road into Newtown, two roundabouts and an access road into the industrial estate in the immediate foreground. The effect would be to change the character of the view considerably, with the filed patterns in both the background and foreground being substantially disrupted. With mitigation the impact of the traffic and highway infrastructure would be reduced.

Visual Sensitivity: Medium

Receptor Sensitivity: High (Walkers)

Phase	Magnitude of Visual Effect	Scale of Visual Impact
Construction:	Substantial Adverse	Major Adverse
Year 1:	Substantial Adverse	Major Adverse
Year 15 (Winter):	Moderate Adverse	Moderate Adverse
Year 15 (Summer):	Moderate Adverse	Moderate Adverse
Phase	**Visual Impact Significance (Receptor Sensitivity – High)**	
Construction:	Substantial Adverse	
Year 1:	Substantial Adverse	
Year 15 (Winter):	Major Adverse	
Year 15 (Summer):	Major Adverse	

18. View from Newtown High School entrance looking along Cedewain

Distance from
Scheme centreline: *380m*
Orientation: *South-southeast*
Field of view: *130°*
OS Reference: *104 907*

Whilst the area viewed beyond the town is fairly restricted towards the hills to the south, the landform would change as a result of the main line cutting and the side road into the town would cut across the lower field. Mitigation woodland planting would change the character of the backdrop, but once established would be neutral in effect and would result in a negligible change from the Scheme.

Visual Sensitivity: Medium

Receptor Sensitivity: Medium (Pupils, Road Users)

Phase	***Magnitude of Visual Effect***	***Scale of Visual Impact***
Construction:	Slight Adverse	Minor Adverse
Year 1:	Slight Adverse	Minor Adverse
Year 15 (Winter):	Negligible/ No Change	None
Year 15 (Summer):	Negligible/ No Change	None
Phase	***Visual Impact Significance (Receptor Sensitivity –***	
Construction:	Minor Adverse	
Year 1:	Minor Adverse	
Year 15 (Winter):	None	
Year 15 (Summer):	None	

19. View looking south from Middle Dolfor Road

Distance from
Scheme centreline: 90m
Orientation: South
Field of view: 50°
OS Reference: 107 902

The Scheme in this view would consist of a major bridge structure above roof level. It would be visible linking the existing woodland trees either side of this narrow valley and would dominate the character of the view. The effect of the bridge would not be significantly reduced over time as mitigation would be limited to re-establishing the woodland setting to abutment areas. During construction the impact would be at its greatest, with high cranes and construction plant.

Visual Sensitivity: Medium

Receptor Sensitivity: High (Residents), Medium (Road Users)

Phase	***Magnitude of Visual Effect***	***Scale of Visual Impact***
Construction:	Substantial Adverse	Major Adverse
Year 1:	Substantial Adverse	Major Adverse
Year 15 (Winter):	Substantial Adverse	Major Adverse
Year 15 (Summer):	Substantial Adverse	Major Adverse
Phase	***Visual Impact Significance (Receptor Sensitivity – High)***	***Visual Impact Significance (Receptor Sensitivity – Medium)***
Construction:	Substantial Adverse	Major Adverse
Year 1:	Substantial Adverse	Major Adverse
Year 15 (Winter):	Substantial Adverse	Major Adverse
Year 15 (Summer):	Substantial Adverse	Major Adverse

20. View looking north from Middle Dolfor Road

Distance from
Scheme centreline: 90m
Orientation: North-northeast
Field of view: 50°
OS Reference: 107 900

As with View 19 a major bridge structure would cross this view emerging from the existing woodland, but would be more effectively screened by intervening trees to the left of the view. However there would be a very large change in the character of the view with the introduction of a significant built element in this enclosed valley. Mitigation would do little to reduce the visual impact.

Visual Sensitivity: Medium

Receptor Sensitivity: High (Residents), Medium (Road Users)

Phase	***Magnitude of Visual Effect***	***Scale of Visual Impact***
Construction:	Substantial Adverse	Major Adverse
Year 1:	Substantial Adverse	Major Adverse
Year 15 (Winter):	Substantial Adverse	Major Adverse
Year 15 (Summer):	Substantial Adverse	Major Adverse
Phase	***Visual Impact Significance (Receptor Sensitivity – High)***	***Visual Impact Significance (Receptor Sensitivity – Medium)***
Construction:	Substantial Adverse	Major Adverse
Year 1:	Substantial Adverse	Major Adverse
Year 15 (Winter):	Substantial Adverse	Major Adverse
Year 15 (Summer):	Substantial Adverse	Major Adverse

21. View from Ceiriog, Heol Treowen

Distance from
Scheme centreline: 260m
Orientation: East-northeast
Field of view: 120°
OS Reference: 111 910

The Scheme would cross almost the entire width of this view, mainly on a significant embankment form. However the intervening high ground would screen the lower part of the embankment where it would be closest. Mitigation woodland planting on the embankment sides would screen traffic in the longer term, particularly during summer months. However it would also block views to the farm buildings across the valley and therefore would change the character from an agricultural scene to a wooded view.

Visual Sensitivity: High

Receptor Sensitivity: High (Residents)

Phase	***Magnitude of Visual Effect***	***Scale of Visual Impact***
Construction:	Substantial Adverse	Substantial Adverse
Year 1:	Substantial Adverse	Substantial Adverse
Year 15 (Winter):	Moderate Adverse	Major Adverse
Year 15 (Summer):	Moderate Adverse	Major Adverse
Phase	***Visual Impact Significance (Receptor Sensitivity – High)***	
Construction:	Substantial Adverse	
Year 1:	Substantial Adverse	
Year 15 (Winter):	Substantial Adverse	
Year 15 (Summer):	Substantial Adverse	

22. View from PROW FP14, south of Heol Treowen

Distance from
Scheme centreline: 220m
Orientation: Southeast
Field of view: 90°
OS Reference: 113 911

Through this view the Scheme would change the valley form which characterises the scene. Whilst mitigation woodland planting would screen traffic once established the change in the view would be permanent.

Visual Sensitivity: High

Receptor Sensitivity: High (Walkers)

Phase	***Magnitude of Visual Effect***	***Scale of Visual Impact***
Construction:	Substantial Adverse	Substantial Adverse
Year 1:	Substantial Adverse	Substantial Adverse
Year 15 (Winter):	Moderate Adverse	Major Adverse
Year 15 (Summer):	Moderate Adverse	Major Adverse
Phase	***Visual Impact Significance (Receptor Sensitivity – High)***	
Construction:	Substantial Adverse	
Year 1:	Substantial Adverse	
Year 15 (Winter):	Substantial Adverse	
Year 15 (Summer):	Substantial Adverse	

23. View from PROW FP14, Upper Brimmon Farm

Distance from
Scheme centreline: 200m
Orientation: North
Field of view: 100°
OS Reference: 114 906

The Scheme would cross the entire view on embankment, contrary to the existing valley landscape. Woodland planting on the slopes would screen traffic but would also introduce a linear woodland into the scene, currently characterised by fields and hedge boundaries.

Visual Sensitivity: Medium

Receptor Sensitivity: High (Residents, Walkers)

Phase	***Magnitude of Visual Effect***	***Scale of Visual Impact***
Construction:	Substantial Adverse	Major Adverse
Year 1:	Substantial Adverse	Major Adverse
Year 15 (Winter):	Moderate Adverse	Moderate Adverse
Year 15 (Summer):	Moderate Adverse	Moderate Adverse
Phase	***Visual Impact Significance (Receptor Sensitivity – High)***	
Construction:	Substantial Adverse	
Year 1:	Substantial Adverse	
Year 15 (Winter):	Major Adverse	
Year 15 (Summer):	Major Adverse	

24. View from Cefn-y-faesdre to Upper Blackhill road, looking north

Distance from
Scheme centreline: 960m
Orientation: Northwest
Field of view: 90°
OS Reference: 116 897

The western half of the Scheme length would be visible in this panoramic view, although in the context of its extensive range. The route would be seen cutting through the rural foreground below the viewing position, most noticeable during construction and before mitigation planting matures. Whilst at some distance the Scheme would bring the development edge closer and would therefore degrade the rural context of the town as seen in the view.

Visual Sensitivity: High

Receptor Sensitivity: High (Walkers), Medium (Road Users)

Phase	***Magnitude of Visual Effect***	***Scale of Visual Impact***
Construction:	Moderate Adverse	Major Adverse
Year 1:	Moderate Adverse	Major Adverse
Year 15 (Winter):	Slight Adverse	Moderate Adverse
Year 15 (Summer):	Slight Adverse	Moderate Adverse
Phase	***Visual Impact Significance (Receptor Sensitivity – High)***	***Visual Impact Significance (Receptor Sensitivity – Medium)***
Construction:	Substantial Adverse	Major Adverse
Year 1:	Substantial Adverse	Major Adverse
Year 15 (Winter):	Major Adverse	Moderate Adverse
Year 15 (Summer):	Major Adverse	Moderate Adverse

25. View from Newtown Cemetery, looking south

Distance from
Scheme centreline: 820m
Orientation: South
Field of view: 70°
OS Reference: 117 920

Whilst the Scheme would pass through the countryside seen in this view, much of it would be screened by existing topography. However there would be a visible section where the route cuts across the scarp slope in the centre-right of the scene, much of it on embankment. This section would be initially visually contradictory to the prevailing landform, but would in time be softened by the establishment of mitigation woodland planting on the constructed slopes.

Visual Sensitivity: Medium

Receptor Sensitivity: Medium (Visitors, Mourners)

Phase	***Magnitude of Visual Effect***	***Scale of Visual Impact***
Construction:	Moderate Adverse	Moderate Adverse
Year 1:	Moderate Adverse	Moderate Adverse
Year 15 (Winter):	Slight Adverse	Minor Adverse
Year 15 (Summer):	Slight Adverse	Minor Adverse
Phase	***Visual Impact Significance (Receptor Sensitivity –***	

Construction:	Moderate Adverse	
Year 1:	Moderate Adverse	
Year 15 (Winter):	Minor Adverse	
Year 15 (Summer):	Minor Adverse	

26. View from PROW FP22/ Wern Ddu Lane

Distance from Scheme centreline: *230m*
Orientation: *West-southwest*
Field of view: *90°*
OS Reference: *124 915*

The Scheme would pass through the area seen in this view, but again would be largely screened by the undulating topography. The only visible section would be in the group of trees and hedge boundaries to the left of the scene, where it would be at-grade or on a low embankment. Established mitigation hedgerows and planting would screen traffic in summer months but in winter or at night there would be more potential for visual effects. In particular the Kerry Road Roundabout would be lit and whilst not directly visible would introduce artificial lighting into an otherwise dark countryside scene.

Visual Sensitivity: High

Receptor Sensitivity: High (Walkers), Medium (Road Users)

Phase	***Magnitude of Visual Effect***	***Scale of Visual Impact***
Construction:	Moderate Adverse	Major Adverse
Year 1:	Moderate Adverse	Major Adverse
Year 15 (Winter):	Slight Adverse	Moderate Adverse
Year 15 (Summer):	Slight Adverse	Moderate Adverse
Phase	***Visual Impact Significance (Receptor Sensitivity – High)***	***Visual Impact Significance (Receptor Sensitivity – Medium)***
Construction:	Substantial Adverse	Major Adverse
Year 1:	Substantial Adverse	Major Adverse
Year 15 (Winter):	Major Adverse	Moderate Adverse
Year 15 (Summer):	Major Adverse	Moderate Adverse

27. View from A489 Kerry Road

Distance from Scheme centreline: *320m*
Orientation: *West*
Field of view: *70°*
OS Reference: *124 911*

This view looks down onto a side valley through which the Scheme would cross, passing across the centre of the view, between foreground trees and hedgerows. The Scheme would be largely at-grade but with a roundabout junction in the centre of the scene, with embankment slopes on its southern side. The viewing angle would mean that hedgerows planted for mitigation would not entirely screen traffic in the view. In addition lighting around the roundabout would introduce an urban element into an existing rural scene, distinct from Newtown beyond.

Visual Sensitivity: High

Receptor Sensitivity: Medium (Road Users)

Phase	Magnitude of Visual Effect	Scale of Visual Impact
Construction:	Substantial Adverse	Substantial Adverse
Year 1:	Substantial Adverse	Substantial Adverse
Year 15 (Winter):	Moderate Adverse	Major Adverse
Year 15 (Summer):	Moderate Adverse	Major Adverse
Phase	**Visual Impact Significance (Receptor Sensitivity –**	
Construction:	Substantial Adverse	
Year 1:	Substantial Adverse	
Year 15 (Winter):	Major Adverse	
Year 15 (Summer):	Major Adverse	

28. View from Upper Dolfor Road looking south

Distance from
Scheme centreline: 60m
Orientation: South-southwest
Field of view: 60°
OS Reference: 107 903

In this view the Scheme would comprise an overbridge carrying Upper Dolfor Road over the mainline which would be crossing right to left from a major underbridge to a cutting. The Scheme would include the loss of the lane's hedge boundaries and introduction of safety barriers. This would result in a distinct urbanisation of the scene, which would not be significantly reduced through mitigation planting.

Visual Sensitivity: Medium

Receptor Sensitivity: High (Residents), Medium (Road Users)

Phase	Magnitude of Visual Effect	Scale of Visual Impact
Construction:	Substantial Adverse	Major Adverse
Year 1:	Substantial Adverse	Major Adverse
Year 15 (Winter):	Substantial Adverse	Major Adverse
Year 15 (Summer):	Substantial Adverse	Major Adverse
Phase	**Visual Impact Significance (Receptor Sensitivity – High)**	**Visual Impact Significance (Receptor Sensitivity – Medium)**
Construction:	Substantial Adverse	Major Adverse
Year 1:	Substantial Adverse	Major Adverse
Year 15 (Winter):	Substantial Adverse	Major Adverse
Year 15 (Summer):	Substantial Adverse	Major Adverse

29. View from A483 Pool Road heading east

Distance from
Scheme centreline: 0m
Orientation: East
Field of view: 80°
OS Reference: 128 921

The Scheme would change this view with Pool Road diverted to the south and passing under a new underbridge structure carrying the mainline, on a large embankment. The significant mature

trees to the right of the view would be lost, as would the agricultural building. During construction the view would be significantly adversely changed, although with time mitigation woodland planting would moderate the detractive effects, screening traffic on the bypass. The scale of the main embankment would result in a significant depth of woodland planting, meaning that in summer the impact of traffic, structures and highway infrastructure would be much reduced.

Visual Sensitivity: Medium

Receptor Sensitivity: Medium (Road Users)

Phase	***Magnitude of Visual Effect***	***Scale of Visual Impact***
Construction:	Substantial Adverse	Major Adverse
Year 1:	Substantial Adverse	Major Adverse
Year 15 (Winter):	Moderate Adverse	Moderate Adverse
Year 15 (Summer):	Slight Adverse	Minor Adverse
Phase	***Visual Impact Significance (Receptor Sensitivity –***	
Construction:	Major Adverse	
Year 1:	Major Adverse	
Year 15 (Winter):	Moderate Adverse	
Year 15 (Summer):	Minor Adverse	

30. View from A483 Pool Road heading west

Distance from Scheme centreline: *50m*
Orientation: *East-northeast*
Field of view: *60°*
OS Reference: *133 921*

As with View 29 the Scheme would change this scene, with the A483 moved north to meet a new roundabout junction, in the field to the right. From the junction the bypass route would climb on embankment to the south, through the line of the existing mature trees. Pool Road would leave the roundabout and pass under the bypass section. The roundabout would be lit, thereby introducing an urban character to the currently countryside scene. With mitigation planting elements of the Scheme would be screened but would still represent a major change in the scene, particularly the infrastructure associated with the roundabout junction.

Visual Sensitivity: Medium

Receptor Sensitivity: Medium (Road Users)

Phase	***Magnitude of Visual Effect***	***Scale of Visual Impact***
Construction:	Substantial Adverse	Major Adverse
Year 1:	Substantial Adverse	Major Adverse
Year 15 (Winter):	Moderate Adverse	Moderate Adverse
Year 15 (Summer):	Moderate Adverse	Moderate Adverse
Phase	***Visual Impact Significance (Receptor Sensitivity –***	
Construction:	Major Adverse	
Year 1:	Major Adverse	
Year 15 (Winter):	Moderate Adverse	
Year 15 (Summer):	Moderate Adverse	

In summary the Scheme would result in a range of visual effects and impacts, determined by distance, aspect, elevation and intervening topography and vegetation. In addition some views are seen by a range of receptors of differing sensitivity, resulting in different visual impact significance. In most cases mitigation planting would reduce visual impact over time, but there

are certain views where this would not be the case. The pattern of impact significance is summarised in Table 7.4.3 below including different receptor impacts where relevant.

Table 7.4.3 – Summary of Visual Impact Significance

Key View	Visual Impact Significance (Adverse)			
	Constructio	Year 1	Winter Yr 15	Summer Yr 15
1 From Pen-y-shwa Lane to the south	Major	Major	None	None
2 From the Severn Way, west of Bryn House	Substantial	Substantial	Major	Major
3 From PROW FP3 east of Bryn House	Moderate	Moderate	None	None
4 From the junction of Bryn Gardens/ Bryn Street	Moderate	None	None	None
	Minor	None	None	None
5 Looking south from Coed-y-Ffridd	Major	Major	Moderate	Moderate
	Moderate	Moderate	Minor	Minor
6 From Llanfair Road entering Newtown	Moderate	Moderate	Minor	Minor
7 From Primrose Drive, Llanllwchaiarn	Major	Major	Moderate	Moderate
	Moderate	Moderate	Minor	Minor
8 From PROW FP28 along the southern side of Porthouse Wood	Major	Major	None	None
9 From A489 approaching Newtown from west	Not Significant	Not Significant	Not Significant	Not Significant
10 From A489 leaving Newtown heading west	Major	Major	Moderate	Moderate
11 From PROW 2 west of Glandulas Holiday Home Park	Substantial	Substantial	Major	Major
12 From Chapel Close, Stepaside	Major	Major	None	None
13 From Mochdre Bridge, Mochdre Lane	Substantial	Substantial	Substantial	Substantial
	Major	Major	Major	Major
14 From footpath south of Heol Pengwern	Not Significant	None	None	None
15 From green space at Maesyrhandir	Moderate	Moderate	Not Significant	Not Significant
16 From footpath crossing the hill north of Lon Ceirios	Major	Moderate	None	None
17 From the hill south of Garth Owen	Substantial	Substantial	Major	Major
18 From Newtown High School entrance	Minor	Minor	None	None
19 Looking south from Middle Dolfor Road	Substantial	Substantial	Substantial	Substantial
	Major	Major	Major	Major
20 Looking north from Middle Dolfor Road	Substantial	Substantial	Substantial	Substantial
	Major	Major	Major	Major
21 From Ceiriog, Heol Treowen	Substantial	Substantial	Substantial	Substantial
22 From PROW FP14, south of Heol Treowen	Substantial	Substantial	Substantial	Substantial
23 From PROW FP14, Upper Brimmon Farm	Substantial	Substantial	Major	Major
24 From Cefn-y-faesdre to Upper Blackhill Rd looking north	Substantial	Substantial	Major	Major
	Major	Major	Moderate	Moderate
25 From Newtown Cemetery, looking south	Moderate	Moderate	Minor	Minor
26 From PROW FP22/ Wern Ddu Lane	Substantial	Substantial	Major	Major
	Major	Major	Moderate	Moderate
27 From A489 Kerry Road	Substantial	Substantial	Major	Major
28 From Upper Dolfor Road looking south	Substantial	Substantial	Substantial	Substantial
	Major	Major	Major	Major

29 From A483 Pool Road heading east	Major	Major	Moderate	Minor
30 From A483 Pool Road heading west	Major	Major	Moderate	Moderate

7.4.4. Visual Impact on Affected Properties

The approach to visual impact assessment is similar to the assessment of landscape and townscape, through consideration of the identified properties or group of properties likely to be affected by the Scheme as a consequence of being within the Zone of Visual Influence.

The baseline quality and character of the existing visual amenity available at each property is described in Volume 3, Appendix D.3, along with an assessment of the resulting impact from the Scheme at completion in Year 1, and in Winter and Summer in Year 15.

The affected properties, or groups of properties, are illustrated in Volume 2, Figures 7.11a -b, along with a colour-coded indication of the resulting visual impact in winter in Year 15.

The assessment indicates that of the 217 individual properties assessed the majority would suffer no visual impact by Year 15. Those that do would be those closest to the route and particularly those adjacent to structures and roundabout junctions. In winter Year 15 there would be 13 No. properties with a Substantial visual impact, 38 No. with a Moderate impact and 30 No. with a Slight impact, leaving 136 No. with No Change.

7.5. Proposed Mitigation

7.5.1. Construction mitigation

During construction operations landscape and visual impacts would arise from both changes to the landscape and the impact of particular activities. These could include exposed earthworks, temporary construction compounds, scaffolding structures, site lighting, and temporary fencing, spoil heaps, cranes and construction traffic movement. Whilst it would not be possible to fully mitigate the effect of moving and operating site vehicles there are a number of other measures which could reduce adverse effects.

- Careful siting of site offices, compounds and car parks, with screen bunds around sensitive perimeters, grass seeded to provide appropriate screening.
- Consideration of material and colours for temporary fencing etc., whilst taking account of safety requirements.
- Sensitive design and placing of site signage, in order to provide the required information whilst limiting wider landscape and visual impacts.
- Control of site lighting, minimising light-spill beyond the required area.
- Retain existing vegetation in particular mature vegetation wherever possible. Tree protection to be undertaken wherever necessary.
- Programme planning to ensure exposed earthworks are re-vegetated as soon as possible to accelerate landscape integration.
- Temporary seeding of topsoil and subsoil storage heaps.
- Offsite planting on individual land owners land by agreement where localised visual benefits would be achieved

7.5.2. Operational mitigation

During construction mitigation measures would be provided to remove or reduce adverse landscape and visual effects arising during the operational phase, from the highway itself, associated earthworks and structures, traffic movement and lighting. These landscape mitigation objectives are set out in greater detail in the Landscape Strategy. (Refer to Volume 3, Appendix D.4).

This strategy also sets out the potential range of landscape mitigation elements including the planting of broadleaf woodland and woodland edge mixes, native mixed-species hedgerows, individual trees, species-rich and amenity grassland, earthworks such as false cuttings, and finishes treatments to structures. Where earthworks result in exposed rock a number of approaches could be taken depending on the nature and degree of fracturing, including soil placement, reusing an existing seed bank, hydroseeding with herb or shrub species, and allowing natural weathering and regeneration.

The retention of existing trees, woodland and hedgerows would be a key component of mitigating adverse impacts. Opportunities for the early translocation of vegetation would also be sought, particularly with those species appropriate for coppicing, such as hazel, hawthorn, blackthorn and willow, and where suitable receptor sites can be identified.

The proposed landscape mitigation measures, for the Scheme from west to east are described below and are illustrated in Volume 2, Figures 7.12a-m.

Volume 2, Figures 7.13a-g show representative photomontages illustrating the effects of the Scheme and mitigation measures on selected views. These indicate the views as existing, in Year 1 following completion and in Year 15 with established mitigation.

Western arm of western A489 tie-in – A489 Llanidloes Road Roundabout (Figure 7.12a)

On approaching the roundabout from the west along the existing A489, the Scheme would be approximately 4m above the existing ground level. Proposed broadleaf woodland planting on either side would screen the road corridor during the summer months, and would tie into the existing wooded scarp slope to the south and riverside tree belts to the north. The existing hedge boundaries along both sides of the existing A489 to the north would be retained, and the remnant field between the existing and proposed roads made available for drainage attenuation. The new roundabout itself would have a designed landscape treatment, with standard trees marking its function as a western gateway to Newtown.

Eastern arm of western A489 tie-in – A489 Llanidloes Road Roundabout (Figure 7.12a – b)

On approaching the roundabout travelling south west along the existing A489 from Newtown the road corridor would be enclosed by a narrow margin of woodland planting, with a new field hedgerow to the south along the toe of the small embankment. To the north the retained A489 hedgerow would mark the Scheme boundary behind the woodland strip. There would be an open grass area around a side road junction on the northern side.

Chainage 0 – 220 (Figure 7.12c)

Travelling south east from the A489 Llanidloes Road Roundabout the carriageway would be within cutting, approximately 4-5m deep. The cutting slopes would be planted in broadleaf woodland, and on the western side this would abut existing woodland. False cuttings up to 3m high would provide visual screening on both sides of the Scheme to help screen the adjacent Holiday Home Park. An overbridge would cross the highway cutting and to the east of the Scheme the approach track would be on embankment, with the northern face in woodland. Beyond the embankment and to the south this track would be bounded by hedges with individual trees. Along the Scheme south of the overbridge the cutting slopes reduce to existing ground level, but with a margin of proposed woodland and hedgerow boundaries continuing to enclose the corridor.

Chainage 220 – 480 (Figure 7.12c)

From Ch 220 the cutting would become deeper, 15m in depth. Between Ch 300-450 exposed rock would be apparent on the lower profile of the cutting slopes, with woodland planting above on the upper slopes. The outer scheme boundary would be marked by a native hedgerow. Depending on the nature of the exposed rock a degree of vegetation would be achieved through soil placement and/or hyroseeding. From Ch 410 to the north and Ch 370 to the south a 2m high acoustic barrier would be provided.

Chainage 480 – 700 (Figure 7.12c)

Continuing east, the Scheme would emerge from cutting onto embankment, approximately 12m above existing ground level as it approaches Mochdre Brook at Ch. 550. Woodland planting would be planted on both sides of the carriageway, reducing the visually apparent extent of the

proposed Mochdre Bridge. Masonry cladding to the abutment walls would assist in integrating the structure into the landscape, with screen planting in front. An access road under the bridge, west of the brook, and Coleg Powys Underpass to the east of the new bridge would necessitate breaks in the woodland planting. Along the toe of embankment slopes the highway boundary would be delineated by native species hedgerows, which would tie into the prevailing field pattern. The 2m acoustic barrier would continue on both sides, reducing to 1m high as it cross the bridge structure.

Chainage 700 – 1150 (Figure 7.12c – d)

This section of the Scheme would traverse the valley side, with predominantly cutting slopes on the southern side, up to 6m high, and a combination of embankments and minor cuttings to the north. Woodland planting would be provided to both cutting and embankment slopes through this section, screening the highway and its traffic. Beyond Ch 1000 the Scheme would be raised on embankment on both sides, up to 16m high to the north of the Scheme, and again here woodland planting would enclose the road corridor. Hedge planting would follow the outer highway boundary, re-establishing and integrating with the field boundary pattern.

Chainage 1150 – 1480 (Figure 7.12d)

Between Ch1150 and 1320 there would be a steep cutting on the southern side of the Scheme, up to 28m deep, predominantly in exposed rock. The treatment of this face would be dependent upon the nature and degree of fracturing of the rock. However the landscape objective would be to create a naturalistic character, and encouraging an appropriate pattern of re-vegetation. Where the extent of exposed rock allows woodland planting would be provided to integrate with the existing broadleaf woodland to the south. The southern cutting face would continue to the east, but here would be entirely planted in woodland species. On the northern side a 2m acoustic barrier in combination with a belt of mitigation woodland would screen highway traffic from views from the north, with a hedge tying in to the existing pattern of field boundaries.

Chainage 1480 – 2020 (Figure 7.12d – e)

Through this section the Scheme would continue to cross the relatively steep valley slopes, resulting in the southern side being at grade or on a low embankment, up to approximately 3m, whilst the northern side would be on embankment up to 15m high. The grassed southern slopes would be planted with intermittent trees and bounded by a field hedgerow, whilst to the north the corridor would be enclosed by woodland planting along its entire length. Between Ch 1550 and 1700 a false cutting around the layby would strengthen the screening of views from the north. New field hedgerows would mark the highway boundary on both sides of the Scheme.

Chainage 2020 – 2500 (Figure 7.12e – g)

This section of the Scheme would include the A483 Dolfor Road Roundabout. From the west the Scheme would be on embankment, up to 15m above existing ground level, with woodland planting on both the northern and southern side slopes.

The A483 roundabout would be located within a bowl form, surrounded by cutting slopes. The lower slopes would be in open grassland with intermittent trees, with woodland on the upper slopes. The roundabout itself would be planted with individual trees creating a designed gateway character. To the southwest and northwest of the roundabout the remnant land between the top of cutting and existing A483 would be planted in woodland to provide further mitigation of the landscape impacts of the roundabout lighting.

To the east of the roundabout the Scheme would enter a cutting through an existing hill, up to 23m deep. Again the lower slopes would be grassland and planted with only intermittent trees, and with woodland on the upper cuttings, entirely enclosing the road corridor and screening views from outside. However the scale of the cutting allows this to be achieved whilst maintaining an open unplanted character either side of the highway.

A483 Southern Tie-in to Lower Dolfor Road Roundabout (Figure 7.12e – g)

Between the A483 and the southern tie-in the Scheme would be largely in cutting, up to 4m deep, with woodland and hedgerow planting along the brow of the slope and grass with intermittent trees on the lower slopes. The southern end of the Scheme tie-in would be on a minor open embankment bordered by hedgerows, reflecting the existing road corridor character.

To the north of the A483 Dolfor Road Roundabout the link into Newtown would be in cutting as far as the Lower Dolfor Road Roundabout, cutting across the northern face of an existing hill, and therefore whilst the southern cutting slopes would be up to 13m deep, those on the northern side would only be approximately 3m in depth. On both sides of the road the lower slopes would be open grassland with intermittent trees, with the upper slopes and crests planted in woodland.

Lower Dolfor Road Roundabout to Newtown (Figure 7.12g)

This short section of the Scheme would include both the Lower Dolfor Road Roundabout, which would be slightly elevated above existing ground level, and the linking section tying in to the Dolfor Road into Newtown. This latter part would be approximately at grade with the existing level to the east, but elevated above the fields to the west with wooded embankment slopes. This would provide screening of the Scheme and its traffic for the nearest properties in Garth Owen to the north. A block of woodland planting to the east of the roundabout would also filter views from the elevated properties on Upper Dolfor Road. However the effect of the roundabout lighting and the noise fence on the surrounding area would not be fully mitigated by proposed planting. The design of the roundabout island would be developed in detail as a gateway location, with a more formal approach. An attenuation pond would be located to the north of the roundabout with associated planting to both integrate it into the landscape and maximise habitat benefits.

Lower Dolfor Road Roundabout to Mochdre Industrial Estate (Figure 7.12g)

This linking section of the Scheme would be on a low embankment, with open slopes to the south bounded by a hedgerow, and woodland planting on the embankment slope to the north, tying into the existing scrub woodland and providing screening of views from the edge of the Garth Owen estate. The existing hill adjacent to this link section further west provides total screening of the Scheme from residential areas to the north. At its western extent this section would link up with the Mochdre Industrial Estate road, and therefore would adopt its highway character with open verges and grouped tree planting.

Chainage 2500 – 2630 (Figure 7.12f)

The Dolfor Underbridge would cross the narrow valley known as the Dingle, passing some 18m above Middle Dolfor Road. Whilst there would be some new woodland planting adjacent to the bridge abutments the primary mitigation measure would be to maximise the retention of existing mature trees. This established woodland would limit the visual impact of the bridge deck in views from within the valley floor, whilst the narrow valley form would screen the structure from the wider landscape.

The 3-span bridge form would require two support piers in the valley floor, but this allows shallower bridge beams to create a visually lighter form.

Chainage 2630 – 3180 (Figure 7.12f – h)

The Scheme would be within a deep cutting in this section, with 21m high slopes to the south and 10m to the north. The northern slope would be open grassland with groups of individual trees, and bounded on its crest by a hedgerow. The southern cutting face would include an area of exposed rock along its lower margins, with woodland planting above, and again bounded by a hedgerow.

Chainage 3180 – 3900 (Figure 7.12h – i)

The Scheme would be elevated on embankment up to 21m above the adjacent ground level, and therefore the side slopes would be planted in woodland in order to screen both the built earthworks and the Scheme traffic. There would be a false cutting between Ch 3060 – 3420. The northern face of this false cutting would be graded back to the adjacent field level and returned to agricultural use. A false cutting and a short section of acoustic barrier up to 2m high would also be provided between Ch 3500-3850 to the south of the Scheme. Where open fields are adjacent the outer boundary of the woodland planting, and the toe of embankment, would be marked by a native species hedgerow, re-establishing the field pattern. Adjacent existing woodland similar planting for mitigation would be undertaken to help integrate the Scheme into the surrounding landscape.

Chainage 3900 – 4300 (Figure 7.12i)

Through this section the Scheme would be largely within cutting, up to 15m deep on the southern side and 10m to the north. Much of the lower slopes would be in grass other than those areas where rock is exposed. The upper slopes would be planted in woodland with hedgerows along the crest. The cutting form would screen the Scheme traffic from the potential long views from the north, whilst the depth allows open slopes to be maintained either side of the highway corridor.

Chainage 4300 – 4700 and Kerry Road Roundabout to the A489 northern county road tie-in (Figure 7.12j)

This section would include Kerry Road Roundabout and the mainline largely at grade or on low embankment. Narrow margins of woodland planting and hedgerows would line the road corridor providing a degree of screening of the road and its traffic. However the roundabout would be lit, introducing an urban character to the rural landscape which the mitigation planting would not significantly reduce.

Kerry Road Roundabout to the A489 county road southern tie-in (Figure 7.12j)

South of the Kerry Road roundabout the Scheme would tie in to the existing road on embankment, but with a depth of woodland planting on both sides. Consequently the traffic would be screened, as would the artificial landform, particularly from the adjacent Lower Brimmon Farm east of the road. An attenuation pond west of the Scheme would be enclosed by hedgerows and integrated with woodland planting.

Chainage 4700 – 5200 (Figure 7.12j – k)

This section of the Scheme would be in cutting, up to 10m deep, with the landscape treatment being generally open grass slopes with scattered individual trees, and with the crest of the cutting bounded by hedgerows. The Wern Ddu Overbridge would cross at Ch 4900, and here woodland planting would screen the bridge abutments, reducing its visual impact from within and outside the road corridor. The depth of the cutting through this section would allow extensive blocks of woodland to be avoided, which are not consistent with the prevailing landscape.

Chainage 5200– 5400 (Figure 7.12k – l)

This section of the Scheme would cross the prevailing topography such that on its western side it would be close to at-grade but to the east would be on embankment. A false cutting from Ch 5200 – 5400 on the southern side of the lay-by would provide some screening from lay-by traffic. Woodland planting on the eastern slopes would screen the earthworks form and hedgerows on both sides would re-establish an adjacent field pattern.

Chainage 5400 – Eastern A483 Pool Road Roundabout (Ch5850) (Figure 7.12l – m)

The Scheme would cross over both the railway line and Pool Road with underbridges in this section, and therefore the road would be elevated on embankments up to 13m high. Both faces of the embankment would be planted in mitigation woodland, screening the scale of the earthworks, the bridge abutments and highway traffic. To the north of the Pool Road Underbridge woodland planting would also provide screening for views from the group of properties at Glan Hafren. Planting either side of the bridge structures would narrow the perceived opening and therefore reduce the visual impact of these structures on the approaches and from wider views.

Eastern A483 Pool Road Roundabout (Ch5850) – eastern tie-in (Figure 7.12m)

Whilst the roundabout would be approximately level with the fields to the north, a false cutting and associated planting would provide screening of the highway and its traffic, particularly for the properties to the north. The highway infrastructure, island landscape treatment and lighting would create an urban character around the roundabout junction itself, but the woodland planting around would contain this effect. To the east of the junction the Scheme would be on embankment, with the side slopes planted in woodland. The northern boundary of this section would be defined by a hedgerow, tying into the existing field pattern and A483 boundary.

Eastern A483 Roundabout (Ch5850) – Pool Road tie-in (Figure 7.12l – m)

Travelling westbound from the roundabout the Pool Road link would be within a small cutting before passing under the bridge carrying the bypass. This section would have a landscape

treatment of individual trees in a semi-formal arrangement in order to create a gateway character, as the eastern approach to Newtown. The detailed design would be developed through community engagement and liaison. Where the Scheme would tie-in to the existing Pool Road an embankment slope would be required on its northern side. This would be planted in woodland and in combination with a proposed hedgerow would provide a degree of screening of traffic for views from across the valley.

7.6. Summary and Conclusions

The landscape of the Newtown area is generally an attractive one, characterised by its rural nature and by the dominant valley topography. None of the landscape character areas defined are of less than Medium Quality or Sensitivity.

The townscape of Newtown itself shows a greater range of Quality and Sensitivity, arising from architectural and age diversity, with some particularly high quality areas in the town core.

The selected representative key views illustrate the predominantly attractive nature of the study area, with only a small proportion being assessed as less than Medium Quality or Sensitivity.

In assessing the visibility of the Scheme in the landscape it is worth noting how the prevailing topography would assist in integrating the Scheme into the landscape, particularly the effect of narrow side valleys and the stepped form of the southern valley slopes. Consequently the Scheme would be screened entirely from parts of the valley floor, with the outer Zone of Visual Influence limited largely by the upper valley edges.

It is those landscape character areas which would be physically altered by the Scheme where long-lasting significant impacts would occur. Impacts that would result from the introduction of engineered forms into a rural landscape context and the associated changes in landform.

None of the townscape character areas would be directly affected by the Scheme, and many would be largely visually separated from much of it. In most cases those that would be closest to the route are industrial areas, with a low sensitivity. As a result almost none of the townscape areas would suffer a lasting significant impact, with the only one to do so being a residential area (TCA 27 Glandulas Drive) which is adjacent to the Scheme.

The impact on views within the study would be quite variable and are influenced by a range of factors. However there would be significant residual effects on a number of representative views, particularly those that would be in close proximity to elevated bridge structures and those where the affected view is of an unspoilt rural scene.

The affected properties assessment illustrates that the Scheme would have a relatively narrow corridor of influence with the most significantly affected properties being those closest to the proposed route or where elevation would provide more open views to the Scheme. In general the proposed mitigation measures would reduce the visual impact over time, although the assessment illustrates that this would be less effective where visible structures would be provided, such as at Mochdre Bridge or The Dingle, or where roundabout junctions and their infrastructure would be introduced. At Year 15 only a small number of properties with long distance views of the Scheme would suffer any residual visual impact and this would be only Slight.

The proposed mitigation measures would enhance the integration of the Scheme into the landscape through manipulation of the landform and the provision of extensive planting. However significant changes in the landscape and its appearance would be unavoidable and therefore in many cases the mitigation would achieve a reduction in adverse effects rather than their removal.

The Scheme would result in adverse effects on both the landscape and visual amenity, although the scale and significance of these changes would be reduced through both the prevailing topography and the proposed mitigation measures.

There is no impact of the Scheme on the policies and plans identified in Section 7.1.2.

Table 7.6.1 – Summary of Impacts in Relation to Landscape

Year 1 provides magnitude of impact prior to mitigation,
Year 15 provides magnitude and significance following mitigation

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation
Construction Impacts				
1 Northern Rolling Hills/Slopes	Change in visual context only	Slight Adverse	Slight Adverse	Minor Adverse
2 Northern Scarp Slope	Change in visual context only	Slight Adverse	Slight Adverse	Moderate Adverse
3 Eastern River Corridor	Direct impact from eastern tie-in	Moderate Adverse	Moderate Adverse	Moderate Adverse
4 Llanllwchaiarn	Change in visual context only	Slight Adverse	Slight Adverse	Minor Adverse
5 Valley Mouth	Direct impact	Substantial Adverse	Substantial Adverse	Major Adverse
6 Enclosed Valley	Direct impact	Substantial Adverse	Substantial Adverse	Substantial Adverse
7 Plateau	Direct impact	Substantial Adverse	Substantial Adverse	Substantial Adverse
8 Undulating Slopes	Direct impact	Substantial Adverse	Substantial Adverse	Substantial Adverse
9 Confluence	Direct impact	Substantial Adverse	Substantial Adverse	Major Adverse
10 South Western Valley Slopes	Direct impact	Substantial Adverse	Substantial Adverse	Substantial Adverse
11 South Scarp Slope	Change in visual context only	Slight Adverse	Slight Adverse	Moderate Adverse
12 South Eastern Valley Slopes	Change in visual context only	Slight Adverse	Slight Adverse	Minor Adverse
13 Western River Corridor	Direct impact, but only on southern edge	Slight Adverse	Slight Adverse	Moderate Adverse
1 North Longbridge	Change in visual context only	Slight Adverse	Slight Adverse	Moderate Adverse
2 Bryn Lane & Infirmary	Change in visual context only	Slight Adverse	Slight Adverse	Minor Adverse
5 Covered Reservoir and Latham Park	Change in visual context only	Slight Adverse	Slight Adverse	Minor Adverse
15 Cemetery, Sports Ground and Golf Course	Change in visual context only	Slight Adverse	Slight Adverse	Minor Adverse
18 Heol Treowen Estate	Change in visual context only	Slight Adverse	Slight Adverse	Not significant
19 Heol Treowen - West	Change in visual context only	Slight Adverse	Slight Adverse	Not significant
20 Newtown High School and Leisure Centre	Change in visual context only	Slight Adverse	Slight Adverse	Not significant
21 Garth Owen Estate	Change in visual context only	Slight Adverse	Slight Adverse	Minor Adverse
22 Maesyrhandir Estate	Change in visual context only	Slight Adverse	Slight Adverse	Not significant
26 Mochdre Industrial Estate	Change in visual context only	Moderate Adverse	Moderate Adverse	Minor Adverse
27 Glandulas Drive	Change in visual context only	Moderate Adverse	Moderate Adverse	Moderate Adverse
28 Maesyrhandir Green Corridor	Change in visual context only	Moderate Adverse	Moderate Adverse	Moderate Adverse
1 From Pen-y-shwa Lane to the south	Residents, walkers	Slight Adverse	Slight Adverse	Major Adverse
2 From the Severn Way west of Bryn House	Walkers	Moderate Adverse	Moderate Adverse	Substantial Adverse
3 From PROW FP3 east of Bryn House	Walkers	Slight Adverse	Slight Adverse	Moderate Adverse

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation
4 From Bryn Gardens/ Bryn Street	Residents	Slight Adverse	Slight Adverse	Moderate Adverse
	Road Users	Slight Adverse	Slight Adverse	Minor Adverse
5 Looking south from Coed-y-Ffridd	Residents	Moderate Adverse	Moderate Adverse	Major Adverse
	Road Users	Moderate Adverse	Moderate Adverse	Moderate Adverse
6 From Llanfair Road entering Newtown	Road Users	Moderate Adverse	Moderate Adverse	Moderate Adverse
7 From Primrose Drive, Llanllwchaiarn	Residents	Moderate Adverse	Moderate Adverse	Major Adverse
	Road Users	Moderate Adverse	Moderate Adverse	Moderate Adverse
8 From PROW FP28 south of Porthouse Wood	Walkers	Slight Adverse	Slight Adverse	Major Adverse
9 From A489 into Newtown from west	Road Users	Slight Adverse	Slight Adverse	Not significant
10 From A489 leaving Newtown heading west	Road Users	Substantial Adverse	Substantial Adverse	Major Adverse
11 From west of Glandulas Holiday Home Park	Walkers	Substantial Adverse	Substantial Adverse	Substantial Adverse
12 From Chapel Close, Stepaside	Residents	Slight Adverse	Slight Adverse	Major Adverse
13 From Mochdre Bridge, Mochdre Lane	Residents	Substantial Adverse	Substantial Adverse	Substantial Adverse
	Road Users	Substantial Adverse	Substantial Adverse	Major Adverse
14 From footpath south of Heol Pengwern	Residents	Slight Adverse	Slight Adverse	Not significant
15 From green space at Maesyrhandir	Residents, walkers	Moderate Adverse	Moderate Adverse	Moderate Adverse
16 From the hill north of Lon Ceirios	Walkers	Moderate Adverse	Moderate Adverse	Major Adverse
17 From the hill south of Garth Owen	Walkers	Substantial Adverse	Substantial Adverse	Substantial Adverse
18 From Newtown High School entrance	Pupils, road users	Slight Adverse	Slight Adverse	Minor Adverse
19 Looking south from Middle Dolfor Road	Residents	Substantial Adverse	Substantial Adverse	Substantial Adverse
	Road Users	Substantial Adverse	Substantial Adverse	Major Adverse
20 Looking north from Middle Dolfor Road	Residents	Substantial Adverse	Substantial Adverse	Substantial Adverse
	Road Users	Substantial Adverse	Substantial Adverse	Major Adverse
21 From Ceiriog, Heol Treowen	Residents	Substantial Adverse	Substantial Adverse	Substantial Adverse
22 From PROW FP14, south of Heol Treowen	Walkers	Substantial Adverse	Substantial Adverse	Substantial Adverse
23 From PROW FP14, Upper Brimmon Farm	Residents, walkers	Substantial Adverse	Substantial Adverse	Substantial Adverse
24 From Cefn-y-faesdre to Upper Blackhill Rd	Walkers	Moderate Adverse	Moderate Adverse	Substantial Adverse
	Road Users	Moderate Adverse	Moderate Adverse	Major Adverse
25 From Newtown Cemetery, looking south	Visitors, mourners	Moderate Adverse	Moderate Adverse	Moderate Adverse
26 From PROW FP22/ Wern Ddu Lane	Walkers	Moderate Adverse	Moderate Adverse	Substantial Adverse

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation
	Road Users	Moderate Adverse	Moderate Adverse	Major Adverse
27 From A489 Kerry Road	Road Users	Substantial Adverse	Substantial Adverse	Substantial Adverse
28 From Upper Dolfor Road looking south	Residents	Substantial Adverse	Substantial Adverse	Substantial Adverse
	Road Users	Substantial Adverse	Substantial Adverse	Major Adverse
29 From A483 Pool Road heading east	Road Users	Substantial Adverse	Substantial Adverse	Major Adverse
30 From A483 Pool Road heading west	Road Users	Substantial Adverse	Substantial Adverse	Major Adverse
Operational Impacts				
1 Northern Rolling Hills/Slopes	Change in visual context only	Slight Adverse	Negligible/No Change	None
2 Northern Scarp Slope	Change in visual context only	Slight Adverse	Negligible/No Change	None
3 Eastern River Corridor	Direct impact from eastern tie-in	Moderate Adverse	Slight Adverse	Minor Adverse
4 Llanllwchaiarn	Change in visual context only	Slight Adverse	Negligible/No Change	None
5 Valley Mouth	Direct impact	Substantial Adverse	Moderate Adverse	Moderate Adverse
6 Enclosed Valley	Direct impact	Substantial Adverse	Substantial Adverse	Substantial Adverse
7 Plateau	Direct impact	Substantial Adverse	Moderate Adverse	Major Adverse
8 Undulating Slopes	Direct impact	Substantial Adverse	Moderate Adverse	Major Adverse
9 Confluence	Direct impact	Substantial Adverse	Moderate Adverse	Moderate Adverse
10 South Western Valley Slopes	Direct impact	Substantial Adverse	Moderate Adverse	Major Adverse
11 South Scarp Slope	Change in visual context only	Slight Adverse	Negligible/No Change	None
12 South Eastern Valley Slopes	Change in visual context only	Slight Adverse	Negligible/No Change	None
13 Western River Corridor	Direct impact, but only on southern edge	Slight Adverse	Negligible/No Change	None
1 North Longbridge	Change in visual context only	Slight Adverse	Negligible/No Change	None
2 Bryn Lane & Infirmary	Change in visual context only	Slight Adverse	Negligible/No Change	None
5 Covered Reservoir and Latham Park	Change in visual context only	Slight Adverse	Negligible/No Change	None
15 Cemetery, Sports Ground and Golf Course	Change in visual context only	Slight Adverse	Negligible/No Change	None
18 Heol Treowen Estate	Change in visual context only	Slight Adverse	Negligible/No Change	None
19 Heol Treowen - West	Change in visual context only	Slight Adverse	Negligible/No Change	None
20 Newtown High School and Leisure Centre	Change in visual context only	Slight Adverse	Negligible/No Change	None
21 Garth Owen Estate	Change in visual context only	Slight Adverse	Negligible/No Change	None
22 Maesyrhandir Estate	Change in visual context only	Slight Adverse	Negligible/No Change	None
26 Mochdre Industrial Estate	Change in visual context only	Moderate Adverse	Negligible/No Change	None
27 Glandulas Drive	Change in visual context only	Moderate Adverse	Slight Adverse	Minor Adverse
28 Maesyrhandir Green Corridor	Change in visual context only	Moderate Adverse	Negligible/No Change	None
1 From Pen-y-shwa Lane to the south	Residents, walkers	Slight Adverse	Negligible/No Change	None

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation
2 From the Severn Way west of Bryn House	Walkers	Moderate Adverse	Slight Adverse	Major Adverse
3 From PROW FP3 east of Bryn House	Walkers	Slight Adverse	Negligible/No Change	None
4 From Bryn Gardens/ Bryn Street	Residents	Negligible/No Change	Negligible/No Change	None
	Road Users	Negligible/No Change	Negligible/No Change	None
5 Looking south from Coed-y-Ffridd	Residents	Moderate Adverse	Slight Adverse	Moderate Adverse
	Road Users	Moderate Adverse	Slight Adverse	Minor Adverse
6 From Llanfair Road entering Newtown	Road Users	Moderate Adverse	Slight Adverse	Minor Adverse
7 From Primrose Drive, Llanllwchaiarn	Residents	Moderate Adverse	Slight Adverse	Moderate Adverse
	Road Users	Moderate Adverse	Slight Adverse	Minor Adverse
8 From PROW FP28 south of Porthouse Wood	Walkers	Slight Adverse	Negligible/No Change	None
9 From A489 into Newtown from west	Road Users	Slight Adverse	Slight Beneficial	Not Significant
10 From A489 leaving Newtown heading west	Road Users	Substantial Adverse	Moderate Adverse	Moderate Adverse
11 From west of Glandulas Holiday Home Park	Walkers	Substantial Adverse	Moderate Adverse	Major Adverse
12 From Chapel Close, Stepaside	Residents	Slight Adverse	Negligible/No Change	None
13 From Mochdre Bridge, Mochdre Lane	Residents	Substantial Adverse	Substantial Adverse	Substantial Adverse
	Road Users	Substantial Adverse	Substantial Adverse	Major Adverse
14 From footpath south of Heol Pengwern	Residents	Negligible/No Change	Negligible/No Change	None
15 From green space at Maesyrhandir	Residents, walkers	Moderate Adverse	Slight Adverse	Not Significant
16 From the hill north of Lon Ceirios	Walkers	Slight Adverse	Negligible/No Change	None
17 From the hill south of Garth Owen	Walkers	Substantial Adverse	Moderate Adverse	Major Adverse
18 From Newtown High School entrance	Pupils, road users	Slight Adverse	Negligible/No Change	None
19 Looking south from Middle Dolfor Road	Residents	Substantial Adverse	Substantial Adverse	Substantial Adverse
	Road Users	Substantial Adverse	Substantial Adverse	Major Adverse
20 Looking north from Middle Dolfor Road	Residents	Substantial Adverse	Substantial Adverse	Substantial Adverse
	Road Users	Substantial Adverse	Substantial Adverse	Major Adverse
21 From Ceiriog, Heol Treowen	Residents	Substantial Adverse	Moderate Adverse	Substantial Adverse
22 From PROW FP14, south of Heol Treowen	Walkers	Substantial Adverse	Moderate Adverse	Substantial Adverse
23 From PROW FP14, Upper Brimmon Farm	Residents, walkers	Substantial Adverse	Moderate Adverse	Major Adverse
24 From Cefn-y-faesdre to Upper Blackhill Rd	Walkers	Moderate Adverse	Slight Adverse	Major Adverse
	Road Users	Moderate Adverse	Slight Adverse	Moderate Adverse

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation
25 From Newtown Cemetery, looking south	Visitors, mourners	Moderate Adverse	Slight Adverse	Minor Adverse
26 From PROW FP22/ Wern Ddu Lane	Walkers	Moderate Adverse	Slight Adverse	Major Adverse
	Road Users	Moderate Adverse	Slight Adverse	Moderate Adverse
27 From A489 Kerry Road	Road Users	Substantial Adverse	Moderate Adverse	Major Adverse
28 From Upper Dolfor Road looking south	Residents	Substantial Adverse	Substantial Adverse	Substantial Adverse
	Road Users	Substantial Adverse	Substantial Adverse	Major Adverse
29 From A483 Pool Road heading east	Road Users	Substantial Adverse	Slight Adverse	Minor Adverse
30 From A483 Pool Road heading west	Road Users	Substantial Adverse	Moderate Adverse	Moderate Adverse

8. Nature Conservation

8.1. Introduction

8.1.1. General

This chapter describes the Ecology and Nature Conservation assessment of the Scheme.

The chapter summarises key nature conservation legislation and policy, describes the survey and assessment methodologies used, describes the baseline conditions and evaluates the nature conservation resources on the route of the Scheme. The chapter identifies and assesses the significance of effects the Scheme would have on nature conservation, outlines mitigation measures to reduce/remove identified effects, and finally identifies and assesses any residual effects the Scheme would have after implementation of the mitigation measures described. A summary of the impacts is provided in Table 8.7.1 at the end of this chapter.

Refer to Volume 2 Figure 8.1 (a – b) for the ecological designations and Volume 2, Figure 8.2 (a – i) for the results of the Phase 1 Habitat Survey. Volume 2 Figure 8.3 (a – d) shows the ecological constraints and as it contains sensitive information relating to protected species, the figures will not available to the public.

8.1.2. Policy context

8.1.2.1. Key Legislation

This section summarises the key legislation in relation to nature conservation and ecology, which primarily concerns protected sites and protected species.

Conservation of Habitats and Species Regulations 2010 (as amended)

The Conservation of Habitats and Species Regulations 2010 (as amended)[8.1] transposes Council Directive 92/43/EEC[8.2] on the conservation of natural habitats and of wild fauna and flora (EC Habitats Directive) into national law. The Regulations provide for the designation and protection of European sites and the protection of European protected species as listed in the EC Habitats Directive and EC Birds Directive (Council Directive 2009/147/EC)[8.3]. The regulations provide guidance on undertaking assessment of impacts on European Protected Sites (Special Areas of Conservation - SACs, Special Protection Areas – SPAs and Ramsar sites) through the Habitats Regulations Assessment process.

Wildlife and Countryside Act 1981 (as amended)

The Wildlife and Countryside Act (WCA) [8.4] governs the designation and protection of Sites of Special Scientific Interest (SSSI) and National Nature Reserves (NNR), and protection of various plant and animal species. Schedule 1 of the Act lists protected bird species, Schedule 5 lists other protected animal species, and Schedule 8 lists protected plant species. Schedule 9 of the Act lists invasive alien species which it is an offence to introduce or allow to spread.

The Countryside and Rights of Way (CRoW) Act, 2000

The CRoW Act[8.5] further enhances protection given to some species through the WCA by introducing an offence of recklessly disturbing a schedule 5 animal. It also provides further protection and guidance regarding the protection of SSSIs.

The CRoW Act required the compilation of a list of species and habitats of principal importance for biodiversity in Wales, though this was superseded by the NERC Act (see below).

Natural Environment and Rural Communities (NERC) Act, 2006

Of particular relevance from the NERC Act[8.6] is the following duty contained within Section 40 "Every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity". Section 40 (3) further states that “Conserving biodiversity includes, in relation to a living organism or type of habitat, restoring or enhancing a population or habitat”.

Section 42 of the NERC Act also updated the requirement for a list of species and habitats of principal importance for conservation of biological diversity in Wales.

The Water Environment (Water Framework Directive) (England and Wales) Regulations (2003)

These regulations[8.7] are the transposition into UK legislation of the EU Water Framework Directive (Council Directive 2000/60/EC)[8.8]. The basic principles are the following:

- Enhance the status and prevent further deterioration of aquatic ecosystems and associated wetlands, which depend on the aquatic ecosystems.
- Promote the sustainable use of water.
- Reduce pollution of water, especially by 'priority' and 'priority hazardous' substances.
- Ensure progressive reduction of groundwater pollution.

The Protection of Badgers Act (1992)

This legislation[8.9] protects badgers against wilful killing, injury or ill-treatment, and disturbance in their setts, and also prohibits interference with or obstruction of badger setts. Although primarily intended to protect badgers against deliberate persecution, the legislation is also relevant in the context of development work.

The Hedgerows Regulations (1997)

This legislation[8.10] governs the assessment and protection of hedgerows, although it should be noted that the Scheme is exempt from these regulations as it is a highway scheme.

Wild Mammals Protection Act, 1996

This act[8.11] operates in parallel with legislation listed above conferring specific protection on rare or threatened mammal species, by protecting all wild mammals from any actions intended to cause unnecessary suffering.

8.1.2.2. Key Policies and Plans

One Wales: One Planet (May 2009)

The One Wales: One Planet states that sustainable development in Wales means enhancing the economic, social and environmental wellbeing of people and communities, achieving a better quality of life for our own and future generations:

- In ways which promote social justice and equality of opportunity;
- In ways which enhance the natural and cultural environment and respect its limits using only our fair share of the earth's resources and sustaining our cultural legacy.

It also states that sustainable development is a core principle within the National Assembly's founding statute, and the Welsh Government has a statutory duty under the Government of Wales Act 2006 (Section 79), to develop a scheme setting out how they propose, in the exercise of their functions, to promote sustainable development.

Some of the actions set out in the document for achieving this relate to sustaining the environment, including the natural environment.

Environment Strategy for Wales

The Environment Strategy for Wales was published in 2006 and outlines the Welsh Government's long-term strategy for the environment of Wales, for the next 20 years. It provides a framework within which to achieve an environment, which is clean, healthy, biologically diverse and valued by the people of Wales.

National Transport Plan Environmental Report Addendum (March 2010)

This Strategic Environmental Assessment carried out as part of this plan included as one of its objectives to ensure that biodiversity is valued, protected and enhanced. A number of sub-objectives were identified within this general biodiversity objective, comprising:

- Avoid transport related damage to designated wildlife sites and protected species;
- Manage the transport network in a way that protects and enhances biodiversity and avoids losses;
- Provide opportunities for all users of the transport system to access, and appreciate, natural heritage;
- Reduce negative impacts of transport on habitats, fauna and flora, including damage and/or fragmentation of designated sites, habitats and protected species, and encourage the enhancement of any positive effects;
- Minimise wildlife casualties due to transport;
- Help achieve objectives of the UKBAP Action Plan.

Technical Advice Note (TAN) 5, Nature Conservation and Planning (2009)

TAN 5[8.12] provides advice to local planning authorities on the application of the law relating to planning and nature conservation and its impact within the land use planning system. The most recent revision of TAN 5 brings it in line with the strategic policy in Planning Policy Wales (PPW, issued in 2002 and revised in 2014[8.13]) and advises how planning policy with regard to ecology needs to be interpreted to be in compliance with Planning Policy Wales.

TAN 5 provides advice on the following:

- Positive planning for nature conservation;
- Nature conservation and Local Development Plans;
- Nature conservation in development management procedures;
- Development affecting protected internationally and nationally designated sites and habitats;
- Development affecting protected and priority habitats and species.

Planning Policy Wales - Edition 7 (July 2014)

Of particular relevance to this assessment is Chapter 5 - Conserving and Improving Natural Heritage and the Coast which outlines the Welsh Government's commitments to Nature Conservation. The Welsh Government's objectives for the conservation and improvement of the natural heritage are to:

- promote the conservation of landscape and biodiversity, in particular the conservation of native wildlife and habitats;
- ensure that action in Wales contributes to meeting international responsibilities and obligations for the natural environment;
- ensure that statutorily designated sites are properly protected and managed;
- safeguard protected species,
- promote the functions and benefits of soils, and in particular their function as a carbon store.

Powys Unitary Development Plan (UDP) 2001-2016

Section 4 of the Powys UDP[8.14], adopted in March 2010, relates to environmental policies. The overarching aim of the UDP's environment policies is to: "…balance the need for accommodating new development with that of protecting and enhancing the natural and built environments. It is intended that environmental enhancement and protection should maintain or improve the quality of life for all."

Strategic Policy SP3 of the UPD "Natural, Historic and Built Heritage" is an overarching policy, underlining the Council's commitment to maintaining the environmental quality of Powys for the enjoyment of present and future generations, and seeking to attain this by safeguarding, protecting and conserving the natural and built environment.

Relevant specific environmental polices included in the plan include:

- Policy ENV 1: Agricultural Land;
- Policy ENV 3: Safeguarding Biodiversity and Natural Habitats;
- Policy ENV 4: Internationally Important sites;
- Policy ENV 5: Nationally Important sites;
- Policy ENV 6: Sites of regional and Local importance;
- Policy ENV 7: Protected Species;

- Policy ENV 8: Tree Preservation Orders;
- Policy ENV 11: Development in Conservation Areas;
- Policy ENV 19: Amenity Open Spaces.

Policy ENV1: Agricultural Land. When considering proposals for development, the best and most versatile agricultural land will be safeguarded wherever possible. It may be appropriate to safeguard lower quality agricultural land in situations where such land is of particular value to agriculture within the locality;

Policy ENV3: Safeguarding Biodiversity and Natural Habitats. The need to maintain biodiversity and the nature conservation and amenity value of habitats and features that are of importance for wild flora and fauna is recognised. Wherever possible those interests will be protected against adverse forms of development and they will be maintained with development proposals;

Policy ENV 4: Internationally Important sites. Proposals for development that might affect SPAs and Potential SPAs, SACs and candidate SACs or listed Ramsar sites will only be permitted where:

- directly connected with or necessary to the management of the site for nature conservation;
- not likely to significantly affect the achievement of the conservation objectives for which the site is designated either individually or in combination with other proposals.

Where it cannot be shown that a proposed development will not adversely affect the integrity of the site and this effect cannot be removed by conditions, permission will be refused unless there is no alternative solution and

- Where the site hosts a priority habitat or species, there are reasons of public health or safety or beneficial consequences of primary importance to the environment;
- There are other reasons which in the opinion of the European commission are imperative reasons of overriding public interest why the development should proceed.

Policy ENV 5: Nationally Important sites. There is a presumption against proposals for development likely to damage, either directly or indirectly, the nature conservation interest of NNRs or SSSIs. Developments will only be permitted where the benefits clearly outweigh the nature conservation value of the site and conditions will be attached to any permission or a planning obligation sought to ensure:

- Satisfactory provision for the safeguarding of features of nature conservation importance within the proposed development;
- The provision of appropriate compensatory of mitigation measures to offset the impact of the proposals;

Policy ENV6: Sites of Regional and Local importance. Development proposals unacceptably adversely affecting the conservation interest of sites of regional or local nature conservation, geological or geomorphological importance will be refused. Where development is considered to be acceptable a condition may be attached to any permission or a planning obligation sought to ensure:

- Satisfactory provision for the safeguarding of features of nature conservation, geological or geomorphological importance within the proposed development;
- Provision of appropriate compensatory or mitigation measures to offset the impact of the proposals.

Policy ENV 7: Protected Species. Developments which contravene the protection afforded to European protected species will only be permitted where they are necessary in the interests of public health or safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment. Evidence will be required to indicate that a developer has considered alternative sites for the development but these have not proved suitable.

Where other protected species are affected by a proposal the applicant must conform with any statutory protection provisions and conditions that are attached to any permission to safeguard the species within the development and to provide appropriate mitigation measures.

Policy ENV 8: Tree Preservation Orders. Trees, groups of trees and woodlands of amenity value that make a particular contribution to the landscape or that are noted for their beauty or local rarity will be protected. Proposals for development that unacceptably adversely affect trees that are the subject of a tree preservation order will be refused.

Where necessary to maintain the character of a conservation area, trees will be protected. In order to maintain the character of the conservation area, proposals for development that unacceptably adversely affect the trees will be refused.

Applications to fell or carry out work on trees which are the subject of a tree preservation order will be approved if the work is necessary for public safety or to secure the future of trees themselves by appropriate management measures.

Policy ENV 11: Development in Conservation Areas. Proposals for development within or adjoining a Conservation Area should be of high quality design and should preserve or enhance the character or appearance of that area. Inappropriate developments that would significantly detract from that character will be opposed.

Full applications will be required for development proposals within or adjoining Conservation Areas.

Policy ENV 19: Amenity Open Spaces. Within settlements proposals for development which would lead to the partial or complete loss of amenity open space identified on the proposals map will be refused unless alternative open space of equivalent recreational or amenity value to the community and to the setting and character of the settlement can be provided.

Powys Local Development Plan (LDP)

The Powys Local Development Plan 2011 -2026 Deposit Draft (July 2014) will, once fully adopted, replace the Powys UDP. Production of the LDP has been informed by Strategic Environmental Assessment (SEA), Sustainability Appraisal (SA) and Habitats Regulations Assessment (HRA) in respect of Natura 2000 sites within Powys[8.15].

The proposed vision for the Powys LDP is: “Powys is a county of considerable variety extending from the South Wales Valleys to the Berwyn Mountains in the north, and from the Cambrian Mountains in the west to the English border in the east.

As the ‘green heart of Wales’, Powys will be a place of vibrant and resilient communities providing sustainable development and economic opportunities set in a healthy, safe environment, whilst celebrating, protecting, enhancing and making the most of its natural resources, native wildlife and habitats, heritage and distinctive characteristics.

Powys’ towns and larger villages will be vibrant and accessible service centres. They will be the focus for integrating housing, economic and service development to meet their own needs and those of their surrounding communities.

Powys’ rural areas will be a working countryside of sustainable communities supported by a thriving and diverse rural economy of small businesses.”

Natural Heritage is the subject of one of the LDP’s objectives (number 11), which aims: “To conserve and protect Powys’ land, air and water resources important for environmental quality, geodiversity and biodiversity and where possible to ensure development enhances them and produces a net gain for biodiversity.”

Relevant Local Plan Policies for nature conservation are:

Policy DM1: Strategic Planning Matters

“All proposals for development must not compromise, or unacceptably adversely affect, either on their own or in combination with existing or approved development, the following:

…9. The natural environment, integrity or conservation objectives of:

i. European Protected Sites / Habitats (Natura 2000 sites).
ii. Local Biodiversity Action Plan Habitats.
iii. Wildlife Trust Reserves.
iv. Local Wildlife Sites.
v. Sites Importance for Nature Conservation.
vi. Local Nature Reserves.
vii. Sites of Special Scientific Interest.
viii. Regionally Important Geological Sites.
ix. Important carbon stores
x. Best and most versatile Agricultural land (Grades 1, 2 and 3a)…"

Policy DM2: Detailed and Site Specific Planning Matters

"In addition to the requirements set out in National Guidance, all proposals for development will be permitted where they comply with the following:

…3. Proposals shall protect, positively manage and wherever possible enhance biodiversity and geodiversity interests to produce a net gain for the county including the enhanced connectivity of habitats…"

United Kingdom Biodiversity Action Plan (UKBAP)

In 1992 the UK signed the Convention on Biological Diversity at the Rio Convention pledging the UK to develop national strategies for the conservation and sustainable use of biological diversity.

The UK Government subsequently produced *Biodiversity: The UK Action Plan* in 1994[8.16] which described the biological resources of the UK as a whole and in turn led to the production of Biodiversity Action Plans for individual habitats and species. A total of 1150 Priority Species and 65 Priority Habitats have been identified (following update to list in 2007) as those most in need of protection, these are summarised below in Table 8.1.1.

Table 8.1.1 Summary of UK Priority BAP Species and Habitats

Species	
Group	**Number of Species**
Terrestrial Mammals	18
Birds	59 (incl. subspecies)
Fish (excl. marine)	15
Reptiles	6
Amphibians	4
Terrestrial Invertebrates	413
Vascular Plants	212
Lichens	69 & 2 communities
Non-vascular plants	122
Fungi (including Lichens)	215
Marine (incl. fish, reptiles, mammals, invertebrates and algae)	87
Habitats	
Terrestrial	27 broad habitats covering 65 Priority Habitats

Local Biodiversity Action Plans (LBAPs)

Biodiversity: The UK Biodiversity Steering Group Report was published in 1995[8.17]. This recognised that to successfully implement the UKBAP at a local level and translate national policy into action, it would be necessary to produce Local Biodiversity Action Plans (LBAPSs) across the UK. In response to this, local authorities throughout the UK produced LBAPs; the Powys LBAP[8.18] is of relevance to the Scheme, and is summarized below in Table 8.1.2:

Table 8.1.2 Summary of Powys LBAP Species and Habitats

Habitat Action Plans	Species Action Plans
Coniferous woodland	Alien plant species
Farmland	Allis and twaite shad
Garden Habitats	Brown hare
Linear habitats	Brown trout
Lowland dry acid grassland	Climbing corydalis weevil
Lowland meadows	Curlew
Lowland raised bog	European otter
Lowland wood pasture	Fairy shrimp
Mesotrophic waters	Floating water plantain
Rhos pasture	Globeflower
Rivers and streams	Great crested newt
Scrub and ffridd	Hazel dormouse
Traditional orchards	High brown fritillary
Upland calcareous grassland	Lapwing
Upland and lowland heath	Lesser horseshoe bat
Upland oak woodland	Marsh fritillary
Wet woodland	Nightjar
	Pearl bordered fritillary
	Pillwort
	Pipistrelle bat
	Red kite
	Red northern wood ant
	Red squirrel
	River jelly lichen
	River lamprey
	Slender green feather moss
	Tree sparrow
	Water vole
	Waxcap grasslands
	White-clawed crayfish
	Wood bitter vetch

Trunk Road Estate Biodiversity Action Plan (TREBAP)

This is a biodiversity action plan[8.19] produced by the Welsh Government to assist with the identification, management and provision of biodiversity within the Soft Estate of the Trunk Road Network in Wales.

The objectives of the TREBAP, within the constraints of resources and road safety, are to:

- Set practical and realistic actions and targets for the period 2004 – 2014;
- Link with other relevant Biodiversity Action Plan targets for habitats and species;
- Increase awareness of the Transport Directorate's staff and contractors, its environmental partners and the general public, of the biodiversity interest of the trunk road and motorway network;
- Encourage the use, and dissemination, of best practice for biodiversity in the management and development of the trunk road and motorway network; and
- Reflect the requirements of the Assembly's Sustainable Development Scheme and Action Plan where relevant.

The Action Plan covers eleven habitat action plans and seventeen species action plans, as well as two generic action plans Ecological Survey and Education and Awareness. The list of Action Plans is shown in Table 8.1.3:

Table 8.1.3 Summary of TREBAP Species and Habitats

Habitats	Species
Boundary Features Calcareous Grassland Coastal and Estuarine Habitats Heathlands Lowland Dry Acid Grassland Lowland Meadows Purple Moor Grass and Rush Pastures Rivers and Streams Rock Faces and Screes Water bodies Woodlands and Planted Native Trees and Shrubs.	Amphibians Aquatic Species Barn Owl Bats Dormouse Marsh Fritillary Butterfly Otter Reptiles Water Vole Welsh Clearwing Moth Native Black Poplar Bluebell Deptford Pink Limestone Woundwort Orchids Spreading bellflower Wood Bitter Vetch

The Welsh Government has also launched a new initative regarding Wildflowers and Road Verges. The Minister for Economy, Science and Transport wishes to see more wildflower areas on our road network and announced this to all Assembly Members in July 2014.

Section 42 of the NERC Act 2006 – List of Species and Habitats of Principal Importance for Conservation Biological Diversity in Wales

The list which is reproduced in full in Volume 3, Appendix E.1 is summarised in Table 8.1.4. Although these lists were primarily based on the UK BAP species and habitats lists, the numbers in each category differ from the UK BAP list as not all priority species and habitats occur in Wales.

Table 8.1.4 Summary of Section 42 Species and Habitats

Species	
Group	**Number of Species**
Mammals (excl. marine)	17
Birds	51
Fish (excl. marine)	10
Reptiles	5
Amphibians	3
Invertebrates	186
Vascular Plants	77
Lichens	69 & 2 communities
Mosses and liverworts	33
Fungi (including Lichens)	26
Stoneworts	5
Marine (incl. fish, reptiles, mammals, invertebrates and algae)	56
Habitats	
Terrestrial	16 broad habitats covering 36 Priority Habitats
Marine	4 broad habitats covering 20 Priority Habitats

Birds of Conservation Concern 3: the population status of birds in the United Kingdom, Channel Islands and the Isle of Man (2009)

A total of 246 species have been assessed[8.20] against a set of objective criteria to place each on one of three lists – green, amber and red – indicating an increasing level of conservation concern. There are 52 species on the red list, 126 on the amber list and 68 on the green list.

The Population Status of Birds in Wales 2 (2009)

This report[8.21] is similar to the Birds of Conservation Concern 3 list but is considered from a Welsh perspective rather than a UK perspective. The findings are broadly similar but there are have important differences in the classification of conservation concern for a small number of species. A total of 213 species have been assessed, there are 45 species on the red list, 100 on the amber list and 68 on the green list.

8.2. Methodology

8.2.1. Survey Methodologies

Survey methodologies for work undertaken in 2007-2009 are described in the *A483/A489 Newtown Study DMRB Stage 2 Environmental Impact Assessment Volume 1A Report,* dated December 2009[8.22]. Survey methodologies for work undertaken in 2013 and 2014 are described below and, where appropriate, in Volume 3 Appendices E.3 - E.6, E.8 - E.10 and E.12. In addition, surveys were undertaken in 2012 in preparation of the ECI contract. This is outlined in the Environmental Scoping Report 2013[8.23] and was used to guide the surveys proposed for 2013. It has been referenced where relevant.

Note that in the descriptions of surveys below and throughout this chapter, 'route corridor' refers to potential route options identified at Stage 1, and surveyed in 2008, 'preferred route' refers to the preferred route option and buffer zone to either side identified at Stage 2 in 2012, and 'the Scheme' refers to the Scheme surveyed in 2013 and 2014 and described in detail in Section 2.5 this ES.

Desktop survey

A desktop study for the preferred route and a 1km buffer to either side was undertaken in February 2012 to determine the available data with regard to protected species and habitats from which potential ecological restraints were identified. This involved study of OS data, aerial photography and the CCW Phase 1 Habitat Survey [8.24]and a review of reliable online resources, as well as a data search with Powys Biodiversity Information Service (BIS). These surveys highlighted any designated areas within and adjacent to the study area and any protected species that have been recorded in the area previously.

Phase 1 Habitat Surveys

Initial Phase 1 Habitat surveys of the route corridor were undertaken for the Stage 1 assessment in 2008. These comprised an initial Phase 1 Habitat survey in January 2008, which was carried out in accordance with the methodology outlined in the Phase I Habitat Survey Handbook[8.25] (Joint Nature Conservancy Council 1993). All the habitats within the route corridor, comprising a 500m buffer to either side of each route option, were surveyed, given the limitations of land access, and mapped with target notes regarding key species present and extent and quality of habitat.

An extended Phase 1 Habitat survey was then conducted throughout the site during May 2008 with all habitats within 250m of each of the route options walked and mapped following the guidelines given within the Phase 1 Habitat Survey Handbook. Species lists with abundances and detailed target notes were produced for each habitat, where appropriate.

This extended Phase 1 Habitat survey was repeated in 2012 for the preferred route, and updated in May and June 2013 for the Scheme. Consultation with NRW over the need for more detailed National Vegetation Classification (NVC) surveys of specific habitats present on the Scheme identified that NVC surveys would be required only if the Phase 1 Habitat surveys identified species-rich or wet grasslands which would merit more detailed assessment. As the Phase 1 Habitat surveys did not identify any species-rich or potentially significant wet grassland areas, no NVC surveys have been considered necessary.

Hedgerow Surveys

Hedgerows were surveyed incidentally during Phase 1 Habitat surveys in 2008 and 2012, and were surveyed for specific groups such as terrestrial invertebrates and breeding birds (see below). In addition, all hedgerows crossed by the Scheme were re-surveyed in 2013, with particular emphasis on assessing their habitat quality for dormice (see below).

Vascular Plants and Bryophytes

Neither the desk study nor the Phase 1 Habitat Survey identified any issues relating to vascular plants or bryophytes so no detailed surveys were undertaken.

Lichen Surveys

Lichen surveys of mature trees on the route of the Scheme were undertaken in June 2014, in warm, dry weather. All substrates were potentially examined for lichens, with particular attention paid to mature trees. Some parts of the Scheme which, based on aerial photo and tree survey data, lacked mature trees were not surveyed. Locations of specimens were recorded using a handheld GPS receiver. A number of specimens were collected for identification in the laboratory.

Species were regarded as 'notable' and potentially of conservation interest if they met one of the following criteria:

- Graded as Critically Endangered, Endangered, Vulnerable, or Near Threatened in the Welsh red data list (Woods 2010)

- Indicated as Nationally Rare (recorded in 1-15 hectads in Great Britain) or Nationally Scarce (in 16-100 hectads in Great Britain) in Woods & Coppins (2012).

- Indicated as International Responsibility (British populations considered to be of international importance due to their abundance in Britain compared to the rest of the world) in Woods & Coppins (2012).

- Used in the calculation of the New Index of Ecological Continuity (NIEC) (Coppins & Coppins 2002). Sites containing a high number of species from a list of indicator species are considered to have a high likelihood of ancient origin, but individual NIEC species are not necessarily of conservation interest.

Invasive Plant Surveys

The presence of invasive plants was noted during each of the Phase 1 Habitats surveys in 2008, 2012 and 2013, particularly any non-native invasive species such as Japanese Knotweed (*Fallopia japonica*), Giant Hogweed (*Heracleum mantegazzianum*) and Himalayan Balsam (*Impatiens glandulifera*), which are listed under Schedule 9 of the WCA (as amended) and which it is therefore an offence to plant or cause to spread in the wild. The first two of these species are also addressed within the Powys LBAP.

Protected Species Walkover Surveys

During each of the Phase 1 Habitats surveys observations and notes were made of any areas that had potential for the presence of protected species or other features of interest from an ecological and nature conservation perspective.

Invertebrate Surveys

Terrestrial invertebrate surveys were undertaken in 2012, to assess the value of hedgerows, woodlands and other habitats (tree lines, grassland) for invertebrates, and to identify any important features and species present on the preferred route.

During these surveys areas flagged up during the extended Phase 1 Habitats survey were walked over on foot recording all species seen. In addition, the following methods were used:

- sweep netting and beating of foliage and vegetation;
- manual hand searching of vegetation and manual searching and turning of stones and rocks;
- visual searching of flowers for pollen and nectar feeding species.

Invertebrates collected were transferred to glass tubes for closer inspection, kept for later identification, and/or release. All visits were timed to take advantage of the best weather conditions for invertebrates, all of which were carried out during dry, calm, warm and sunny weather.

Aquatic invertebrate surveys were also undertaken in 2012 in order to obtain Biological Monitoring Working Party (BMWP)[8.26] scores to assess the pollution status of watercourses crossed by the preferred route. A modified version of the BMWP methodology was used, adopting a longer (but still standardised) time period for kick sampling in order to increase the likelihood of recording less common species, and in order to obtain an indication of the abundance of each species recorded. Abundance was specified using the ACFOR system: Abundant, Common, Frequent, Occasional, Rare.

For each watercourse surveyed, a minimum of two samples were taken (in most cases, three). One of the samples was taken above (e.g. upstream) of the zone affected by the Scheme and two below. Each watercourse was surveyed twice, in April and late May 2012. Three watercourses were surveyed: the Mochdre Brook at Mochdre Bridge, the Black Hall Brook adjacent to the A483 below Black Hall, and Green Brook alongside the Mochdre Industrial Estate.

White-clawed Crayfish Surveys

Notes were made as to the suitability of watercourses for this species during other surveys in 2008, and incidental observations were made. No further surveys were undertaken at Key Stage 3 for this species, as review of previous data and consultation with NRW confirmed that it is unlikely to be present due to the presence of the alien signal crayfish.

Fish surveys

Notes were made as to the suitability of watercourses for fish species during other surveys in 2008 and incidental observations made.

No specific fish surveys were undertaken for the Stage 3 assessment in 2013 because clear span bridge structures were proposed at the two watercourses then considered most likely to be of value for fish (Mochdre and Dolfor Brooks).

Following an inspection of the Scheme in January 2014, NRW provided advice on which other watercourses crossed by the Scheme are also likely to be of value to fish. These watercourses, associated with culverts C3a, C4, C5, C6, C9, C10, C11 and C12, and S4 were subsequently assessed for their suitability for notable fish species in spring 2014. In July 2014, three watercourses C3a, S5 and C11 were electro-fished using a backpack. The results of these surveys are included as Volume 3 Appendix E.4.

Amphibians

The desktop survey in 2012 included a search for records of amphibians in the area. The presence of ponds within the route corridor was established during the original extended Phase 1 Habitat surveys, and eleven were visited to assess their suitability to support amphibians and particularly Great Crested Newts (*Triturus cristatus*; GCN).

Six ponds that were deemed suitable were surveyed further, in 2008, following the methodology and guidance within the *Great Crested Newt Mitigation Guidelines* [8.27] and the DMRB Volume 10 Section 4 Part 6[8.28]. Four visits to each pond were conducted within the GCN survey season with at least two visits conducted during the optimal survey period between mid-April and mid-May. During each visit a licensed surveyor undertook daylight egg searches and refuge checks followed by torch surveys after dark. Egg searches were carried out by searching aquatic vegetation for folded leaves; the leaves were only opened to the minimum required to confirm the newt's presence given that leaves do not re-adhere once opened. Torch searches were conducted shortly after dusk by walking around the pond using the torch beam to check for newts with particular attention paid to marginal vegetation and potential display areas. Bottle trapping was not undertaken at this stage of the study.

In 2012 a total of 14 ponds were identified within a 500m buffer either side of the preferred route, from OS maps and from Phase 1 Habitat survey data. Of these 14 ponds, nine were considered suitable and were accessible for survey, using at least one survey technique (i.e. at least one of egg searches, torch survey and bottle trapping).

For each waterbody the surrounding terrestrial habitat was assessed for its potential to support a population of great crested newts. Factors such as presence of predators in the pond, good terrestrial habitat, habitat links, presence/absence of barriers to movement etc. were taken into account. The results of the habitat assessment determined which survey methods would be used to survey each pond. Surveys were undertaken between 23rd April 2012 and 20th June 2012.

Given the absence of great crested newt records in the desktop survey, and in Stage 2 and Stage 2 field surveys, it was not considered necessary to repeat GCN surveys for the Scheme in 2013.

Reptiles

Reptile surveys were carried out in conjunction with the Stage 2 Extended Phase I Habitat Survey in 2008 with areas of potential reptile habitat recorded and mapped and any potential basking sites investigated.

More intensive reptile surveys were undertaken in 2012. Initially a reptile habitat assessment was carried out in order to establish suitable areas to lay reptile mats. Specific areas of potential reptile habitat were targeted for survey according to their habitat suitability. Reptile mats were laid on 22nd May 2012. Seven reptile checks were undertaken during suitable weather conditions during the period June 2012 to September 2012. This methodology complies with advice set out in DMRB Volume 10, Section 4, Part 7[8.29].

Breeding Birds

Breeding bird surveys were undertaken in 2008 following the methodology from the British Trust for Ornithology (BTO) Common Bird Census[8.30] and the BTO/JNCC (Joint Nature Conservation Committee)/RSPB (Royal Society for the Protection of Birds) Breeding Bird Survey[8.31]. This involved surveying the site recording and mapping the bird species observed and makes notes regarding the behaviour and activity of these species. These surveys were conducted twice, the first during April 2008 and the second during June 2008 to allow for differences in the nesting times between different species.

Breeding bird surveys were repeated in 2012 in order to assess the range and numbers of species breeding in habitats along the preferred route, by timed transect visits undertaken on two occasions within the optimum breeding season. These data are supplemented with casual records and consultation with locally-based experts and enthusiasts to determine the status of birds along the preferred route.

A Modified Breeding Bird Survey method was used in 2012, by undertaking linear surveys along a transect line, recording birds seen or heard on a pro forma recording sheet. Visits are termed ‘early’ and ‘late’ and are timed to be one month apart during the optimum breeding season (from the end of April to mid-June being the best time). In order to more comprehensively survey the preferred route, a single transect along the preferred route (as close to the proposed footprint as possible) was surveyed instead of the normal 1km length. Survey of the preferred route therefore included 20 transect units each of which was approximately 0.5km long.

During survey, the ecologist walked slowly along the transect line, recording any birds seen or heard singing during that time as species codes, and recording the distance from the transect line at which birds were recorded. For this survey, the average time taken per transect unit was 15 minutes. The combined data from the two surveys provides an indicator of birds holding territory (and probably nesting) during the period: the same species singing on both occasions in the same area is likely to be nesting nearby. Other species (and nests) recorded outside the timed survey were also recorded where noted.

Further breeding bird surveys were undertaken in April and May 2014, specifically to address concerns over the possible presence of woodland birds of conservation concern, such as red kite (*Milvus milvus*) and common crossbill (*Loxia curvirostra*). These surveys assessed two woodland areas on and close to the Scheme, at the Fridd woodland, at the western end of the Scheme and in the Castell-y-Dail woodlands. Surveys comprised a desk study, walked breeding bird transect carried out on four occasions in each site (based on standard Breeding Bird Survey methodologies as above), and vantage point watches of potential raptor nest sites identified during the transect surveys. The report of these surveys is included within Volume 3, Appendix E.5.

Barn Owls

Potential barn owl (*Tyto alba*) habitat was identified during walkover surveys in 2008, and these areas were walked in conjunction with bat and amphibian surveys in spring 2008. However there were no records of barn owls in the vicinity of the Scheme, or evidence of the presence of barn owls found during these surveys.

Potential for barn owls to occur on the Scheme was noted during other surveys in 2012 and surveys of buildings and trees for bats in 2012 and 2013 also included a search for evidence of barn owls.

Badgers

A survey was conducted in 2008 throughout the route corridor plus a 250m buffer zone with particular focus given to areas of habitat identified as having high badger (*Meles meles*) potential during the extended Phase 1 Habitat survey. The survey was conducted following the methodology in Harris, Cresswell and Jefferies (1989)[8.32] and the guidance within DMRB Volume 10 Section 4 Part 2[8.33], and involved searching for the following signs of badger activity:

- Dung Pits/Latrines – single or multiple pits (latrines) usually found along pathways or as territorial markers;
- Hairs – distinctive texture and colouration;
- Footprints – distinctive size and shape, often with claw marks in deeper sediments;
- Setts – distinctive size and shape of entrance, can be main, annexe, subsidiary or outlying;
- Paths and Boundary Crossings – well used trails through vegetation including through hedges over banks, across roads and streams often with additional signs of badger use;
- Feeding Signs – often distinctive and include snuffle pits (conical depressions in the soil where the snout has been inserted) and scratched up turf.

These surveys were repeated in 2012 for the preferred route, with field surveys taking place between April and September 2012 in accordance with advice set out in DMRB Vol 10, Section 4, Part 2. The survey area was searched for signs of badger activity by walking the site, including the perimeter of any boundaries such as fences, hedges and stone walls. Activity levels at identified setts were assessed by classifying each entrance as:

- Well-used - entrances are clear of any debris or vegetation, are obviously in regular use, and may or may not have been excavated recently;
- Partially used - entrances are not in regular use and have debris such as leaves or twigs in the entrance, or have moss and/or other plants growing in or around the entrance. Partially used holes could be in regular use after a minimal amount of clearance.
- Disused - entrances have not been in use for some time, are partially or completely blocked, and cannot be used without a considerable amount of clearance. If the hole has been disused for some time all that may be visible is a depression in the ground where the hole used to be, and the remains of the spoil heap, which may be covered by moss or plants.

These surveys were updated in 2013 by re-visiting all previously identified setts and re-assessing the level of activity. Evidence of badgers was also noted when observed during other surveys.

A further re-assessment of all badger setts identified during previous surveys, within 100m of the Scheme, was undertaken in 2014. This re-assessment used the survey methodology and classification described above, with additional reference to Andrews (2013)[8.34]. Any new setts were also noted during this survey. The results of these surveys are presented in the confidential Appendix Volume 3 Appendix E.6 which is not available for public consultation to protect this species.

Bats

An analysis of desktop survey records was undertaken in 2008 to ascertain which bat species were likely to be present within the route corridor and whether any areas of particular bat activity were present, especially roosts. OS maps and aerial photographs were analysed in conjunction with information collated during field walkover surveys to ascertain areas that were most likely to have particular concentrations of bat activity or be important flight lines.

Five transects in areas of most likely bat activity were surveyed in May/June and August 2008. Each of these transects were walked for two hours at dusk and again for two hours leading up to the following dawn by surveyors using both heterodyne/frequency division bat detectors and Anabats to provide recordings of bats detected. Every bat detected was identified where possible to species level in the field with further analysis of Anabat recordings later. Particular attention was given to detecting the possible presence of a number of bat species of high conservation

concern, namely Barbastelle (*Barbastella barbastellus*) and Lesser Horseshoe Bats (*Rhinolophus hipposideros*) which had been identified as present in the surrounding areas (but at some distance from the route corridor) during the desktop surveys. Notes were also made of bat activity/behaviour to aid with the establishment of the value of various areas and habitats in relation to foraging, flight lines, roosts etc.

Stage 2 bat surveys in 2012 comprised surveys to identify potential roost sites, and surveys for commuting and foraging activity. A preliminary assessment of the trees and hedges on the preferred route was undertaken between May and August 2012. The trees were assessed from ground level using close focusing binoculars and a high powered torch. Where feasible, surveyors noted the general age and condition of the tree, the tree species, and any notable bat roosting features such as woodpecker holes, cavities, splits within the limbs, peeling bark, epicormic growth or dense ivy-cover. The trees inspected were graded according to Table 8.2.1 below which is taken from *Bat Surveys - Good Practice Guidelines*[8.35]. These surveys were repeated in spring 2014, during which all the trees affected by the Scheme were re-assessed for their potential to support bats (refer to ES Volume 3, Appendix E.10).

Table 8.2.1 Tree categories used in assessment of potential for roosting bats

Tree category and description	Further measures to inform proposed mitigation	Likely mitigation
Known or confirmed roost	Follow NRW guidance and Bat Conservation Trust (2012) guidelines, to establish the extent to which bats use the site.	Tree felled under EPS licence following the installation of equivalent habitats as a replacement.
1* Trees with multiple, highly suitable features capable of supporting larger roosts	Avoid disturbance to trees where possible. Further dusk and pre-dawn surveys to establish the presence, species, numbers of bats present and the type of roost.	Felling would be undertaken taking reasonable avoidance measures such as “soft felling” to minimise the risk of harm to individual bats.
1 Trees with definite bat potential, supporting fewer suitable features than category 1* trees or with potential for use by single bats	Avoid disturbance to trees where possible. Further dusk and pre-dawn surveys to establish the presence, species, numbers of bats present and the type of roost.	Trees with confirmed roosts following further survey are upgraded to Category 1* and felled under licence as above. Trees with no confirmed roosts may be downgraded to Category 2 dependent on survey findings.
2 Trees with no obvious potential, although the tree is of a size and age that elevated surveys may result in cracks or crevices being found; or the tree supports some features which may have limited potential to support bats	Avoid disturbance to trees where possible. No further surveys	Trees may be felled taking reasonable avoidance measures. Stop works and seek advice in the event bats are found, in order to comply with relevant legislation
3 Trees with no potential to support bats	None	No mitigation for bats required.

A preliminary assessment of the buildings within the route corridor was undertaken during August 2012. A methodical search of the buildings’ exterior was conducted from ground level using close focusing binoculars and a high powered torch. On the basis of this examination, buildings were assessed as being either of higher or lower value for bats, based on criteria in the good practice guidelines.

Bat activity surveys were undertaken on the evenings of the 30th May, 18th June, 22nd June, 25th June, 1st August, and 22nd August 2012. The surveys were programmed to take place when bats are most likely to be active, commencing approximately thirty minutes before sunset and continuing until approximately two hours after sunset. The survey timings and conditions are described in Volume 3, Appendix E.8. During each activity survey, surveyors undertook a walked transect which incorporated five minute listening stops to identify the bat species present and assess the level of bat activity within the site. Each surveyor was equipped with heterodyne or frequency division bat detectors (Batbox Duet). Recordings of the frequency division output were made onto Roland Edirol R-05 MP3 recorders for later analysis using Batsound software to

identify bat species present within the site. The survey was carried out to the standard methodology as described in *Bat Surveys – Good Practice Guidelines*.

Further bat roost surveys were undertaken in autumn 2013 and spring 2014 in order to assess the status of buildings on the route of the Scheme in relation to roosting bats. These surveys examined buildings in ten locations on or close to the Scheme for signs of use by bats, such as urine stains, rub marks, droppings and insect remains. Any crevices and potential access points were noted to determine the likelihood of use or potential for use as a roost by bats. Binoculars and ladders were used for observation of areas which were otherwise inaccessible and, where appropriate, samples of droppings were collected for DNA analysis by the University of Warwick. The locations where buildings were surveyed were: Bontdulas, adjacent to the Mochdre Brook; Castell-y-Dail House, and the adjacent Castell-y-Dail Centre; four properties in the Dolfor Valley, Ashbrook, Kinsale, Hillcrest and Cwym-y-Gwynt, of which Kinsale is within the footprint of the Scheme; the house and outbuildings at Lower Brimmon; barns at Tyn-y-Green; and a barn off Pool Road at the eastern end of the Scheme, which is also within the footprint of the Scheme. The bat building report is provided in Volume 3, Appendix E.9.

Further bat activity surveys were also undertaken in 2013, to identify the presence of any commuting routes or key foraging areas of particular value for bats which would be affected by the Scheme. These surveys were undertaken in May/June, July and September 2013, and comprised short transect surveys (typically up and down a single linear feature or a pair of connected linear features) at nineteen potential crossing points identified along the Scheme. Each transect was surveyed by a team of two surveyors with handheld broadband bat detectors and recording devices. The purpose of surveying short transects on specific linear features was to record numbers of commuting bats at locations severed by the Scheme, rather than to simply record presence of commuting bats when encountered on that part of a transect, as had been done on previous surveys. Locations of transects surveyed in 2013 are shown in Volume 3, Appendix E.8.

Each crossing point was surveyed continually by the surveyor teams for two hours at dusk and dawn with any recordings made analysed later. Each surveyor team used three detectors to allow for greater frequency coverage (i.e. heterodyne detectors tuned to appropriate frequencies for lesser horseshoe and barbastelle bats), and a third detector recording bat passes for later analysis.

Emergence and re-entry surveys of the confirmed roost at Kinsale, Ashbrook and the Barn along Pool Road were undertaken in Summer 2014, following the standard methodology as described in *Bat Surveys – Good Practice Guidelines.* The full survey report is available in ES Volume 3, Appendix E.12.

Two dusk emergence and one dawn re-entry survey were undertaken at Kinsale on:

- 8th July 2014 between 21:15 – 23:15 (time of sunset – 21:35)
- 10th July 2014 between 03:00 – 05:00 (time of sunrise – 05:02)
- 15th July 2014 between 21:15 – 23:15 (time of sunset – 21:30)

One dusk emergence and one dawn re-entry survey was conducted at Ashbrook on:

- 8th July 2014 between 21:15 – 23:15 (time of sunset – 21:35)
- 10th July 2014 between 03:00 – 05:00 (time of sunrise – 05:02)

One dawn re-entry survey was conducted at the Barn along Pool Road on:

- 25th July 2014 between 03:25 – 05:25 (time of sunrise – 05:22)

Three surveyors were used at Kinsale, two at Ashbrook and three at the Barn along Pool Road. Each surveyor watched for bats either leaving the building at dusk or returning and dawn. The locations where bats left or returned were noted. The surveyors used either AnaBat SD2 frequency division or Pettersson D240x time expansion detectors and recording devices to record

bats entering or leaving the buildings. Bat calls recorded were later analysed using AnalookW or Bat Sound software. Species were determined with reference to British Bat Calls[8.36].

Dormice

Potential Dormice (*Muscardinus avellanarius*) areas within 250m of the route corridor identified from desktop or walkover surveys were surveyed from March to April 2008 following the guidance given within DMRB [8.37] Volume 10 Section 4 Part 5. The potential for Dormice within these areas was further assessed and searches made for signs of Dormouse activity, namely characteristically gnawed hazelnut shells and natural nests constructed in hedgerows, holes in trees etc.

As a result of surveys undertaken March/April 2008, sixteen search areas were identified as having good Dormice potential. These areas were systematically searched for the characteristically opened hazelnuts as detailed within English Nature's *Dormouse Conservation Handbook* [8.38].Within each of the sixteen survey areas, up to five 10m by 10m survey quadrats were searched. Each of these quadrats was located within an area of heavily fruiting hazel (*Corylus avellana*) and was systematically searched for twenty minutes. Where very few nuts were found that had been opened by mammals other than squirrels up to an additional five quadrats were searched. These surveys were conducted during October 2008.

During surveys in 2012, 250 nest tubes were distributed in suitable hedgerows and woodland at 20 locations along the preferred route on 15th May, and checked on 1st June and 1st, 2nd, 22nd and 23rd August 2012. The survey was carried out to the standard methodology as described in the *Dormouse Conservation Handbook* with nest tubes securely suspended from branches at approximately 20m intervals. Similar methods are also detailed in the DMRB. The survey aimed to confirm presence of dormice by identifying dormouse nests.

Further surveys for dormice were undertaken in 2013. Because the majority of suitable habitat features affected by the Scheme are too small to allow installation of 50 nest tubes, surveys on the Scheme footprint itself can identify presence, but would not be able to confirm likely absence of dormice. Consequently surveys in 2013 took a strategic approach by surveying larger areas of suitable woodland or hedgerow habitat that were either along the Scheme or close to it and connected by suitable habitats.

At least 50 tubes were placed in each area during May 2013 at 20m intervals. Checks were made in July, October and November 2013, with any dormice found or signs of recently constructed nests recorded. These surveys were undertaken by a licensed Dormouse specialist in accordance with the guidelines provided within the *Dormouse Conservation Handbook*.

Nest tube survey sites in 2013 are shown in Volume 3, Appendix E.13. The majority of nest tube survey locations in 2013 were in areas without previous records of dormice; however some sites with existing older records were included in order to update these records.

In parallel with these strategic nest tube surveys, all hedgerows affected by the Scheme were assessed for their potential to support dormice, by looking at the species diversity of food plants, structure and management of the hedgerow, connectivity to other suitable habitat and connectivity to previous records of dormice.

Otters

Watercourses within 250m of the route corridor were surveyed in 2008 for evidence of otter (*Lutra lutra*) activity or potential for use by otters. These surveys followed the National Rivers Authority (1993a and b)[8.39] methodology and the guidance given within the DMRB Volume 10 Section 4 Part 4[8.40]. This involved searching for the following signs of otter activity:

- Spraints – characteristic faeces often deposited in prominent positions, can be described as fresh (up to a few days), recent (a few days to a few weeks) or old (at least a couple of weeks);
- Sign Heaps – scrapes of sand, mud or vegetation often with additional spraint;
- Footprints – characteristic shape and size;
- Feeding Remains – such as fish scales or amphibian remains;
- Actual/Potential Holt – including cavities under tree roots and within banks, additional signs of activity will determine whether these are in use;

- Actual/Potential Resting Up Sites – temporary shelters within dense vegetation such as scrub and reed beds.

These surveys were repeated twice between March and July 2008 to allow for seasonal changes in otter behaviour and activity involved lengths of watercourse being walked and the above signs looked for and recorded. Note that although these surveys did not extend as far as the 2km recommended in DMRB survey guidelines, they were sufficient to confirm presence of otters and the extent of survey possible downstream of the Scheme is in most cases limited by culverting of watercourses beneath Newtown town centre.

Otter surveys were repeated in 2012 for the Mochdre Brook. A field survey was undertaken on 29th May 2012, using a modification of the methodology employed in the Welsh National Survey of Andrews et al. (1993)[8.40], whereby the surveyor(s) walk a distance of c600m along the river bank, recording otter signs. In this instance the method was modified to walk a distance of c.250m either direction from Mochdre Bridge, which represents the median where the proposed route crossed the brook.

Surveys in 2013 were not considered necessary as the continued presence of otters could be predicted from previous survey data and watercourse characteristics. An inspection of the Scheme by NRW in January 2014 provided additional records of otters.

Water Voles

Suitable habitats for water voles (*Arvicola amphibius*) within 250m of the route corridor were surveyed in 2008 following the guidance in the *Water Vole Conservation Handbook Second Edition*[8.42] by searching for the following characteristic signs:

- Latrines – piles of characteristic droppings;
- Footprints – characteristic shape and size;
- Tunnel Entrances – both above and below water level;
- Pathways in Vegetation – often running between tunnels and vegetated waterside habitat;
- Cropped Grass around Tunnel Entrances – a distinctive sign of breeding females;
- Feeding Remains – large chewed segments of vegetation with distinctive teeth marks.

An assessment was also made of the habitats present to determine their potential value to the species. These surveys were undertaken between April and July 2008 during which more detailed assessment of the habitats in the area was also carried out to determine the potential value of the area to water voles. Based on the results of the 2008 surveys and the desktop survey, which indicated that there was no evidence of this species on or close to the Scheme, it was not considered necessary to repeat these surveys in 2012 or 2013.

8.2.2. Assessment Methodology

Proposed level and scope of assessment

This assessment represents a Stage 3 Assessment in accordance with DMRB[8.43], and primarily follows guidance in HA205/08[8.44] with reference to the Chartered Institute for Ecology and CIEEM's *Guidelines for Ecological Impact Assessment in the United Kingdom*[8.45]. The assessment has used this combination of guidelines to define the value of the receptors, the magnitude of impact on the receptors and, by combining the value and magnitude, the significance of the impact.

Value of environmental resources and receptors

The wildlife value has been assessed using the Ratcliffe Criteria, as described in DMRB Volume 11 Section 3 Part 4. This assesses an ecological feature in terms of:

- Fragility;
- Rarity;
- Size (Area or extent);
- Diversity;
- Potential Value;
- Position within the Ecological/ Geographical Unit;

- Typicality;
- Recorded History;
- Naturalness;
- Intrinsic Appeal.

In addition to the above, criteria are taken from the Report of UK Steering Group on Biodiversity and Guidelines for Local Biodiversity Action Plans which will underpin the results.

- UK priority species and habitats – in particular those most characteristic of the area;
- Significance – is the habitat confined to the area or does the area have a high proportion of the national resource;
- Opportunity – available to enhance the resource;
- Decline Rates – declines and measure assessment over the last 25 years;
- Threat – lack of management, recreation, pollution, development;
- Distinctiveness – high profile or popular species particularly associated with the area;
- Fragmentation – degree of habitat fragmentation/fragment viability;
- Importance of habitat for key species.

The degree to which a feature can be substituted is also taken into consideration. Guidance suggests that the loss of a feature of value that is irreplaceable may be considered more significant than the loss of a feature that can be replaced or substituted. The overall ecological value of the area will be considered in the context of the pattern of habitat and interdependencies between habitats, as well as the relative legislative value of any protected species, habitats or sites.

Values are given in terms of the geographical context in accordance with IEEM (2006) guidance, modified to exclude the 'Regional' category, as shown below:

- International;
- UK;
- National (Wales);
- County;
- District;
- Local or Parish;
- Zone of Influence.

Examples of features of value are given below for each value level with respect to ecological features of international, national and local designated features or non-designated features.

Very High Value (International)

- Special Areas of Conservation (EU Habitats Directive);
- Special Protection Areas (EU Birds Directive);
- Significant populations of European protected species (such as bats);
- Sites hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals 1979).

High Value (UK)

- Sites of Special Scientific Interest (WCA, as amended);
- Geological Conservation Review (GCR) sites;
- Significant populations of UK protected species (WCA);
- Significant populations of species listed within Section 42 of the NERC Act.

Medium Value (National i.e. Wales)

- Regionally important designations which can be reasonably substituted including: Local Nature Reserves (LNRs; National Parks and Access to the Countryside Act 1949);
- Important "inventory" sites (e.g. ancient semi-natural woodland and grassland inventories);
- Small populations of European or UK protected species;
- Significant populations of UK or Wales 'Red list' Birds of Conservation Concern, or Species of Principal Importance for biodiversity under the NERC Act.

Low Value (County or District i.e. Powys or Montgomeryshire)

- Sites of Importance to Nature Conservation (SINCs)/County Wildlife Series (CWSs)/ other local designations;
- Sites with Local Biodiversity Action Plan (LBAP) habitats or species;
- Non-breeding individuals of European or UK protected species;
- Small populations of UK or Wales 'Red list' Birds of Conservation Concern, or Species of Principal Importance for biodiversity under the NERC Act.

Negligible Value (Local, Parish and Zone of Influence only)

Sites with no ecological designations, and at most only non-breeding individuals of LBAP species, and sites with no recognised nature conservation interest.

Assessment Criteria

The IEEM guidance states that *'the assessment of impacts should be undertaken in relation to the baseline conditions within the zone of influence that are expected to occur if the development were not to take place'.*

The baseline conditions are described as *'the conditions that would pertain in the absence of the proposed project at the time that the project would be constructed/operated/commissioned'.* The guidance recommends that these should be informed by changes arising from other causes. It is also stated that the future baseline condition should take account of:

- Environmental trends;
- Completed developments;
- Developments for which planning consent has been granted.

A baseline projection will be presented based on the assumption that the land is left in its present condition or the present management regime continues. The significance of the impacts will be re-assessed on the assumption that the proposed mitigation measures are implemented.

The assessment will include direct, indirect, short-term, medium-term and long-term, secondary and cumulative impacts. Positive and negative impacts on the ecological baseline of the site will also be assessed.

Magnitude of impact will be assessed by the scale of loss or damage predicted to semi-natural vegetation, wildlife habitats and protected species. Significance will be assigned by looking at the magnitude of change to habitats and species of local and regional importance and assigning higher significance to greater loss of regionally important habitats.

The following criteria for determining the magnitude of impact will be used and are based upon, or adapted from, those given in the guidance.

Major negative - The proposal (either on its own or with other proposals) may adversely affect the integrity of the site, in terms of the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the population levels of species of interest.

This includes large-scale damage or loss of a large proportion of a particular semi-natural habitat type or protected species' habitats that are of regional/national importance or listed as key habitats in the UK Biodiversity Action Plan Steering Group Report Loss of Protected Species.

Moderate negative - The site's integrity would not be adversely affected but the effect on the site is likely to be significant in terms of its ecological objectives. If, in the light of full information, it cannot be clearly demonstrated that the proposal would not have an adverse effect on integrity, then the impact should be assessed as major negative.

This would apply in the case of damage or loss of a small proportion of a particular semi-natural habitat type or protected species' habitats that are of regional/national importance or listed as key habitats in the UK Biodiversity Action Plan Steering Group Report.

Minor negative - Neither of the above apply, but some minor negative impact is evident. (In the case of Natura 2000 sites a further assessment may be necessary if detailed plans are not yet available).

This would apply in the case of damage or loss of a proportion of a particular semi-natural habitat type or protected species' habitats that are of district/county importance or listed as key habitats in local Biodiversity Action Plans.

Negligible negative – Very minor loss of or detrimental impact is evident, but below a level which would be considered a Minor negative impact.

This would apply in the case of damage or loss of common semi-natural vegetation or wildlife habitats but not protected species. Habitats are not locally or regionally important.

Neutral - No observable impact in either direction. This would apply in the case of damage or minor losses of common types of habitats or common wildlife. Habitats are not locally or regionally important.

Negligible positive – Impacts which provide a negligible net gain for biodiversity overall.

Minor positive - Impacts which provide a slight net gain for biodiversity overall. This would apply in the case of an increase in the population of a species or area of habitat which is not locally or nationally important.

Moderate positive - Impact which provide a net gain for biodiversity overall (but which would not positively affect the integrity of the site). This would include a small increase in the proportion of a semi-natural habitat or habitat of a protected species that are locally important or listed as key habitats within the UK Biodiversity Action Plan Steering Group Report.

Major positive - Impact which provides a net gain for biodiversity overall in terms of increases in habitat diversity (and which may positively affect the integrity of the site).

This would apply in the case of a large-scale increase in a protected species or habitat of a protected species that are locally important or listed as key habitats within the UK Biodiversity Action Plan Steering Group Report.

The integrity of a site is defined within TAN 5 as: *'…the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified'*.

Overall Significance of Impacts Assessment

The IEEM guidelines define an ecologically significant impact as; 'an impact (negative or positive) on the integrity of a defined site or ecosystem and/ or the conservation status of habitats or species within a given geographical area'.

Significance criteria will be established to take account of:

- Conservation value and/ or sensitivity of ecological feature
- Magnitude of impact
- General disturbance/ disruption to habitat
- Structural and species diversity
- Timing of impact
- Duration
- Reversibility
- Cumulative effects
- Impact inter-relationships

The overall significance of each impact is determined from the ecological value of the feature and the magnitude of the potential impact, as shown in Table 8.2.2 below which is based on that provided within DMRB HA205/08. As a result of the Impact Assessment table having more than one significance level for some combinations of nature conservation value and impact magnitude, professional judgement has been used in deciding which significance category is more appropriate, taking a precautionary approach where necessary.

Table 8.2.2. Table of Overall Significance of Impacts Assessment

Magnitude of potential impact	Nature Conservation Value of Sites Damaged or Improved				
	Very high	High	Medium	Low	Negligible
Major negative	Very large adverse	Large or Very large adverse	Moderate or Large adverse	Slight or Moderate adverse	Slight adverse
Moderate negative	Large or Very large adverse	Moderate or Large adverse	Moderate adverse	Slight adverse	Neutral or Slight adverse
Minor negative	Moderate or Large adverse	Slight or Moderate adverse	Slight adverse	Neutral or Slight adverse	Neutral or Slight adverse
Negligible negative	Slight adverse	Slight adverse	Neutral or Slight adverse	Neutral or Slight adverse	Neutral
Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
Negligible positive	Slight positive	Slight positive	Neutral or Slight positive	Neutral or Slight positive	Neutral
Minor positive	Moderate or Large positive	Slight or Moderate positive	Slight positive	Neutral or Slight positive	Neutral or Slight positive
Moderate positive	Large or Very Large positive	Moderate or Large positive	Moderate positive	Slight positive	Neutral or Slight positive
Major positive	Very large positive	Large or Very large positive	Moderate or Large positive	Slight or Moderate positive	Slight positive

Zone of Influence

The Zone of Influence (ZoI) concept is used to describe the area over which impacts may occur as a result of the Scheme. Clearly, the relevant ZoI will depend on the ecological receptor concerned. For example, a SAC designated for mobile species such as bats may be considered within the ZoI at greater distance from the Scheme than a SAC designated for sedentary species or habitats such as ancient woodland, and the same may be true for undesignated receptors.

8.2.3. Limitations and assumptions

A number of limitations apply for the ecological surveys which have been undertaken. Species and habitats are dynamic, affected by natural processes as well as human intervention; consequently the presence of particular species or habitats may change over time, and this can be impossible to detect during 'snapshot' surveys, over a brief time period, however detailed those surveys are. Where possible, an indication of likely future baseline conditions for the receptors described below is provided.

In addition, many species are only apparent seasonally, so that surveys at some times of year may be better able to detect them (e.g. recording of higher plants during Phase 1 habitat surveys). Some species are also affected by weather conditions, and may not be recorded during adverse weather even if present at that time of year (e.g. bats recorded during bat activity surveys). As far as possible, all surveys described in this Chapter were undertaken at optimal times and conditions for recording the target species, and all surveys were undertaken at suitable times and conditions. Details of the survey methodologies are provided for specific receptors in the Appendices accompanying this Chapter.

Given these difficulties in reliable recording and prediction of the presence of ecological receptors, where there is any uncertainty, a precautionary approach has been taken where necessary in the assessment of impacts and subsequent mitigation design.

8.3. Baseline Conditions

8.3.1. Designated sites

Internationally designated sites

All internationally designated sites for nature conservation within 30km of the Scheme are shown in Volume 2, Figure 8.1 (a – b). The only internationally designated site within the ZoI for the Scheme is the Montgomery Canal SAC, which is located approximately 840m to the north-east of the Scheme at its closest point. The Montgomery Canal SAC (and associated SSSI, see below) is designated due to the presence of floating water-plantain (*Luronium natans*), the canal supports the largest and most extensive population of this species in Britain. The SAC lies to the north of the River Severn; as it is on the opposite side of the river from the Scheme there is no groundwater connectivity between the two (refer also to Chapter 14 of this ES). The canal takes some water from the River Severn downstream of the point where minor watercourses crossed by the Scheme enter the River Severn, but it is not considered that there is potential for impacts resulting from pollution incidents on the Scheme due to the distance between the Scheme and canal, and resulting dilution of any pollutants. These issues are explored in more detail in the Statement to Inform an Appropriate Assessment (SIAA), which is included in Volume 3, Appendix E.2 to this ES.

The Core Management Plan for the SAC[8.45], identified both the floating water-plantain population and canal vegetation generally to be in an unfavourable condition in 2007, primarily through siltation in some sections of the canal, and concerns over water quality. However the Core Management Plan details management requirements and provides an action plan for each management unit, consequently it is predicted that the SAC would remain of international importance over the lifetime of the Scheme.

None of the other SACs within 30km of the Scheme are considered to be within the zone of influence for the Scheme, given the features for which they are designated and the distances involved.

Nationally designated sites

All nationally designated sites for nature conservation within 10km of the Scheme are shown in Volume 2, Figure 8.1b. There are four SSSI sites in the vicinity of the Scheme: the Montgomery Canal SSSI, Mochdre Dingles SSSI, Penstrowed Quarry SSSI and Gweunydd Penstrowed SSSI, all of which are located within 2km of the western end of the Scheme.

The Montgomery Canal SSSI corresponds with the Montgomery Canal SAC, described above. Mochdre Dingles SSSI supports semi-natural broadleaved woodland and in particular species-rich upland ash woodland. Penstrowed Quarry SSSI is a geological SSSI showing an important section of Penstrowed Group sedimentary rocks. Gweunydd Penstrowed SSSI supports unimproved neutral grassland with some unimproved acid grassland, and Montgomeryshire's best known population of lesser butterfly orchid (*Platanthera bifolia*). The locations of these sites relative to the Scheme are shown in Volume 2, Figure 8.1b. All are considered to be within the ZoI for the Scheme on a precautionary basis, due to their proximity to it.

As these sites are subject to monitoring by NRW and there are no specific known threats to these, it is predicted that these sites would remain of national importance for the life time of the Scheme.

Two further SSSIs (Caeau Cwmffrwd and Hollybush Pastures) are more distant at between 4-5km distance from the Scheme and are considered to be outside the ZoI.

Locally designated sites

There are no local Sites of Importance for Nature Conservation (SINC) or Regionally Important Geological Sites (RIGS) within the ZoI for the Scheme.

8.3.2. Plants and habitats

Description of Scheme

The Scheme would cross primarily agricultural pasture land lying south of Newtown. The land rises steeply above the town and is bisected by several steep minor valleys at Mochdre Bridge,

the Dolfor valley and below Black Hall. Between these valleys the Scheme primarily comprises sheep- (and some cattle-) grazed pastures separated by managed hedgerows. There are several small woodland areas at Castell-y-Dail, in the Dolfor Valley and near Upper Brimmon. Glandulas Holiday Home Park lies either side of the western end of the Scheme, and the western half of the Scheme also includes a small number of arable fields.

The following sections describe the habitats present on the Scheme; Phase 1 Habitat survey plans for the Scheme are shown in Volume 2, Figure 8.2 (a – i).

Broadleaved woodlands and scrub

There are small areas of broadleaved woodlands along the Scheme in several locations: on the eastern slope of the Mochdre valley, on the slope between the two roads adjacent to Mochdre Bridge; two sections of wooded stream corridor in the Coleg Powys Farm; two areas within the Castell-y-Dail woodland; woodland on both sides of the Dolfor valley; woodland north of Upper Brimmon; and woodland north-east of Great Brimmon Farm (refer to the Phase 1 Habitats plan in Volume 2, Figure 8.2). These woodlands typically support oak, ash, bramble, hawthorn, rose, sycamore (*Acer pseudoplatanus*) with a range of other species in some woods including hazel, field maple, holly (*Ilex aquifolium*), willow (*Salix* spp.) and alder (*Alnus glutinosa*). Several of the woodlands also support a diverse ground flora including species such as bluebells (*Hyacinthoides non-scripta*), wood anemone (*Anemone nemorosa*) and dog's-mercury (*Mercurialis perennis*) and are therefore likely to be long-established woodlands. Woodland at Castell-y-Dail is identified as ancient semi-natural woodland by BIS.

Native broadleaved woodlands are identified as a priority habitat in the TREBAP.

The nature conservation value of these areas in the absence of development is unlikely to increase significantly over time. Changes to management are considered unlikely, as the majority of these woodlands are on slopes too steep to readily allow access, consequently it is considered most likely that these would retain their value over the operational lifetime of the Scheme.

Coniferous and mixed woodlands

Coniferous and mixed woodlands are present in several locations: on the slope above the existing A489 at the western end of the Scheme; in the Castell-y-Dail woodlands; an area within fields to the east of the Castell-y-Dail woodlands; and on the slopes of the valley below Black Hall.

Coniferous woodlands are identified as a priority habitat in the Powys LBAP.

The majority of these woodlands are mixed, with canopy and understorey species in addition to the conifers including oak, hazel and sycamore. With the possible exception of the Castell-y-Dail woodlands, conifers are unlikely to be harvested from these woodlands, and it may therefore be expected that as these become over-mature and fail, the proportion of broadleaved species may increase through germination from the seed bank. As such, it is considered possible that the ecological value of these may increase over time, either through harvesting or natural processes, though any benefit would be negated by replanting of conifers, and consequently an increase in value cannot be predicted with any certainty.

Hedgerows

The majority of field boundaries along the Scheme are hedgerows rather than fences or walls. Many of the hedgerows are species-poor and/or are subject to regular management by tractor-mounted flail, consequently both the diversity and structure of many hedgerows along the Scheme mean they are of limited ecological value. A number of the hedgerows have associated trees, which are not routinely trimmed, and in some areas there are unmanaged hedgerows.

These hedgerows typically consist of hawthorn (*Crataegus monogyna*), hazel (*Corylus avellana*), blackthorn (*Prunus spinosa*) and elder (*Sambucus nigra*) with many also supporting ash (*Fraxinus excelsior*), bramble (*Rubus fruticosus* agg). and roses (*Rosa* spp.). A minority of hedgerows support other species including beech (*Fagus sylvatica*), field maple (*Acer campestre*), oak (*Quercus* spp.), and other species.

There are a number of hedgerow trees on, or close to the route of the Scheme. Although the majority of these are typical hedgerow trees, one veteran oak tree is present east of Kerry Road, and the Scheme has been aligned to allow retention of this tree.

Assessment of hedgerows for their suitability to support dormice (see below) found that the more species-rich and sympathetically managed hedgerows were concentrated in several areas along the Scheme, primarily around the Glandulas Holiday Home Park, the Mochdre Brook valley, either side of the Dolfor valley, and eastwards from the minor road at Wern Ddu Lane to the railway line.

Linear features including hedgerows are identified as a priority habitat in the Powys LBAP, and in the TREBAP.

The nature conservation value of the hedgerows is unlikely to increase over the operational life time of the Scheme, and could decrease if the existing management regime is extended to include all hedgerows along the route.

Watercourses

The Scheme crosses watercourses in the following locations: two minor streams flowing beneath the existing A489 at the western end of the Scheme; the Mochdre Brook; minor stream flowing through woodland with the Coleg Powys Farm; a minor stream and three seasonal watercourses flowing from the Castell-y-Dail woodlands; the Green Brook; the Dolfor Brook; a minor stream flowing across the Scheme to the north of Upper Brimmon Farm; several seasonally wet ditches between the A489 Kerry Road and Wern Ddu Lane; a seasonally wet ditch north of Penygelli and the same watercourse where it is crossed by the Scheme to the north of the railway line, close to the eastern end of the Scheme; and an unnamed watercourse running parallel to the Scheme, which is crossed by the A489 Kerry Road on the approach to its junction with the Scheme, and which flows beneath the A483 Pool Road and into the River Severn just east of the Scheme.

The majority of these watercourses are seasonally wet ditches or very small streams which do not support distinctive or important communities of aquatic or emergent plants. The two larger watercourses, at Mochdre Brook and the Dolfor valley, represent a more ecologically important resource but even here there are few aquatic or emergent plants; it is likely this is due to the flow characteristics of the streams which vary considerably in their water levels and flow rates depending on rainfall upstream. Two other watercourses, on the Coleg Powys Farm, and the Green Brook, are considered potentially more ecologically important based on the relatively unmodified and undisturbed stream channels. Consequently, these four watercourses are considered likely to be more valuable than the other minor streams and ditches, and so are considered as a separate receptor below.

Rivers and streams are identified as priority habitats under both the Powys LBAP and TREBAP.

Watercourses are a habitat at risk of experiencing changes over time, even in the absence of the Scheme, due to climate change. Although specific changes are hard to predict, there appears to be a trend towards experiencing more frequent periods of very wet weather resulting in flood conditions, and also more periods of prolonged drought. In addition, watercourses can obviously be affected by changes to land management upstream. It is considered likely that the two larger watercourses would retain sufficient flow even during dry periods to maintain their current ecological value, though they would remain at risk of damage through pollution or sedimentation, particularly during low flows. The smaller streams and ditches may become even more seasonal in their flow patterns and are therefore unlikely to increase in value, and may well decline in value over the operational life time of the Scheme.

Pond

One pond is present on the route of the Scheme, on a field boundary to the east of Lower Brimmon Farm. The pond is relatively large in area but very shallow, with much of the pond area comprising waterlogged marshy grassland, rather than open water. The pond is ringed by emergent vegetation, predominantly rushes, and also supports some aquatic vegetation. It is likely that this pond is subject to significant fluctuations in water levels. Whilst occasional drying-out is not necessarily damaging to ponds (indeed, this can benefit amphibians by reducing predation from fish), the pond may be at risk of deterioration during the operation lifetime of the Scheme, both through siltation reducing the already shallow depth of the pond, and through more regular drying-out if current trends towards prolonged periods of dry weather continue. Small numbers of common amphibian species (common frog, palmate newt) were recorded in the pond during surveys in 2008.

Marshy grassland

Small areas of marshy grassland are present in several locations, mostly within grazed fields. Areas of marshy grassland are present at: the western end of the Scheme immediately adjacent to the existing A489; on the eastern side of the Castell-y-Dail woodlands; south of the Scheme between Castell-y-Dail and the Black Hall valley; north of Upper Brimmon Farm; and east of Lower Brimmon.

These areas of marshy grassland were mostly small areas associated with small watercourses and springs with two wet grassland slopes on the east side of the Castell-y-Dail woodlands. However all of these were species-poor, with soft rush (*Juncus effusus*) dominant and often the only plant species present which was characteristic of the habitat. Consequently, while these areas have been classified as marshy grasslands to distinguish them from other improved grassland habitats, those on or close to the Scheme are considered to be of little intrinsic nature conservation value.

As with the minor watercourses, it is considered that these areas may be at risk of deterioration during the operational lifetime of the Scheme, if current trends towards prolonged periods of dry weather continue.

Semi-improved grassland

One area of semi-improved grassland is present a short distance from the Scheme, on the western side of the valley below Black Hall. This area was on a steep slope with erosion scars caused by grazing livestock, and presumably therefore supports a higher diversity of plant species due to the thinner soils on this slope. Nevertheless, this area did not support a high diversity of plant species, nor were any notable species recorded. Consequently this area is considered to be of fairly limited ecological value. Some semi-improved grassland with knapweed (*Centaurea nigra*) and Bird's-foot trefoil (*Lotus corniculatus*) occurred in a horse-grazed field adjacent to the A489 at Glanhafren Hall. A second area of reverting, ungrazed grassland with a few Common Spotted orchids (Dactylorhiza fuchsii)) occurs on the steep slopes between the industrial estate and the Dolfor Road.

This area lies within an otherwise agriculturally improved field, and on a slope below another agriculturally improved field to the west. It is therefore considered that the area is at risk of degradation through nutrient run off from the field above, and is therefore unlikely to increase in extent or diversity during the operational lifetime of the Scheme.

Improved grassland

As stated above, the majority of land crossed by the Scheme comprises species-poor improved grassland or limited ecological interest. This is typically grazed with sheep or cattle, though in some areas re-seeded leys are used for production of silage in addition to being grazed. These habitats make up the majority of the area directly affected by the Scheme.

It is predicted that the nature conservation value of these grasslands would generally remain unchanged, though some areas close to the edge of Newtown could in future become subject to further light industrial and residential development.

Amenity grassland

Small areas of amenity grassland are present along the Scheme at the Glandulas Holiday Home Park. These have negligible nature conservation value, and are considered unlikely to change in character or ecological importance in the absence of the Scheme.

Invasive Plant Species

Japanese knotweed has been recorded in three locations on the route of the Scheme: on the banks of the River Severn close to the western end of the Scheme; opposite Bontdulas Cottages close to the Mochdre Brook; on the Green Brook; and on the Dolfor Brook at the point where it would be crossed by the Scheme.

Lichens

Lichen surveys in June 2014 identified 94 lichen species and one lichenicolous fungus on substrates on or close to the footprint of the Scheme. Nearly all the lichen communities noted were strongly influenced by nutrient-enrichment from agriculture, potentially via dust deposition, fertiliser spreading, and release of gaseous ammonia. Most areas of woodland were very shady and lichen-poor. Rock was a rare substrate at the site, represented only by a small mudstone exposure and a few stones at field margins.

Of the more unusual species recorded. *Chaenotheca stemonea* is regarded as Vulnerable in Wales (Woods 2010)[8.47] due to the small number of known populations. This species occurred on the dry, rain-sheltered bases of three mature larch in woodland at the western end of the Scheme and would be unaffected by the Scheme *Strigula jamesii* is regarded as Vulnerable in Wales, is Nationally Scarce, and occurred on hazel at the margin of Castell-y-Dail Woodland and would be unaffected by the Scheme.

Three additional species were Nationally Scarce. *Cladonia cyathomorpha* occurred on occasionally flushed rocks on a small mudstone outcrop on the western side of the Green Brook valley; this species is occasional in much of North Wales and may be a little under-recorded in Britain. This species was located on rocks within the footprint of the Scheme at approx. Ch. 2050. *Lecanora compallens* is a recently recognised and probably under-recorded species of field and wayside trees. This was located in two places along the Scheme. It would be unaffected where it occurs on an ash at Lower Brimmon but where it occurs on an ash at Brimmon farm it would be lost to the Scheme Porina *byssophila* was formerly considered to be Nationally Rare and confined to shaded rock, but it has been overlooked as a species of shady bark, often in unremarkable habitats. This is on the same hazel as the *Strigula jamesii* at Castell-y-Dail woodland and would be unaffected. No legally protected lichen species, Species of Principal Importance or LBAP species were recorded on or close to the Scheme.

Very few species from the list of those considered to be indicative of old woodland and ecological continuity were found, namely *Cladonia caespiticia*, *Chaenotheca trichialis* and *C. stemonea*. The whole site thus has a score of 3 on the NIEC, suggesting a low likelihood of ancient origin and ecological continuity. It is likely that there has been little ecological continuity in habitats on the Scheme, as large trees are scattered and possibly planted, and woodlands are small and much disturbed. In addition, old-woodland species would have suffered from acid deposition and eutrophication. Full details of the lichen survey results are provided in Volume 3 Appendix E.3.

Ash Dieback Disease

Ash die-back disease (*Chalara fraxinea* and its sexual stage *Hymenoscyphus pseudoalbidus*) is a fungal pathogen which causes widespread damage and death in Ash (*Fraxinus excelsior*). It was first identified as present in Britain in 2012 and by 2014 was widely, if uncommonly, reported throughout lowland England and Wales. Information on presence of Ash die-back is required to manage the effects of the disease and inform the response of controlling and monitoring the spread of the disease. As part of the environmental work for the A483/A489 Newtown Bypass, information is needed on the presence of Ash die-back along the route to inform construction management plans.

Ash die-back has been reported about 15 km to the east of Newtown on transplanted saplings (Forestry Commission website, http://www.forestry.gov.uk/ashdieback, accessed 2.7.14) but has not been confirmed from the immediate Newtown area.

In accordance with IAN 172/13 (W) surveys were undertaken along the Scheme during 2 and 3 July 2014 looking for ash trees, which were then inspected for symptoms of ash die-back as

described on the Forestry Commission website. Land belonging to Glandulas Holiday Home Park was not surveyed. The survey concentrated on areas directly affected by the proposed Scheme, but other adjacent trees were inspected on passing.

Due to the number of ash trees, it was not possible to examine every tree in detail. Hedges were mostly inspected from one side only. For tall trees in the canopy with no lower branches, binoculars were used to look for necrotic leaves and shoots in the canopy.

Ash is widespread along the proposed route, either as trimmed trees in hedges, standard trees in hedges or woodland, or regenerating on ungrazed land. No examples of Ash die-back were found during the survey.

8.3.3. Protected and other notable animal species

Invertebrates

Both aquatic and terrestrial invertebrate surveys undertaken in 2012 generally found only common and widespread species, at all sampling locations along the Scheme. Invertebrate surveys of hedgerows and adjoining grassland on field margins identified a total of 74 invertebrate species. Of these only two species of note were recorded: *Phylidorea lineola*, a small cranefly which is widespread but uncommon in the UK in damp areas; and *Syntormon denticulatum*, a marsh fly which is close to the northern edge of its UK range in Newtown. Both were recorded near Upper Brimmon.

Invertebrate sampling of woodland and scrub habitats at Castell-y-Dail and the woodland overlooking the A489 at the western end of the Scheme found a total of 37 invertebrate species. One locally occurring species, the parasitic fly *Paykullia maculata*, was recorded at Castell-y-Dail.

Aquatic invertebrate sampling found a diversity of taxa in all three watercourses surveyed that indicated very high water quality, though there was some indication that at the Mochdre Brook the water quality was affected by drainage from the road and houses adjacent to the bridge. However, although the diversity of species was high, no protected or notable species were noted during the sampling.

It is therefore considered that invertebrate populations on the route of the Scheme are of limited nature conservation value, but that the watercourses and wetter areas have some value through supporting a high diversity of common species, and a small number of uncommon species.

Invertebrates are a group which are likely to be sensitive to any future changes in climatic conditions and land use. Aquatic invertebrates would be subject to the same challenges as described above for the watercourses themselves, while terrestrial invertebrates would be at risk from changes to land management. It is therefore considered that invertebrate populations on the route of the Scheme are more likely to decrease in value, in the absence of the Scheme itself, than to increase. However because these effects cannot be predicted with any certainty, it is assumed that the nature conservation value of invertebrates would be maintained throughout the operational lifetime of the Scheme.

White-clawed crayfish (*Austropotamobius pallipes*) are not considered likely to be present on or close to the Scheme. Signal crayfish (*Pacifastacus leniusculus*) were recorded during aquatic invertebrate sampling at the Mochdre Brook, and so are not considered as an ecological receptor likely to be affected by the Scheme.

Fish

Desktop surveys identified that the Mochdre Brook is the only watercourse crossed by the Scheme that is routinely surveyed by NRW and therefore has known fish populations of any value. This watercourse is known to support stone loach (*Barbatula barbatula*) and brown trout (*Salmo trutta*). Following a site inspection in January 2014, NRW identified the Mochdre Brook as also supporting Atlantic salmon (*Salmo salar*) and bullhead (*Cottus gobio*), and considered that it may support Eels (*Anguilla anguilla*).

NRW also identified other watercourses as potentially suitable to support fish populations: the stream within Coleg Powys land (location of Culvert 3a) which was considered suitable for bullhead; and the Green Brook at the location of Culvert 8) which was considered suitable for brown trout and bullhead. However, another section of the same watercourse, at the location of

S4 was considered to be of low value to fish, as was the existing culvert downstream of the confluence between the Green and Dolfor Brooks.

An assessment of suitability of watercourses to support fish was carried out in 2014, and assessed eight sites: locations of Culverts 3a, 4, 8, 9, 10, 11, 12 and Structure 4. Some of these, for example C8 and S4, represent different parts of the same watercourses. This assessment identified that the majority of small watercourses crossed by the Scheme were sub-optimal for fish populations due to low flows, canalised stream channels, or siltation. However, watercourses crossed by Culverts 3a and 8 were considered potentially suitable to support brown trout and bullhead. Electrofishing surveys were then carried out in 2014 to confirm the status of fish in the watercourses at proposed locations of Culvert 3a, Culvert 11, and the Dolfor Brook (Structure 5). However, no fish populations were found at any of these sites.

In the absence of the Scheme, fish populations in these watercourses would be at risk from changing patterns of rainfall, and agricultural run-off upstream. NRW consider that the value of several of these watercourses for fish is limited by presence of culverts, so creation of additional culverts (other than for the Scheme) may also affect remaining populations. However, given the size and flow characteristics of these watercourses, it is considered likely that the value of fish populations on the route of the Scheme would be maintained.

Amphibians

Amphibian surveys of the Scheme and surrounding buffer found no evidence of GCN on the southern side of the River Severn, although a population was identified in ponds close to the sewage works at Dolfor Lock on the north side of the River Severn. Small numbers of other amphibians: smooth and palmate newts (*Lissotriton vulgaris* and *L. helveticus*), and common frog (*Rana temporaria*) were recorded in the vicinity of the Scheme.

It is therefore considered that GCN are absent from the Scheme and are not considered as an ecological receptor in the assessment below. Common amphibian species are present in one pond in the vicinity of the Scheme, in a field off Wern Ddu Lane.

Amphibians are a group which are under threat from various factors including deliberate removal or inappropriate management of ponds and from introduced infectious diseases. Changing climatic patterns may also affect the suitability of ponds for these species. It is therefore considered more likely that the already limited nature conservation value of the Scheme for amphibians would decline in the absence of the Scheme.

Whilst an existing pond supporting common frog and palmate newt would be lost to the Scheme at Ch. 4880, it would be replaced by two new ponds one on either side of the Scheme which would be linked by a culvert.

Reptiles

Slow worms (*Anguis fragilis*) are present in one location on the route of the Scheme, around the margins of the woodland overlooking the A489 at the western end of the Scheme. The maximum number observed on one visit was nine individuals, suggesting there is at least a ‘good’ sized population present in this area. Although no reptiles were recorded elsewhere on the Scheme, grass snakes (*Natrix natrix*) in particular may occur in small numbers, particularly in areas close to ponds, and the railway line close to the eastern end of the Scheme could not be surveyed in detail for reptiles due to safety considerations.

In the absence of the Scheme, it is considered likely that the value of the Scheme corridor for reptiles would be maintained, but that ongoing habitat management activities on adjoining areas (grazed pasture and the Glandulas Holiday Home Park) would be unlikely to allow any expansion of the population beyond its existing location.

Breeding Birds

Table 8.3.3 shows Red and Amber List species, recorded during the 2012 and 2014 surveys, which should be considered resident or breeding migrants.

Table 8.3.3. Red and Amber List Breeding Bird Species Recorded

Red List Species (decline of ≥ 50% in range or breeding numbers)	Amber List Species (decline of ≥ 25% in range or breeding numbers)
Song Thrush (*Turdus philomelos*) Starling (*Sturnus vulgaris*) House Sparrow (*Passer domesticus*) Linnet (*Carduelis cannabina*) Wood warbler (*Phylloscopus sibilatrix*) Lesser redpoll (*Carduelis cabaret*)	Mallard (*Anas platyrhynchos*) House Martin (*Delichon urbica*) Swallow (*Hirundo rustica*) Dunnock (*Prunella modularis*) Redstart (*Phoenicurus phoenicurus*) Mistle Thrush (*Turdus viscivorus*) Whitethroat (*Sylvia communis*) Willow Warbler (*Phylloscopus trochilus*) Bullfinch (*Pyrrhula pyrrhula*) Swift (*Apus apus*) Stock dove (*Columba oenas*) Pied flycatcher (*Ficedula hypoleuca*)

In addition to the species listed above, the following are of local significance:

- Goshawk (*Accipiter gentilis*, widespread but subject to persecution)
- Greenfinch (*Carduelis chloris*, a species subject to recent drastic decline in UK)
- Dipper (*Cinclus cinclus*, has declined in west Wales since 1970)

Other species which were not recorded but which were considered likely to be present and/or which may be present in future, include grey wagtail (*Motacilla cinerea*, Amber list), kingfisher (*Alcedo atthis*, Amber list), and kestrel (*Falco tinnunculus*, Amber list).

Red Kite (Amber list) although recorded during one of the 2014 transect surveys was confirmed as not breeding in or close to these woodland areas on the Scheme, and is therefore only considered present as a non-breeding species. Common crossbill were not recorded on or close to the Scheme.

Barn Owls

Barn owls were not recorded during any surveys along the Scheme, in 2008, 2012 or 2013. A small number of barn owl pellets (<5) were found in 2014 during surveys at Lower Brimmon, however there was no indication that this site represented a breeding site or regularly occupied roost. As such it is considered likely that this species is largely absent from the Scheme; this is likely to be due to the predominance of sheep-grazed pastures on the Scheme which do not support large small mammal populations, and consequently do not provide suitable foraging habitat for barn owls.

Badgers

Badger setts were identified in twelve locations close to the Scheme, eight of which were within 30m of the Scheme and therefore potentially affected by it. Five setts are partially or entirely within the footprint of the Scheme. The results of these surveys are presented in the confidential Appendix Volume 3 Appendix E.6 which is not available for public consultation to protect this species.

Badgers are protected for animal welfare, rather than conservation reasons, and although present at fairly low density along the Scheme, this is a widespread species in lowland areas of Wales. Consequently, although mitigation may be necessary for licensing reasons, this is not a species that is considered a high nature conservation priority, and this is reflected in the valuation assigned to this receptor.

Roosting Bats

For clarity in later sections of this chapter, baseline conditions for roosting bats and commuting/foraging bats are described separately here, and are identified as different receptors.

The majority of buildings on or close to the Scheme are farmhouses, barns and associated outbuildings (refer to Volume 3, Appendix E.9). Some of these buildings offer high potential for

roosting bats due to their design and construction methods. Others, such as the Barn along Pool Road had low potential. Survey of buildings on or close to the Scheme in Autumn 2013 and Spring 2014 identified evidence of bats in three buildings on or close to the Scheme: at Kinsale in the Dolfor valley, which is on the footprint of the Scheme; in Castell-y-Dail House; and in the main barn at Tyn-y-Green off Wern Ddu Lane. However, there was one building (Gelli, off Pool Road) affected by the Scheme where access to undertake surveys was unavailable at the time of the surveys, consequently this has not been fully assessed.

Kinsale in the Dolfor Valley is a detached residential property with a partially lined slate roof. Internal inspection in August 2013 found 25-30 bat droppings in the loft of the property. There were potential access points for bats behind barge boards and soffits, including at the western gable end, where a bat was observed entering the building during one of the transect bat activity surveys in 2013. Re-inspection of the loft in spring 2014 found similar results, though a sample of droppings taken from the loft was confirmed by DNA testing to be from whiskered bats (*Myotis mystacinus*). Subsequent emergence and re-entry surveys in summer 2014 to characterise this roost identified a single Soprano pipistrelle (*Pipistrellus pygmaeus*) leaving or entering the building under a roof slates near the west facing gable end of the building (refer to ES Volume 3, Appendix E.12). Based on these survey findings it is considered likely that Kinsale supports a non-breeding summer roost for Soprano pipistrelle (*Pipistrellus pygmaeus*) and an occasional summer roost or transitional roost for Whiskered bats (*Myotis mystacinus*), with bats less likely (but not certain) to be absent during winter.

The Barn along Pool Road has slatted wood walls and a corrugated steel roof with plastic windows, concrete pillars and wood beams. There is an open steel lean-to at the east side. A dawn re-entry survey recorded a single Soprano pipistrelle (*Pipistrellus pygmaeus*) entering under a wooden slat on the southern side of the building. Based on the survey findings it is considered likely that the Barn along Pool Road supports a non-breeding summer roost for small numbers of Soprano pipistrelle bats *(Pipistrellus pygmaeus).*

Castell-y-Dail House was surveyed internally in spring 2014, and a small number of old droppings were found in each of the two lofts. These were confirmed by DNA testing to be from Natterer's bats (*Myotis nattereri*). It is likely that these indicate use of the building since approximately 2012, as works including re-insulation of the loft had been carried out at that time. Although relatively close to the Scheme, this building is not within the footprint of the Scheme.

The complex of barns at Tyn-y-Green was also surveyed in 2013. Two accumulations of butterfly wings were found, indicating use as a feeding perch by bats, probably brown long-eared bats. Two bats were also seen returning to the south gable end of the barn nearest the road at dawn during one of the transect bat activity surveys in 2013.

Other buildings surveyed, but where no evidence of use by bats was found, were Hillcrest, Ashbrook and Cwn-y-Gwynt, in the Dolfor Valley, 4 Bontdulas in the Mochdre Valley, the Castell-y-Dail Centre, buildings at Lower Brimmon on the A489 Kerry Road, and the barn off Pool Road at the eastern end of the Scheme.

Survey of trees affected directly (i.e. within the Scheme footprint) or indirectly by the Scheme (i.e. close to junctions which would be lit) in 2014 identified three Category 1* trees, 22 Category 1 trees and 49 Category 2 trees which lie within the footprint of the Scheme. No trees directly affected by the Scheme have been identified as roost sites for bats. A further one Category 1* tree eight Category 1 trees and four Category 2 trees are retained but would be close to lit junctions, and therefore potentially indirectly affected by the operational Scheme (refer to Volume 3, Appendix E.10).

Two tree roosts have been identified close to the Scheme, including a possible common pipistrelle tree roost in woodland north-west of Upper Brimmon Farm identified during activity surveys in 2013 and a walnut tree to the north of the Castell-y-Dail woodland which was identified as a roost site for a single noctule *Nyctalus noctula* bat during surveys in August 2012. Neither of these trees are considered to be directly or indirectly affected by the Scheme.

All bat species are priority species in the TREBAP; several bat species (pipistrelles and lesser horseshoe) are Powys LBAP species.

In the absence of the Scheme, roosts in buildings would be expected to persist, though roosts in trees tend to have a shorter lifespan as roosting opportunities in trees are typically provided by

decay features on the trees, such as peeling bark and rot cavities. It has been suggested that changing climatic conditions may allow a number of British bat species to expand their currently limited ranges, and if this were to occur it is possible that in future the area around the Scheme (though not necessarily the route corridor itself) may support a higher diversity of roosting bats than at present, though numbers of bats roosting on or near the Scheme would primarily be limited by management of foraging habitats.

Commuting and foraging bats

Some bat foraging activity occurs at all the hedgerows and wooded features crossed by the Scheme. The species most commonly encountered during activity surveys are common and soprano pipistrelle (*Pipistrellus pipistrellus* and *P. pygmaeus*), which were present at all survey locations. Smaller numbers of noctule (*Nyctalus noctula*) bats were recorded on most of the survey locations, except at the western end of the Scheme. *Myotis* species were recorded occasionally in most survey locations; these species cannot always be reliably distinguished from their echolocation calls, but Daubenton's bat (*Myotis daubentonii*) has been recorded at the Mochdre Brook, the Dolfor valley and adjacent to the A489 Kerry Road, and Natterer's bats have been recorded in the Dolfor valley and woodland north-west of Upper Brimmon Farm. Long-eared bats, presumably brown long-eared bats (*Plecotus auritus*) as the Scheme is outside the known range for grey long-eared bats (*P. austriacus*), have been recorded rarely in the central part of the Scheme, in the Dolfor valley, woodland near Brimmon Farm, Brimmon Lane and on the A489 Kerry Road.

A lesser horseshoe bat was recorded on two occasions during one survey, at a transect adjacent to the Mochdre Brook, but this was the only location where this species was recorded on the Scheme. Other species encountered very rarely were serotine (*Eptesicus serotinus*), recorded once in the Dolfor valley, and possible Nathusius' pipistrelle (*Pipistrellus nathusii*) calls, recorded in the Mochdre and Dolfor valleys.

The majority of features crossed by the Scheme do not supporting significant commuting routes for bats, however bats were recorded commuting in larger numbers (peak counts of ten or more bats recorded commuting during one survey) in six locations: at the northern edge of Castell-y-Dail (common pipistrelle); the western side of the A483 at the northern end of the Dolfor valley (common pipistrelle); along Brimmon Lane (common pipistrelle), where on one occasion over 50 commuting bats were recorded; along the A 489 Kerry Road (common and soprano pipistrelle); along the Middle Dolfor road, on the floor of the Dolfor valley (common pipistrelle); and on the Upper Dolfor road immediately to the east of the Dolfor valley (common pipistrelle).

Consequently although bat activity occurs on all parts of the Scheme, the majority of bat activity is by common species, and few significant commuting routes are crossed by the Scheme. The less common species such as *Myotis* bats are mainly associated with the valley crossings, watercourses and woodland areas. Lesser horseshoe bats have only been recorded occasionally in one survey location, and barbastelle bats were not recorded during any surveys in 2013.

As stated for roosts above, changing climatic conditions may allow a number of British bat species to expand their currently limited ranges, and if this were to occur it is possible that in future the area around the Scheme may support a higher diversity of bats than at present. However, it is considered unlikely that prevailing agricultural management of the route would change sufficiently that its use by commuting or foraging bats would change significantly, so overall the route is considered unlikely to significantly increase in value for commuting and foraging bats in the absence of the Scheme.

Dormice

Surveys have found dormice in six areas on the Scheme: hedgerows associated with Glandulas Holiday Home Park; the Mochdre valley; the Dolfor valley; the A489 Kerry Road; hedgerows east of Wern Ddu Lane; and adjacent to the A483 at the eastern end of the Scheme. However, not all these records are recent, and nest tube surveys in 2013 failed to confirm continued presence of dormice in one area with older records (the Dolfor valley). Surveys in 2013 also found no evidence of dormice in the Castell-y-Dail woodland.

Assessment of hedgerows on the route of the Scheme in 2013 found that the majority were sub-optimal for dormice. Of 107 hedgerows and woodlands, only 13 were considered optimal for dormice (Category A, refer to Volume 3, Appendix E.13), with a further 28 considered suitable (Category B). A further 55 features were considered to be sub-optimal for dormice (Category C), with the remaining 11 considered largely unsuitable due to either their limited diversity of food

plants, their management, connectivity to other habitat, or a combination of these. While it is recognised that such habitat assessment of hedgerows may not reliably indicate presence or absence of dormice in all cases, this approach is likely to be more reliable than tube surveys in sub-optimal habitats where dormice may be present at low densities.

Given the intensive management regime that the majority of hedgerows along the Scheme are subject to, it is likely that dormice are present only at low densities in suitable and sub-optimal hedgerows. In the latter they may only be present seasonally in late summer and early autumn between dispersal of juveniles from nearby woodland or unmanaged vegetation, and trimming of hedgerows. The 2013 surveys may have failed to confirm presence of dormice in the Dolfor valley because dormouse populations were adversely affected by poor weather in 2012, and so the apparent absence of dormice from Castell-y-Dail woodlands in 2013 should be viewed with some caution.

Dormice are a TREBAP and Powys LBAP species. Overall, therefore, it is considered likely that dormice are present in woodlands and suitable hedgerows on the Scheme in three areas: between the western end of the Scheme and the Mochdre Valley, in the Dolfor Valley and surrounding hedgerows, and from the A489 Kerry Road east to the eastern end of the Scheme. Even in these areas, it is likely that they are present only at low density and potentially only seasonally in the majority of hedgerows. This situation is considered unlikely to change in the absence of the Scheme, as it would require a widespread relaxation of hedgerow management, which is considered unlikely to occur.

Otters and water voles

Evidence of otters has been recorded on several watercourses crossed by the Scheme, during surveys in 2008, 2012 and during NRW's site inspection in early 2014.

An otter spraint was found indicating use of the unnamed watercourse at the extreme western end of the Scheme; this watercourse crossing is immediately adjacent to the River Severn. The watercourse flowing beneath the Scheme and into the Severn from woodland at Glandulas was also considered to have potential for use by otters.

Surveys of the Mochdre Brook in 2012 found evidence of use by otters. Although no evidence of holts was found, the structure of the river banks provide abundant potentially suitable lying-up sites.

Evidence of otters was found on the Green Brook between the Scheme and the confluence with the Dolfor Brook, and roots of nearby trees were identified as potential lying-up sites for otters.

Evidence of use by otters was also found on the Dolfor Brook, at culverts associated with the existing A483 Dolfor Road.

Evidence of otters has also been found on the small stream which runs from Upper Brimmon Farm, crossing the Scheme and then flowing parallel to it eastwards to the A489 Kerry Road close to its junction with the Vastre Industrial Estate. Otter activity here is confirmed both by field signs and a road casualty on the Kerry Road in November 2013.

A culvert beneath the A489 Kerry Road was found to have been used as a holt or lying-up site by otters during NRW's inspection in early 2014. The watercourse crossed by this part of the Scheme flows eastwards parallel to the Scheme itself, so is only crossed by the Scheme at the Kerry Road Roundabout.

Otters are a TREBAP and Powys LBAP species. The presence, and continued presence, of otters on these tributaries in the vicinity of the Scheme is likely to depend both on the food resource available for otters (which in turn could be affected by changing flow characteristics and pollution events) and on the suitability of the watercourses between the Scheme and the main river. These are unlikely to change significantly, consequently it is considered unlikely that the value of these watercourses for otters would change significantly during the operational lifetime of the Scheme.

Water voles are not considered likely to be present in the vicinity of the Scheme, as there are no nearby recent records and no evidence of their presence was found during surveys for the Scheme. Consequently they are not considered as an ecological receptor which could be affected by the Scheme.

8.3.4. Summary of ecological receptors

The table below lists ecological receptors described above, with appropriate valuations for their level of nature conservation significance.

Table 8.3.4. Summary of Ecological Receptors

Ecological Receptor	Valuation of Receptor
Montgomery Canal SAC and SSSI	Very High
Mochdre Dingles SSSI	High
Penstrowed Quarry SSSI	High
Gweunydd Penstrowed SSSI	High
Broadleaved woodlands and scrub	Low
Coniferous woodlands	Negligible
Hedgerows	Low
Mochdre Brook, Coleg Powys stream, Green Brook and Dolfor Brook	Low
Other watercourses	Negligible
Marshy grassland	Negligible
Semi-improved grassland	Negligible
Improved grasslands	Negligible
Amenity grassland	Negligible
Lichens	Low
Invertebrates	Negligible
Fish	Low
Amphibians	Negligible
Reptiles	Low
Breeding birds	Medium
Barn owls	Negligible
Badgers	Low
Roosting bats	Low
Commuting and foraging bats	Low
Dormice	Medium
Otters	Low

8.4. Predicted Environmental Effects

8.4.1. Construction impacts

8.4.2. Approach to predicting effects on ecological receptors

The likely effects of the Scheme are described below, both for construction and operation of the Scheme, in relation to each of the ecological receptors described above that have been valued at 'Lower' level or above. With reference to published guidelines and Table 8.2.2, impacts on receptors of negligible value are considered to be neutral, consequently this section and the mitigation proposals which follow it focus on those receptors where there is potential for an adverse or beneficial impact.

It is important to note that, although potential impacts are identified below in the absence of mitigation measures, the iterative design process by which the Scheme has been developed means that potential impacts have been avoided and minimised where possible in order to design the Scheme as described in this ES (refer to Section 2.5 and 3.2). Therefore, potential ecological impacts resulting from culverting of the Mochdre Brook have not been considered, as it is proposed that a clear-span crossing would be used at this location. This 'mitigation by design', primarily comprising the preferred route alignment, nature and locations of major structures and locations (though not detailed design) of road drainage attenuation are taken into account in the predicted impacts, though other mitigation elements described in Section 8.5 below are not.

A summary of predicted impacts on construction and operation of the Scheme is provided below in Tables 8.4.5A and 8.4.5B.

8.4.3. Construction impacts

Predicted impacts during construction vary in their detailed characterisations between individual ecological receptors, however the predicted impacts fall into several discrete types. Potential direct impacts include:

- loss of habitats through clearance of vegetation (e.g. trees/hedgerows for dormice, breeding birds);
- loss of habitats through topsoil stripping and subsequent earthworks (e.g. loss of reptile habitat and badger setts);
- loss of bat roosts through demolition of buildings;
- loss of aquatic habitat for fish and invertebrates during diversion of watercourses for culvert construction (and subsequent re-diversion through new culverts);
- injury or mortality of key species if present in these habitats at the time of their removal;
- severance of retained habitats to either side of the Scheme by the construction site, particularly for less mobile species (e.g. dormice).

Potential indirect impacts include

- damage to retained habitats adjacent to the Scheme through dust deposition during construction;
- small-scale disruptions in hydrology (groundwater) caused by earthworks during construction of the Scheme, for example flooding of hedgerow sections adjacent to the Scheme;
- disturbance to individuals of key species which are resident in retained habitats close to the Scheme (e.g. by construction site activities such as noise, construction site lighting);
- similar disturbance which could affect breeding success or survival of these species locally;
- potential for pollution events to affect watercourses crossed by the Scheme, and as a result affect key species and habitats downstream of the pollution incident.

Some of these impacts, as well as varying between receptors, also vary seasonally. However, appropriate timings of works (such as removal of vegetation outside the bird breeding season) have been taken into account in the proposed construction programme in order to minimise these effects. These potential impacts are characterised in more detail in Table 8.4.5A below.

8.4.4. Operational impacts

Predicted effects on key ecological receptors during operation of the Scheme also vary in their characteristics, but fall into several broad types. Potential direct impacts include

- the risk of road mortality for a number of species during operation of the Scheme, where these species attempt to cross the Scheme (e.g. otters and badgers);
- the risk of mortality where the verges of the Scheme provide habitat for species which are subsequently at risk from road traffic collisions (e.g. several bird species including barn owl), or from routine management of the verges (e.g. slow worms);
- the potential that some key species may be able to recolonize the verges, and potentially even extend their populations due to the lower intensity of management on the verges compared to the baseline conditions.

The majority of potential effects identified during operation of the Scheme are indirect, and include:

- the risk of adverse effects from pollution incidents on the Scheme entering watercourses;
- the risk of noise and lighting associated with the Scheme causing disturbance to key species in retained habitats close to the Scheme (e.g. nesting birds or roosting bats);
- the potential for the Scheme to represent a physical or psychological barrier to key species, and therefore to result in fragmentation of populations.

8.4.5. Summary of predicted effects

Table 8.4.4A below summarises predicted construction effects on each of the key receptors identified above, and Table 8.4.4B summarises predicted operational effects, both in the absence of mitigation.

Table 8.4.4A. Summary of Predicted Construction Impacts

***Key for Characterisation of impacts**
SI (Sign): Positive (beneficial (+ve)) or Negative (adverse (-ve))
PO (Probability of Occurring): Certain, Probable, Unlikely
CO (Complexity): Direct, Indirect, Cumulative
EC (Extent): Area measures and percentage of total (e.g. area of habitat/ territory lost)
SZ (Size): Description of level of severity of influence (e.g. complete loss, number of animals affected)
RE (Reversibility): Reversible or Not Reversible (can the effect be reversed, whether or not this is planned)
DU (Duration): Permanent (P) or Temporary (T) in ecological terms. Where differing timescales are determined in relation to the life-cycle of the receptor, these should be defined.
TF (Timing and frequency): Important seasonal and/or life-cycle constraints and any relationship with frequency considered.

Ecological Receptor	Nature Conservation Value	Description of Impact	Characterisation of Impact*	Magnitude of Impact	Significance of Impact
Montgomery Canal SAC and SSSI	Very High	No direct or indirect impacts are predicted. Refer to AIES report in Volume 3, Appendix E.2	N/A	Neutral	Neutral
Mochdre Dingles SSSI	High	No direct or indirect impacts anticipated as SSSI is upstream of Scheme	N/A	Neutral	Neutral
Penstrowed Quarry SSSI	High	No direct or indirect impacts anticipated due to distance of SSSI from Scheme	N/A	Neutral	Neutral
Gweunydd Penstrowed SSSI	High	No direct or indirect impacts anticipated due to distance of SSSI from Scheme	N/A	Neutral	Neutral
Hedgerows	Low	Loss of hedgerows during site clearance	SI: -ve PO: certain CO: direct EC: 4878m length SZ: Impact would affect a small proportion of hedgerows in local area RE: not reversible DU: permanent TF: one off loss	Moderate negative	Slight adverse
		Damage to nearby retained hedgerows through deposition of dust or disruption of hydrology	SI: -ve PO: unlikely CO: indirect EC: likely to be limited to hedgerows in close proximity to the Scheme SZ: impact would affect a very small proportion of hedgerows in local area RE: reversible DU: temporary TF: throughout construction; dust deposition more likely during dry weather	Minor negative	Slight adverse
Broadleaved woodlands and scrub	Low	Loss of woodland and scrub during site clearance	SI: -ve PO: certain CO: direct	Moderate negative	Slight adverse

			EC: 4.9ha (broadleaved woodland), 1.7ha (scrub). 6.6ha Total SZ: Impact would affect a small proportion of woodland and scrub in local area RE: not reversible DU: permanent TF: one off loss		
		Damage to nearby retained woodland and scrub through deposition of dust or disruption of hydrology	SI: -ve PO: unlikely CO: indirect EC: likely to be limited to hedgerows in close proximity to the Scheme SZ: Impact would affect a very small proportion of woodland and scrub in local area RE: reversible DU: temporary TF: throughout construction; dust deposition more likely during dry weather.	Minor negative	Slight adverse
Mochdre Brook, Coleg Powys stream, Green Brook and Dolfor Brook	Low	Use of a clear-span bridge structure over the Mochdre valley would avoid direct impacts on this watercourse. There would be a clear-span bridge over the Dolfor valley however a short section of the Dolfor Brook would be realigned. There would be some loss of bankside habitat beneath the bridge decks, but this is not of sufficient extent or value to be significant. The Dolfor Brook would also be culverted in two places at the Lower Dolfor Road Roundabout, though a section of existing culvert would be de-culverted close to proposed culverts C9 and C10 and the Coleg Powys and Green Brooks would be affected by construction of culverts C3a and C8/S4.	SI: -ve PO: certain CO: direct and possibly cumulative for the Dolfor/Green Brooks – five structures affecting the two connected watercourses EC: habitat at the stream crossings would be lost though some would be recovered through de-culverting SZ: Impact would affect a very small proportion of the watercourses, though their value is variable along their length RE: reversible DU: temporary TF: stream diversions would be required during construction of culverts, and stream beds with culverts may take time to establish once watercourses returned to permanent alignments.	Moderate negative	Slight adverse
		Potential for minor pollution of watercourses during construction	SI: -ve PO: unlikely CO: direct	Moderate negative	Slight adverse

			EC/SZ: downstream from the Scheme crossing, depending on severity of pollution incident RE: reversible DU: temporary TF: could occur at any point duration construction		
Lichen	Low	Loss of tree and rock exposure supporting Nationally Scarce lichen species	SI: -ve PO: certain CO: direct EC/SZ: impact limited to rock exposure on the Green Brook, supporting *Cladonia cyathomorpha* and ash tree supporting *Lecanora compallens*. RE: irreversible DU: permanent TF: during site clearance and construction of C8.	Minor negative	Slight adverse
		Damage to notable lichens in retained habitats adjacent to the Scheme, through dust deposition	SI: -ve PO: unlikely CO: indirect EC/SZ: impact limited to small number of trees adjacent to Scheme at the western end of the Scheme and Castell-y-Dail woodland RE: reversible DU: temporary TF: could occur at any point during construction.	Minor negative	Slight adverse
Fish	Low	Disturbance or mortality of fish during watercourse diversions at C3a, C8, C9, C10 and S4	SI: -ve PO: unlikely CO: direct EC/SZ: within the footprint of the Scheme only RE: irreversible DU: temporary TF: during diversion of watercourses into temporary channels to facilitate culvert construction, and on return to permanent alignments.	Minor negative	Slight adverse
		Secondary impacts on fish resulting from pollution of watercourses during construction	SI: -ve PO: unlikely CO: indirect	Minor negative	Slight adverse

			EC/SZ: downstream from the Scheme crossing, depending on severity of pollution incident RE: reversible DU: temporary TF: could occur at any point duration construction		
Reptiles	Low	Loss of slow worm habitat during site clearance works	SI: -ve PO: certain CO: direct EC: 2456m^2 SZ: Scheme affects a small proportion of the area occupied by the reptile population RE: partially reversible, if verges of Scheme are made suitable for re-colonisation following construction DU: permanent/temporary on verges TF: one off loss	Minor negative	Slight adverse
		Mortality of slow worms during construction	SI: -ve PO: likely CO: direct EC/SZ: likely to affect only a small proportion of population, though not necessarily in proportion to the area affected RE: not reversible DU: permanent TF: one off loss	Minor negative	Slight adverse
Breeding birds	Medium	Loss of breeding bird habitat during site clearance works, including foraging habitat within territories for breeding pairs	SI: -ve PO: certain CO: direct EC/SZ: limited to footprint of Scheme RE: partially reversible for some species, if verges of Scheme are made suitable for use following construction DU: permanent/temporary on verges TF: one off loss	Minor negative	Slight adverse
		Damage or destruction of active nests/eggs/dependant young during site clearance works	SI: -ve PO: unlikely CO: direct EC: would be limited to any areas not cleared outside the bird breeding season	Minor negative	Slight adverse

			SZ: likely to affect only a very small proportion of the Scheme RE: not reversible DU: permanent TF: only during site clearance activities taking place during the bird breeding season		
		Disturbance to breeding birds (including potentially to birds listed on Schedule 1 of the WCA) in nearby retained habitat during construction works	SI: -ve PO: unlikely CO: indirect EC/SZ: limited to immediate vicinity of Scheme, depending on sensitivity of the species concerned RE: not reversible DU: temporary TF: only during construction activities taking place during the bird breeding season	Minor negative	Slight adverse
Badgers	Low	Loss of badger setts (Setts 4,5, 9, 10 and 12) during site clearance/earthworks during construction	SI: -ve PO: certain CO: direct EC: one main sett and associated annexe sett (Setts 4 and 5) are partially within an area where excavations are required, and would therefore be lost. Setts 9, 10 and 12 are also within the footprint of the Scheme, and would be lost SZ: this would be a major impact on one social group, and a minor impact on one or more other social groups RE: not reversible DU: permanent TF: one off loss	Major negative	Slight adverse
		Mortality of badgers during construction	SI: -ve PO: unlikely CO: direct EC: limited to any animals remaining in the setts at the time of their removal SZ: the majority of animals in the social group may be in the main sett, depending on the time of year RE: not reversible DU: permanent TF: one off loss	Moderate negative	Slight adverse

		Disturbance to badgers in retained setts close to footprint of Scheme (Setts 6, 8 and 11).	SI: -ve PO: unlikely CO: indirect EC: limited to any animals in retained setts close to the Scheme during construction SZ: likely to affect a small proportion of resident animals, but in up to three social groups RE: not reversible DU: temporary TF: could occur at any point during construction, though more likely to occur during earthworks	Minor negative	Slight adverse
Roosting bats	Low	Loss of soprano pipistrelle and whiskered bat roost site in building (Kinsale) and loss of soprano pipistrelle bat roost in Barn along Pool Road.	SI: -ve PO: certain CO: direct EC/SZ: limited to roosts containing only small numbers of non-breeding animals RE: not reversible DU: permanent TF: one off loss	Moderate negative	Slight adverse
		Mortality of bats present in roost during site clearance and demolition works	SI: -ve PO: probable CO: direct EC/SZ: limited to small numbers of non-breeding animals present in roosts at time of works RE: not reversible DU: permanent TF: one off loss	Moderate negative	Slight adverse
		Disturbance of bats using nearby retained roost sites (in buildings and trees) due to construction site noise, vibration or lighting	SI: -ve PO: unlikely CO: indirect EC/SZ: limited to small numbers of non-breeding animals present in retained roosts at time of works RE: not reversible DU: temporary TF: most likely to occur during summer months when bats are active and in summer roost sites	Minor negative	Slight adverse
Commuting and foraging bats	Low	Loss of foraging habitat due to site clearance works	SI: -ve PO: certain CO: direct	Minor negative	Slight adverse

			EC: limited to habitat within the footprint of the Scheme SZ: the area which would be lost represents a small proportion of the local resource RE: partially reversible, as some bats may forage on verges of the Scheme post-construction DU: permanent/temporary on verges TF: one off loss		
		Disruption of commuting routes due to removal of linear vegetation features or construction site lighting	SI: -ve PO: certain CO: direct EC: limited to five locations where commuting bats have been identified SZ: in three locations on the outskirts of Newtown, the commuting routes identified are probably used by a high proportion of bats from those roosts RE: reversible DU: permanent TF: during construction period, in the summer months when bats are active	Minor negative	Slight adverse
Dormice	Medium	Loss of habitat in hedgerows and woodlands within the footprint of the Scheme	SI: -ve PO: certain CO: direct EC: TBC SZ: habitat lost would only represent a small proportion of the local resource, and the majority of hedgerows are sub-optimal for dormice RE: not reversible DU: permanent TF: one off loss	Minor negative	Slight adverse
		Mortality of dormice during site clearance activities	SI: -ve PO: probable CO: direct EC: would be limited to small numbers of animals present within the Scheme footprint at the time of site clearance works SZ: likely to affect only a small proportion of the local dormouse population RE: not reversible	Minor negative	Slight adverse

			DU: permanent TF: one off loss		
		Disturbance of dormice in nearby retained habitats through construction site noise, lighting or vibration	SI: -ve PO: unlikely, as dormice are known to nest close to roads CO: indirect EC: would be limited to small numbers of animals present close to the Scheme footprint during construction SZ: likely to affect only a small proportion of the local dormouse population RE: not reversible DU: temporary TF: during construction, and primarily during the summer months when dormice are active	Minor negative	Slight adverse
Otters	Low	Disturbance to otters if using lying up sites or passing along watercourses crossed by the Scheme during construction	SI: -ve PO: unlikely CO: direct EC: likely to be limited to individual otters on unnamed watercourse close to the Kerry Road Roundabout, and possibly other watercourses RE: not reversible DU: temporary TF: at intervals during the construction period	Minor negative	Slight adverse

Table 8.4.4B. Summary of Predicted Operational Impacts

***Key for Characterisation of impacts**
SI (Sign): Positive (beneficial (+ve)) or Negative (adverse (-ve))
PO (Probability of Occurring): Certain, Probable, Unlikely
CO (Complexity): Direct, Indirect, Cumulative
EC (Extent): Area measures and percentage of total (e.g. area of habitat/ territory lost)
SZ (Size): Description of level of severity of influence (e.g. complete loss, number of animals affected)
RE (Reversibility): Reversible or Not Reversible (can the effect be reversed, whether or not this is planned)
DU (Duration): Permanent (P) or Temporary (T) in ecological terms. Where differing timescales are determined in relation to the life-cycle of the receptor, these should be defined.
TF (Timing and frequency): Important seasonal and/or life-cycle constraints and any relationship with frequency considered.

Ecological Receptor	Nature Conservation Value	Description of Impact	Characterisation of Impact*	Magnitude of Impact	Significance of Impact
Montgomery Canal SAC and SSSI	Very High	No direct or indirect impacts anticipated. Refer to SIAA report in Volume 3, Appendix E.2	N/A	Neutral	Neutral
Mochdre Dingles SSSI	High	No direct or indirect impacts anticipated as SSSI is at some distance from Scheme	N/A	Neutral	Neutral
Penstrowed Quarry SSSI	High	No direct or indirect impacts anticipated as SSSI is at some distance from Scheme	N/A	Neutral	Neutral
Gweunydd Penstrowed SSSI	High	No direct or indirect impacts anticipated as SSSI is at some distance from Scheme	N/A	Neutral	Neutral
Broadleaved woodlands and scrub	Low	No direct impact on retained broadleaved woodlands and scrub, and indirect impacts such as air pollution from traffic using the Scheme would not be expected to have any measurable effects	N/A	Neutral	Neutral
Hedgerows	Low	No direct impact on retained hedgerows, and indirect impacts such as air pollution from traffic using the Scheme would not be expected to have any measurable effects	N/A	Neutral	Neutral

Ecological Receptor	Nature Conservation Value	Description of Impact	Characterisation of Impact*	Magnitude of Impact	Significance of Impact
Mochdre Brook, Coleg Powys stream, Green Brook and Dolfor Brook	Low	Potential for indirect impact if pollution events on the Scheme were to enter these watercourses	SI: -ve PO: unlikely CO: direct EC/SZ: downstream from the Scheme crossing, depending on the severity of pollution incident RE: reversible DU: temporary TF: could occur at any time during operation of the Scheme	Moderate negative	Slight adverse
Lichens	Low	No direct impact on retained vegetation supporting notable lichens, and indirect impacts such as air pollution from traffic using the Scheme would not be expected to have any measurable effects	N/A	Neutral	Neutral
Fish	Low	Potential for impacts if pollution events on the Scheme were to enter watercourses	SI: -ve PO: unlikely CO: indirect EC/SZ: downstream from the Scheme crossing, depending on severity of pollution incident RE: reversible DU: temporary TF: could occur at any time during operation of the Scheme	Moderate negative	Slight adverse
		Potential for new culverts to act as barriers to fish movement along watercourses	SI: -ve PO: unlikely CO: direct EC: culverted watercourses with significant fish populations: Green and Dolfor Brooks SZ: potential to act as complete barrier for fish populations in these watercourses RE: reversible DU: permanent TF: ongoing throughout operation of the Scheme	Moderate negative	Slight adverse

Ecological Receptor	Nature Conservation Value	Description of Impact	Characterisation of Impact*	Magnitude of Impact	Significance of Impact
Reptiles	Low	Potential for mortality associated with routine management of verges if reptiles recolonize these areas	SI: -ve PO: unlikely CO: direct EC/SZ: likely to affect only a small proportion of population, though not necessarily in proportion to the area affected RE: not reversible DU: permanent TF: could occur whenever grassland management activities take place during the summer months	Moderate negative	Slight adverse
		Grassland verges of Scheme post-construction have the potential to significantly increase the habitat available for slow worms compared to the baseline situation	SI: +ve PO: probable CO: direct EC/SZ: TBC RE: reversible, depending on management regime of verges during operation DU: permanent TF: once grassland on verges is fully established	Moderate positive	Slight positive
Breeding birds	Medium	Risk of road mortality for birds foraging over the verges of the Scheme or flying low across the Scheme. Of the breeding species present, or likely to be present in future, barn owls and goshawks are considered likely to be most at risk of road mortality.	SI: -ve PO: unlikely CO: direct EC/SZ: road mortality could potentially affect a significant proportion of local populations of these species, particularly for those which may colonise (or re-colonise) the local area in future and therefore only be present in small numbers RE: not reversible DU: permanent TF: could occur at any time during operation of the Scheme.	Minor negative	Slight adverse

Ecological Receptor	Nature Conservation Value	Description of Impact	Characterisation of Impact*	Magnitude of Impact	Significance of Impact
		Disturbance of breeding birds present in retained habitats close to the Scheme, through noise and/or light pollution, is considered very unlikely to occur as birds would not be expected to choose nesting sites where disturbance was already occurring. Impacts would therefore only be predicted if the Scheme first opened to traffic during the bird breeding season, and even in this situation, an adverse impact of breeding birds is considered very unlikely, given levels of human activity associated with the Scheme during construction	N/A	N/A	N/A
Badgers	Low	Fragmentation of social group territories through 'barrier effect' created by operational Scheme, leading to reduction in badger population or disruption of social group territories	SI: -ve PO: unlikely, as traffic volumes are unlikely to be so high at times of day when badgers are active that there would be a barrier effect CO: indirect EC: limited to animals from two social groups close to the Scheme SZ: the Scheme has the potential to significantly affect the viability of both social group territories. RE: not reversible DU: permanent TF: limited to times when badgers are unable to access foraging areas due to high traffic volumes at times when badgers are active	Minor negative	Slight adverse
		Risk of mortality to badgers crossing the Scheme carriageway	SI: -ve PO: probable CO: direct EC: limited to animals from two social groups close to the Scheme SZ: the Scheme has the potential to significantly affect both social groups, potentially to the point of local extinction RE: not reversible DU: permanent TF: could occur at any time during operation of the	Minor negative	Slight adverse

Ecological Receptor	Nature Conservation Value	Description of Impact	Characterisation of Impact*	Magnitude of Impact	Significance of Impact
			Scheme, during hours of darkness. Higher risk during summer months when badgers are more active.		
Roosting bats	Low	Disturbance to bats or disruption of roost use for retained roosts (in buildings or trees) close to the Scheme. Such effects could result from lighting (lighting columns or vehicle headlamps) or noise associated with operation of the Scheme	SI: -ve PO: unlikely CO: indirect EC: limited to any retained roosts close to the Scheme, particularly those close to lit junctions SZ: severity would depend on species affected. Could potentially result in effective loss of one or more non-breeding roosts RE: not reversible DU: permanent TF: impacts would occur during first summer season that Scheme was operational	Moderate negative	Slight adverse
Commuting and foraging bats	Low	Continued fragmentation of commuting routes and associated prevention of access to foraging areas through 'barrier effect' created by operational Scheme	SI: -ve PO: probable CO: indirect EC: limited to animals using roosts associated with the identified commuting routes SZ: in three locations on the outskirts of Newtown, the commuting routes identified are probably used by a high proportion of bats from those roosts RE: not reversible DU: permanent TF: ongoing during operation of the Scheme, during the summer months	Minor negative	Slight adverse
		Risk of bat mortality through collision with vehicles is considered very unlikely to occur, as structures allowing bats to commute beneath the Scheme are proposed in the majority of identified commuting route locations, and the species identified commuting are usually at lower risk of road mortality due to their flight height and behaviour.	N/A	Neutral	Neutral

Ecological Receptor	Nature Conservation Value	Description of Impact	Characterisation of Impact*	Magnitude of Impact	Significance of Impact
		Improved foraging resource for bats along the verges of the Scheme, as these would be less intensively managed than existing grazed pastures	SI: +ve PO: probable CO: direct EC: as foraging bats are present all along the Scheme, this effect could occur wherever the verges provide suitable foraging habitat SZ: the beneficial effect is unlikely to significantly affect local bat populations RE: reversible DU: permanent TF: once vegetation on verges is established following construction, during the summer months	Minor positive	Slight positive
Dormice	Medium	Continued fragmentation of population through 'barrier effect' created by operational Scheme, which may affect viability of population in the long-term	SI: -ve PO: unlikely CO: indirect EC: wherever dormice are present in vegetation adjacent to the Scheme SZ: as dormice are present in low density, populations sizes may be small, particularly on the north side of the Scheme, and therefore at risk of local extinction RE: not reversible DU: permanent TF: ongoing during operation of the Scheme, during the summer months	Minor negative	Slight adverse
		Recent research has shown that dormice can cross road carriageways during seasonal dispersal movements, and therefore could theoretically be at some risk of road traffic mortality. However, it is likely that such dispersal movements are so rare that the risk of dormouse road mortality is negligible. Similarly, as dormice have been shown to nest in habitat very close to active carriageways, including those with lighting columns, no disturbance effects on dormice are predicted.	N/A	Neutral	Neutral

Ecological Receptor	Nature Conservation Value	Description of Impact	Characterisation of Impact*	Magnitude of Impact	Significance of Impact
		Improved foraging resource for dormice along the verges of the Scheme, as these would be less intensively managed than existing grazed pastures	SI: +ve PO: unlikely CO: direct EC: as dormice are present all along the Scheme, this effect could occur in any locations where planting on the verges provides suitable foraging habitat SZ: the beneficial effect is unlikely to significantly affect local dormouse populations RE: reversible DU: permanent TF: once shrub vegetation on verges is established, several years following construction, and only during the summer months	Minor positive	Slight positive
Otters	Lower	Loss of connectivity for otters to use foraging habitats on tributaries to the south of the Scheme, through 'barrier effect' created by operational Scheme (not applicable at Mochdre Valley where a clear span structure is proposed)	SI: -ve PO: unlikely CO: indirect EC: limited to stream north and east of Upper Brimmon Farm, as clear span structure is proposed at Mochdre Brook, and other watercourses are likely to remain inaccessible to otters SZ: this effect would only result in the loss of marginal foraging areas for a very small number of individual otters RE: not reversible DU: permanent TF: ongoing during operation of the Scheme	Minor negative	Slight adverse
		Risk of mortality to otters crossing the Scheme carriageway	SI: -ve PO: probable CO: direct EC: limited to watercourse crossings where flow characteristics mean that	Minor negative	Slight adverse

Ecological Receptor	Nature Conservation Value	Description of Impact	Characterisation of Impact*	Magnitude of Impact	Significance of Impact
			culverts are impassable during wet weather SZ: limited to the very small number of individual otters resident on watercourses close to the Scheme, and unlikely to affect the River Severn population significantly RE: not reversible DU: permanent TF: could occur at any time during operation of the Scheme, though primarily during periods of high flows in watercourses.		

8.5. Proposed Mitigation

This section describes proposed mitigation measures which are not already included as 'mitigation by design' through the iterative process by which the preferred route and basic characteristics of the Scheme has been derived. Proposed mitigation measures are outlined for each of the predicted effects on key ecological receptors described above, for construction and operation of the Scheme.

8.5.1. Construction mitigation

Hedgerows, broadleaved woodland and scrub

The majority of habitat directly affected by the Scheme is considered to be of low nature conservation value, the Scheme provides opportunities to mitigate for loss of these key habitats on an area for area basis.

It is therefore proposed that hedgerows would be planted inside the Scheme boundary fence in locations as shown on Volume 2 Figure 7.12 (a – m). The strategic positioning of hedgerows is discussed below in relation to the role of new hedgerows as a dormouse mitigation tool. The intention is that hedgerows planted along the margins of the Scheme would link together the retained ends of hedgerows severed by the Scheme and by doing so facilitate the colonisation of new hedgerows by a wide range of plant and animal species present in the local hedgerow network. Approximately 12km of hedgerow planting would be provided by the Scheme compared with the approximate loss of 4.9km of hedgerow removed during construction of the Scheme.

Hedgerows would be created in two ways: where sections of hedgerow that require removal during construction support well-established coppice stools of hazel or other shrubs, these would be coppiced (again, see mitigation relating to dormice, below) and translocated to the alignment of proposed new hedgerows. Translocated coppice stools establish sooner than newly planted shrubs and therefore start providing structural and foraging habitat for a range of species more quickly following construction. Ideally, coppice stools would be translocated direct from donor to receptor sites nearby, though earthworks or drainage requirements may mean that some stools have to be translocated twice, first into a temporary 'holding' area, within which they should still be replanted with all roots covered by soil, until it is possible to move them into their final destination. The quality of coppice stools in existing hedgerows on the Scheme varies, but it is estimated that on average three coppice stools per hedgerow crossed by the Scheme would be of sufficient size and quality for translocation.

The remainder of new hedgerow would be planted, using a range of locally native tree and shrub species (refer to habitat assessment data: hedgerow survey results in Volume 3, Appendix E.13). Care should be taken to use plants of UK and ideally Welsh stock rather than, for example, hawthorn sourced from overseas, which can have slightly different genetic and ecological characteristics with potential implications for other wildlife.

Similarly, the loss of 4.9ha of broadleaved woodland and 1.7ha scrub (6.6ha total) would be mitigated by planting of 15ha of locally native and ideally locally sourced trees and shrubs in locations shown in Volume 2, Figures 7.12 (a – m) and 16.1 (a – m). In addition 12km of hedgerow would be provided along the Scheme. Road safety requirements dictate that mature woodland should not be established in close proximity to the Scheme carriageway. However, the broadleaved woodland lost to the Scheme is largely coppice woodland with standards trees, so the establishment of woodland in suitable locations at the base of embankment slopes and at distance from the Scheme carriageway is considered sufficient to mitigate the identified adverse impact, in the long term.

Impacts of dust deposition on retained hedgerows and broadleaved woodlands would be minimised by following good practice measures during construction such as damping down haul routes when necessary, and ensuring that all site traffic obeys the site speed limits. Disruption of hydrology during earthworks, resulting in retained habitats being either flooded or parched, is very difficult to predict and avoid, due to the complexity of the watercourses and the Scheme earthworks. Consequently the identification of these impacts, if they occur, would form part of the remit of the site Environmental Clerk of Works, and remedial action would be taken on site if any problem locations are found.

The verges of the Scheme would also provide opportunities for habitat enhancement, compared to the relatively low ecological value of much of the Scheme footprint described in the baseline conditions above. In particular, on areas where hedgerow or woodland planting are not appropriate, there may be scope to create some unimproved grassland areas along the cutting/embankment slopes, by providing only a thin layer of topsoil on these and either sourcing appropriate seed from hay meadows locally, or using a locally native wildflower seed mix.

Mochdre Brook, Coleg Powys stream, Green Brook and Dolfor Brook

As described above, direct impacts on the Mochdre Brook are largely avoided through use of a clear span structure in this location. The Dolfor Underbridge is a clear span structure across the Dolfor Brook but there may be a requirement for a minor realignment of the water course in this location. Culverts would be installed on the Coleg Powys stream (C3a), the Green Brook (C8 and S4) and the Dolfor Brook (C9 and C10), and consequently pollution incidents affecting these watercourses could occur during works on or above these watercourses. The risk of this occurring would be minimised by using appropriate site procedures for pollution control based on current best practice guidelines. These are described in more detail in the Road Drainage and the Water Environment chapter 14 and would include:

- Avoiding re-fuelling or parking site vehicles close to watercourses;
- Avoiding machinery working in watercourses as far as is possible;
- Minimising release of sediment during necessary watercourse diversions by use of silt traps downstream of the works;
- Positioning site compounds and welfare facilities at sufficient distance from watercourses to avoid the risk of pollution incidents;
- Using bunded fuel tanks and generators;
- Controlling construction site run-off into watercourses;
- Having spill kits available close to watercourses for rapid deployment in the event of a pollution event.

Japanese Knotweed associated with watercourses (and elsewhere, if discovered during pre-construction walkover surveys) would be treated and handled in accordance with the Environment Agency's (EA) *Managing Japanese Knotweed on Development Sites*[8.46], and measures to treat, and prevent the spread of Japanese Knotweed and other invasive plant species would be included in the CEMP for the Scheme.

The same precautionary measures should also be adopted for works on and in the vicinity of the pond at Ch 4880 which would be affected by construction of the Scheme.

Lichens

Predicted impacts on lichens comprise the loss of substrates supporting two Nationally Scarce species, *Cladonia cyathomorpha* and *Lecanora compallens*, and the possibility of damage to notable lichen species on retained substrates adjacent to the Scheme, from dust deposition during construction.

Mitigation for direct impacts on these lichen species would comprise small-scale translocations of the substrates supporting the lichens from the footprint of the Scheme. For *C. cyathomorpha*, outcropping mudstone adjacent to the Green Brook would be removed and relocated to upstream of the proposed Culvert 8, in a location matched for aspect and proximity to the Green Brook, but which does not itself support notable lichens or protected species. Clearly, translocation of the ash tree on Brimmon Farm supporting *L. compallens* is not practical, consequently the section of tree supporting this species would be relocated following felling, to a location outside the footprint of the Scheme where it can be positioned with a similar aspect, light level and humidity to its current position. This may involve re-positioning of a section of the tree against the trunk of a retained tree, provided that the retained tree does not itself support notable lichen species.

Impacts of dust deposition on lichens would be minimised by following good practice measures during construction such as damping down haul routes when necessary, and ensuring that all site traffic obeys the site speed limits. Consequently the identification of these impacts, if they occur, would form part of the remit of the site Environmental Clerk of Works, and remedial action would be taken on site if any problem locations are found.

Fish

Impacts on fish in these watercourses resulting from pollution events would be avoided or minimised by use of the measures described above.

Reptiles

Reptiles, primarily slow worms from the population in the woodland at the western end of the Scheme, may be killed during site clearance works, and a small proportion of the habitat used by this population would be lost. Mitigation to minimise the risk of mortality during construction would comprise a small-scale relocation of animals from the footprint of the Scheme to adjacent retained habitat, by catching animals using artificial refuges positioned on the footprint of the Scheme. A temporary reptile fence would be required around the eastern and northern sides of the woodland area in order to prevent any reptiles re-colonising the footprint of the Scheme; this fencing could be removed once drainage and earthworks were completed in this area.

It is important to note that the relocation of slow worms is seasonally constrained, as reptiles are not active during the winter months, and may not need to use basking sites during warm conditions in mid-summer. The appropriate times of year to undertake this work would be therefore either spring or autumn. Clearly the relocation of slow worms from this area would need to precede soil stripping and earthworks, though it would be possible to create a haul route along this section of the Scheme in order to gain access to the western end of the Scheme prior to relocation of reptiles, following a careful finger-tip search by a suitably qualified ecologist to confirm the absence of slow worms from the haul route. Reptile areas should be marked with protective fencing until the relocation work is completed and soil stripping can commence.

Given that the Scheme only affects a small proportion of the area available to this population, and that the number of animals within the footprint of the Scheme is likely to be relatively low, it is not considered necessary to identify an off-site receptor area. However, the numbers of animals caught would be kept under review to ensure the carrying capacity of the receptor area is unlikely to be exceeded. Approximately 2456m^2 of slow worm habitat, primarily the ditch and field margins around the edges of this woodland area, would be lost during construction. However, by the time the Scheme is operational, establishment of grassland on the cutting slopes past this area are likely to provide 2592m^2 of grassland habitat. Although this is unlikely to be of the same quality as the habitat lost immediately, its greater area would be sufficient to mitigate this loss of area in the short term.

Artificial hibernacula would be provided within this area during the construction phase. The exact number, location and specification for the hibernacula would be agreed in consultation with NRW and details provided within a Method Statement would be included in the CEMP.

Elsewhere on the Scheme, it is only anticipated that grass snakes would be present, and these only infrequently and at low density. A watching brief would be kept for reptiles elsewhere on the Scheme and small-scale capture and relocation of grass snakes (to suitable wetland areas unaffected by the proposed works) would be carried out if required.

Breeding birds

Avoiding mortality of breeding birds would be achieved through timing of works to avoid vegetation clearance during the breeding bird season. This is generally March to August inclusive, but varies between species with some, such as crossbills, potentially breeding earlier in the year. Timings of vegetation clearance are also constrained by the presence of dormice (see below), but the principle to be followed during site clearance would be to coppice hedgerows and other vegetation suitable for use by breeding birds during the winter months, to prevent breeding birds occupying vegetation on the footprint of the Scheme. Any vegetation that cannot be cleared prior to the bird breeding season would need to be checked prior to removal by a suitably qualified ecologist, to confirm the absence of active nests.

When birds are setting up breeding territories in the spring following vegetation removal, the Scheme would be an active construction site with construction traffic etc. Consequently the proposed timings of works have been planned to avoid causing disturbance on breeding birds.

It is not possible to mitigate the effects of loss of nesting habitat in hedgerows and woodland in the short term during the construction period, but planting of hedgerows and woodlands as described above on the verges of the Scheme would mitigate this impact in the medium to long term.

Badgers

Construction impacts on badgers, comprising loss of a main sett and associated annexe, an annexe sett for a different social group, and two subsidiary setts, and potential mortality during removal of these setts, would be mitigated under licence from NRW. A 'ghost' licence application for these works is included in Volume 3 Confidential Appendix E.7.

An artificial sett would be constructed close to the location of the existing main sett affected by the Scheme but outside the working area for the Scheme. The artificial sett would be constructed according to best practice guidance and would be fenced off from the surrounding field. The artificial sett itself would be surrounded by buried chain-link mesh to discourage badgers from extending the sett, either towards the Scheme or the surrounding field.

Where disused or annexe setts are affected by the Scheme, these would be closed during the initial phase of construction.

Standard practice for sett exclusions would be followed, with monitoring of activity at all sett entrances for a minimum of three weeks until it appears all animals have left. The sett would subsequently be excavated, under the supervision of a suitably qualified ecologist, to confirm the absence of any animals underground before the tunnel system is removed. Earthworks to remove topsoil and sub-soil in the area formerly occupied by the sett should take place immediately following excavation of the sett.

It should be noted that sett exclusions are seasonally constrained, and can only be carried out on active setts between July and November inclusive. Consequently works should be programmed to allow exclusion of the sett as soon as possible during the construction period. In addition, the success of artificial setts is, in part, dependent on having the artificial sett established well in advance (ideally six months in advance) of exclusions. Consequently construction of the artificial sett would need to be prioritised or carried out as advance works in order to enable exclusion of the existing sett in late autumn 2015.

Roosting bats

Prior to commencement of works on the Scheme, all trees would be re-assessed to identify any evidence of use by bats. All Category 1* and Category 1 trees affected by the Scheme would be subject to a climbing inspection and/or emergence and re-entry surveys, to confirm the presence or likely absence of bats. No confirmed roosts have been identified in trees directly affected by the Scheme, but any trees showing evidence of use during these re-inspections would be subject to further survey in order to inform an application their removal under licence from the Welsh Government. Subsequent felling of other trees would be undertaken following a specific Method Statement, a draft of which is included in the Bat Tree Report 2014 (refer to Volume 3, Appendix E.10). This Method Statement would form part of the CEMP for the Scheme during construction.

The identified roost at Kinsale, the barn along Pool Road and any other confirmed tree roosts found during the pre-construction inspections would be removed under licence from NRW. A 'ghost' licence application for the demolition of Kinsale and the Barn along Pool Road is included in Volume 3, Appendix E.11.

As the identified roosts in Kinsale and the barn along Pool Road are used by small numbers of non-breeding soprano pipistrelle bats (also whiskered bats in the case of Kinsale), it is possible that bats may be present throughout much of the year. Works would therefore be programmed to allow demolition of these buildings during the autumn avoiding the breeding or hibernation periods. Tree roosts would be felled to the same programme, in order to avoid or minimise impacts on breeding birds and dormice.

Mitigation for loss of the roost site would be provided using bat boxes, either positioned on retained trees close to the Scheme, or if no suitable trees are present on wooden 'telegraph poles' within the footprint of the Scheme. Boxes used would be Schwegler-type woodcrete boxes, selected to suit the bat species present. Three bat boxes would be provided for each roost site removed. Wherever possible, bat boxes would be provided in advance of the building being demolished. However, if wooden poles are used within the Scheme boundary, earthworks requirements may prevent these being provided immediately.

Demolition of Kinsale and the barn along Pool Road would be preceded by the careful removal of roof tiles, wooden slats and other potential roosting features by hand, under the supervision of a

suitably qualified and licensed ecologist, in order to catch and remove any bats present. Only once all roost sites have been investigated will the remainder of the buildings be demolished. Any bats found would be released into nearby bat boxes. Further detail is provided within the Bat Ghost Licence, Volume 3, Appendix E.11.

The risk of disturbance of bats in retained roosts close to the Scheme would also be assessed in more detail following re-inspection of trees pre-construction. However, impacts would largely be avoided by limiting construction site lighting to specific locations where it is absolutely necessary for public safety or security, and by minimising light spill by directing lighting downwards onto, rather than across, areas requiring illumination. Care would be taken to avoid positioning site compounds or welfare units, generators for traffic management etc., in close proximity to retained roosts.

Commuting and foraging bats

The species recorded commuting across the Scheme, common and soprano pipistrelles, are less sensitive than many other bat species to disruption of commuting routes. As such, whilst loss of continuous vegetated features across the Scheme is considered as an adverse impact above, it is also considered likely that during construction bats would continue to cross the Scheme successfully (using either the same commuting route or a parallel feature) in locations where a clear span structure is not being provided. Although other bat species more sensitive to creation of gaps in linear commuting features, such as lesser horseshoe, were also recorded in small numbers, no commuting routes for these species were identified and consequently it is unlikely that the absence of these linear features would have any impact. It is not therefore considered necessary to provide temporary (or permanent) bat guide structures, particularly given recent research indicating that these can be of limited value for bats. Safe commuting routes would either be maintained (e.g. Mochdre Brook) or reinstated (e.g. track to Brimmon Farm) at the majority of commuting route locations during the construction period.

It is not possible to mitigate the effects of loss of foraging habitat in hedgerows and woodland in the short term during the construction period, but planting of hedgerows and woodlands as described above on the verges of the Scheme would mitigate this impact in the medium to long term.

Dormice

Direct impacts on dormice during construction, comprising loss of habitat and a risk of mortality during site clearance operations, would be mitigated through a combination of careful working methods and timing of works.

Based on the results of the surveys, vegetation clearance in three areas on the Scheme is considered licensable: between the western end of the Scheme and the Mochdre Valley, in the Dolfor Valley and surrounding hedgerows, and from the A489 Kerry Road east to the eastern end of the Scheme.

Removal of all hedgerows and woodlands within these three areas that have been identified as being sub-optimal or better for dormice (refer to Appendix E.13, category A-C hedges), and those category D hedgerows that are directly connected to optimal habitats and therefore reasonably likely to be used as dispersal corridors, are considered licensable. Vegetation clearance for these hedgerows would therefore proceed under licence from NRW, and would comprise a one-stage ‘summer’ clearance process in autumn 2015, with above-ground vegetation being cleared during September/October, to avoid the main dormouse breeding and hibernation periods, and the bird breeding season. A Ghost Licence for these works is provided in ES Volume 3, Appendix E.14.

Vegetation clearance would be undertaken using hand tools (e.g. chainsaw, brush cutter) following an ecological inspection to confirm the absence of occupied nests containing dependant young dormice. Hedgerows would generally be cleared from north to south, therefore displacing dormice into the larger area of retained habitat in the hedgerow network to the south of the Scheme. Up to 20m of each hedgerow would be cleared per day.

Stumps and roots of the hedgerows would be removed by machine, following the completion of vegetation clearance on each hedgerow, including removal of roots and stumps to be translocated (see Hedgerows, above).

Removal of other hedgerows in Category D and those in Category E are not be considered licensable, as the low value of these features for dormice means it is extremely unlikely that any hibernating dormice would be present.

Loss of dormouse habitat would be mitigated by planting of hedgerows and woodland as described above. This planting would connect up the ends of severed hedgerow features to maintain or enhance connectivity of dormouse habitat along the Scheme, on both the north and south sides. In doing so, it is anticipated that the populations would remain viable despite the loss of connectivity across the Scheme. Where possible the reconnection of severed hedgerow ends would be expedited by use of translocated material, which would establish more quickly than new planting.

Disturbance to dormice in retained habitats would largely be avoided by limiting construction site lighting to specific locations where it is absolutely necessary for public safety or security, and by minimising light spill by directing lighting downwards onto, rather than across, areas requiring illumination. Care would be taken to avoid positioning site compounds or welfare units, generators for traffic management etc., in close proximity to retained habitat likely to be of particular value to dormice.

Otters

During construction, otters using watercourses crossed by the Scheme may be disturbed by construction site activities, such as construction site noise and lighting. Disturbance would largely be avoided by limiting construction site lighting to specific locations where it is absolutely necessary for public safety or security, and by avoiding light spill onto watercourses. Care would be taken to avoid positioning site compounds or welfare units, generators for traffic management etc., in close proximity to watercourses which may be used by otters.

A method statement to ensure that impacts on otters during construction are avoided would form part of the CEMP for the Scheme, and a draft method statement is included in ES Volume 3, Appendix E.15.

8.5.2. Operational mitigation

Mochdre Brook, Coleg Powys stream, Green Brook and Dolfor Brook

Pollution impacts on the watercourses during operation of the Scheme would be avoided through careful design of drainage and pollution control measures for the Scheme, and appropriate maintenance of these features during operation of the Scheme.

Fish

Measures to avoid pollution to watercourses as described above would also protect fish populations from the effects of pollution events during the operation of the Scheme. Arch structures would be provided at Culverts C3a and C8 which would provide a natural bed to accommodate use by fish species. Other culverts, particularly C9, C10 and S4 would be designed to avoid creation of ‘steps’ which could act as barriers to movement of fish species.

Reptiles

Reptiles that recolonize the verges of the Scheme following construction would be at some risk of mortality during routine grassland cutting. This risk would however be reduced as species-rich grassland would not be created on the verges within 2m of the carriageway, where more regular cutting is required. Habitat likely to be of higher value to reptiles would therefore be limited to cutting and embankment slopes away from the carriageway.

Management of grassland areas supporting reptiles should aim to minimise risk of mortality through timing of works (i.e. during the winter months, when reptiles will be hibernating underground and therefore at lower risk) or, if necessary during the summer months, a cutting height of no less than 50mm would be set to minimise the risk of reptiles being harmed.

Breeding birds

Birds breeding close to the Scheme would potentially be at risk of road mortality; although the causes of road mortality vary between bird species, factors increasing risks are the provision of high quality foraging habitat very close to road carriageways, and planting discontinuous blocks of shrub planting which screen birds’ views of oncoming traffic. Landscaping of the Scheme

would therefore avoid provision of species-rich grasslands within 2m of the carriageway, and shrub planting would be designed to maintain visibility along the Scheme for birds flying over the verges, as far as is practical.

Badgers and Otters

Badgers and otters would be at risk of fragmentation of foraging habitat, or of road mortality, unless safe crossing points combined with mammal-resistant fencing are provided. In several places along the Scheme, structures are proposed that would also function as safe crossing points for badgers, such as the Mochdre and Dolfor valley crossings, and overbridges/underpasses carrying access tracks, such as the Glandulas Overbridge. However, in order to maintain connectivity across the Scheme within both of the badger social group territories, and therefore to reduce the risk of badgers or otters attempting to undermine fencing along the Scheme, the following additional safe crossing points are proposed: (for further details of drainage structures refer to Section 2.7 of this ES):

- Culvert C2a: mammal 600mm dry pipe to the east of C2a;
- Culvert C2b: mammal 600mm dry pipe to the west of C2b;
- Culvert C3a: the watercourse culvert in this location would be an arch structure with a raised ledge to facilitate safe mammal access, on the western side of the culvert;
- Culvert C4: box culvert with a raised ledge to allow for safe mammal crossing;
- Culvert C8: the watercourse culvert in this location would be an arch structure with a raised ledge to facilitate safe mammal access, on the western side of the culvert;
- Structure S4: box culvert with a raised ledge to allow for safe mammal crossing;
- Culvert C9: box culvert with a raised ledge to allow for safe mammal crossing;
- Culvert C10: box culvert with a raised ledge to allow for safe mammal crossing;
- Culvert C11: no specific mitigation as mammals would be able to use the nearby farm underpass;
- Dry mammal pipe at approx. Chainage Ch 3850;
- Culvert C12: mammal 600mm dry pipe in proximity to the culvert C12;
- Dry mammal pipe to the east of A483 Pool Road Roundabout, at approximate Pool Road Chainage Ch150.

Ledges and dry pipes would be positioned at or above the 1 in 100 year flood event level.

Mammal resistant fencing would be provided along the length of the Scheme, with short sections of otter specific fencing to funnel otters towards safe crossing points, whilst also preventing access to crossing points by agricultural livestock (particularly lambs). The specification for otter fencing proposed is, as shown in DMRB, badger fencing with the addition of an overhanging crank on the outer face of the fencing where specific otter mitigation is required.

Roosting bats

Although operational impacts on bats using retained roosts close to the Scheme are considered unlikely, provision of bat boxes would ensure that alternative roost sites are available, in the event that road noise or road lighting caused significant disturbance. Bat boxes, in the positions and of the types described above for mitigation during the construction period, would therefore also be provided in the vicinity of any identified retained roosts, in locations where they are screened from the road carriageway and any associated lighting, by other vegetation. This would include at Castell-y-Dail where Natterer's and noctule bat roosts are present close to the Scheme, and off Wern Ddu Lane, close to Tyn-y-Green.

Commuting and foraging bats

Fragmentation impacts on bats during operation of the Scheme would largely be avoided through provision of structures which could provide safe crossing routes for bats in the majority of locations where commuting bats have been identified. Consequently the clear span structures in the Mochdre and Dolfor valleys, provision of underpasses on the Upper Dolfor Road, Brimmon Farm and Brimmon Lane and access track, the proposed box culvert at Culvert C4 and the proposed arch structures at Culverts C3a and C8 and S4 would provide safe crossing points for bats using these routes. Culverts would not be fitted with trash screens so that culverts are fully accessible for use by commuting bats. It is not possible to provide a safe crossing structure for bats on the Kerry Road, due to the proposed junction layout.

The measures outlined above in relation to avoiding provision of species-rich grassland close to the carriageway to avoid impacts on reptiles and breeding birds would also be applicable to

foraging bats using the verges of the Scheme. The use of wildflower seeding along the Scheme would be considered in more detail at detailed design stage.

Dormice

Planting during construction would seek to minimise fragmentation impacts by connecting up the severed ends of hedgerows on either side of the Scheme, and in this way it should be possible to maintain viable dormice populations on both sides of the Scheme with minimal requirement for habitat connections across the Scheme. However, where clear span structures at Mochdre Brook and the Dolfor valley provide an opportunity to do so, habitat connections beneath these structures either side of the watercourses would be created using either 'dead hedges' (brash from vegetation clearance stacked in a row connecting live hedgerows on each side of the structure), or by use of hurdle fencing. These are proposed as it is not anticipated that live hedges would necessarily persist under the bridge decks, and if they do they would need regular management for safety reasons. These strategic links between dormouse populations on either side of the Scheme (and any dispersal of dormice across the Scheme carriageway that may occur) would prevent isolation of the populations on either side of the Scheme.

Management of landscape planting on the verges of the Scheme would have regard to the presence of dormice. In particular, any trimming of hedgerows and scrub would take place during the winter months, to avoid disturbing or mortality of dormice in summer nests.

8.5.3. Enhancements

It is considered that the proposed creation of hedgerow and species-rich grassland habitats along the verges of the Scheme post-construction have the potential to represent an enhancement on the baseline conditions for the Scheme, provided these are managed sympathetically, and with regard to other ecological receptors such as reptiles, nesting birds and dormice, that may be using these habitats.

Such biodiversity gains would be dependent on appropriate management. For hedgerow habitats, hedgerows should be trimmed no more than one year in three, except in areas where more regular management is required for other reasons such as road safety. In addition, management of hedgerows should be phased across the Scheme so that not all hedgerows on the Scheme are managed in the same year. Hedgerow management should have regard to the possible presence of breeding birds and dormice, and be undertaken in line with guidance from NRW, particularly in respect of licensing requirements for dormice.

For grassland habitats, management should aim to provide a range of sward heights and conditions, in order to provide habitat for a wide range of species, including reptiles. This could be achieved by less regular cutting of areas furthest from the carriageways. Collection of arisings from cutting of grassland areas would also assist in the development and maintenance of species-rich swards and associated fauna. The Scheme would help the Welsh Government meet TREBAP objectives and would support the Minister's initiative for wildflowers along road verges.

8.5.4. Monitoring

Ecological monitoring during- and post-construction would be required in order to confirm the effectiveness of mitigation measures described above. For some receptors the necessary ecological monitoring would be combined with monitoring for landscape reasons (e.g. assessing the success of planting and grassland establishment along the Scheme), and for others monitoring would be a requirement of derogation licences obtained for construction of the Scheme. As a minimum, ecological monitoring for the Scheme would comprise:

- Monitoring the establishment of tree, shrub and hedgerow planting and grassland areas on the Scheme, in parallel with monitoring for landscape purposes;
- Monitoring bat mitigation works (replacement roosts) carried out under licence during construction of the Scheme;
- Monitoring dormouse nest boxes installed in retained and created habitats as mitigation for vegetation clearance under licence during construction of the Scheme;
- Monitoring the effectiveness of fencing and safe crossing points on the Scheme as mitigation to ensure safe crossing points for badgers and otters;
- Monitoring the effectiveness of the artificial badger sett.

8.6. Residual Environmental Effects (following mitigation)

Assuming the effective implementation of mitigation measures detailed above, it is considered that the only residual effects following mitigation would be:

- The short term loss of key habitats (hedgerows, broadleaved woodland and scrub) between site clearance and when new planting matures sufficiently to represent an effective reinstatement of these habitats. For hedgerows it is anticipated that this residual adverse impact would become a neutral impact within approximately ten years following planting, and for woodlands it is anticipated that this would be achieved within approximately fifteen years, given the characteristics of existing woodlands affected by the Scheme.
- The loss of a commuting route for small numbers of common and soprano pipistrelles on the existing A489 Kerry Road, where it is not possible to create a safe crossing point due to the design of the junction. However, given the small numbers of bats present, and the resilience of pipistrelle species to such impacts, it is considered likely that bats would adapt their behaviour to avoid fragmentation between roosts and foraging areas (either crossing the Scheme carriageway or using C13 nearby) and consequently that this is unlikely to result in s significant residual impact. It is therefore anticipated that this would represent a short term adverse impact and that in the medium to long term it would become a neutral impact.

8.7. Summary and Conclusions

The Scheme is not anticipated to have any effects on designated sites, but would directly affect a number of ecological receptors including habitats and protected species. The majority of these are considered to be of medium or low value, and as a result the majority of predicted impacts are slight or moderate, both during construction and operation of the Scheme.

Mitigation measures outlined above would ensure that residual impacts on most of these receptors are avoided in the short and medium term. The only receptors for which residual effects are predicted are the short term loss of key habitats between site clearance and when new planting matures, and the loss of a commuting route for small numbers of common and soprano pipistrelle bats, though it is anticipated that bats would adapt to the presence of the Scheme. Consequently residual adverse impacts on all ecological receptors would be avoided in the long term.

For several receptors, benefits arising from the Scheme are predicted, though these would be dependent on appropriate future management. Overall, it is considered that the Scheme would have a neutral impact on ecological receptors within the Zone of Influence of the Scheme.

Table 8.7.1 summarises likely effects of construction and operation on key receptors, before and after mitigation. Refer also to Table 8.2.2 for significance of impacts. Receptors which are TREBAP habitats or species are shown in bold.

8.7.1. Review of Scheme against Relevant Policies

Policies relevant to nature conservation were listed in Section 8.1.2.2. Through the iterative design process adopted, it has been possible to avoid or minimise effects of the Scheme on ecological receptors, and where this is not possible, to propose measures that would mitigate these impacts in the long term and achieve enhancements for some ecological receptors. As a result, the Scheme is considered to be consistent with these policies.

Specifically, the Scheme avoids impacts on sites designated for their nature conservation interest, and aims to minimise fragmentation impacts on wildlife in the vicinity of the Scheme, through appropriate design of culverts and structures. Although some impacts on protected species are unavoidable during construction and operation of the Scheme, these impacts have been minimised through the design process, and would be mitigated to ensure compliance with relevant policies.

The Scheme would also result in some impacts on species and habitats listed in the UK BAP, Powys BAP or TREBAP. The mitigation measures proposed above would ensure that the objectives of these BAP's are not compromised by the Scheme.

Table 8.7.1 – Summary of Impacts in relation to Nature Conservation
(Receptors which are TREBAP habitats or species are shown in bold).

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation
Construction Impacts				
Montgomery Canal SAC and SSSI	No direct or indirect impacts are predicted	Neutral	Neutral	Neutral
Mochdre Dingles SSSI	No direct or indirect impacts are predicted	Neutral	Neutral	Neutral
Penstrowed Quarry SSSI	No direct or indirect impacts are predicted	Neutral	Neutral	Neutral
Gweunydd Penstrowed SSSI	No direct or indirect impacts are predicted	Neutral	Neutral	Neutral
Broadleaved woodlands and scrub	Loss of woodland and scrub during site clearance	Moderate negative	Minor negative decreasing to neutral within 15 years of planting	Slight adverse in short/ medium term, neutral in long term
	Damage to nearby retained woodland and scrub through deposition of dust or disruption of hydrology	Minor negative	Neutral	Neutral
Hedgerows	Loss of hedgerows during site clearance	Moderate negative	Minor negative decreasing to neutral within 10 years of planting	Slight adverse in short term, neutral in long term
	Damage to nearby retained hedgerows through deposition of dust or disruption of hydrology	Minor negative	Neutral	Neutral
Mochdre Brook, Coleg Powys stream, Green Brook and Dolfor Brook	Some loss of bankside habitat beneath the clear-span bridge decks; the Dolfor Brook would also be temporarily disrupted by proposed culverts C9 and C10 on the A483 towards Newtown town centre, and the Coleg Powys and Green Brooks would be affected by construction of culverts C3a and C8/S4.	Moderate negative	Neutral	Neutral
	Potential for minor pollution of watercourses during construction	Moderate negative	Neutral	Neutral
Lichens	Loss of tree and rock exposure supporting Nationally Scarce lichen species	Minor negative	Neutral	Neutral
	Damage to notable lichens in retained habitats adjacent to the Scheme, through dust deposition	Minor negative	Neutral	Neutral

Fish	Disturbance or mortality of fish during watercourse diversions at C3a, C8, C9, C10 and S4	Minor negative	Neutral	Neutral
	Secondary impacts on fish resulting from pollution of watercourses during construction	Minor negative	Neutral	Neutral
Reptiles	Loss of slow worm habitat during site clearance works	Minor negative	Minor negative decreasing to neutral within 1-2 years of grassland reinstatement	Neutral within or shortly after the Scheme construction period
	Mortality of slow worms during construction	Minor negative	Neutral	Neutral
Breeding birds	Loss of breeding bird habitat during site clearance works, including foraging habitat within territories for breeding pairs	Minor negative	Neutral	Neutral
	Damage or destruction of active nests/eggs/dependant young during site clearance works	Minor negative	Neutral	Neutral
	Disturbance to breeding birds in nearby retained habitat during construction works	Minor negative	Neutral	Neutral
Badgers	Loss of badger setts (Setts 4,5, 9, 10 and 12) during site clearance/earthworks during construction	Major negative	Neutral	Neutral
	Mortality of badgers during construction	Moderate negative	Neutral	Neutral
	Disturbance to badgers in retained setts close to footprint of Scheme (Setts 6, 8 and 11)	Minor negative	Neutral	Neutral
Roosting bats	Loss of soprano pipistrelle and whiskered bat roost site in building (Kinsale) and loss of soprano pipistrelle bat roost in Barn along Pool Road	Moderate negative	Neutral	Neutral
	Mortality of bats present in roost during site clearance and demolition works	Moderate negative	Neutral	Neutral
	Disturbance of bats using nearby retained roost sites (in buildings and trees) due to construction site noise, vibration or lighting	Minor negative	Neutral	Neutral
Commuting and foraging bats	Loss of foraging habitat due to site clearance works	Minor negative	Neutral	Neutral
	Disruption of commuting routes due to removal of linear vegetation features or construction site lighting	Minor negative	Neutral	Neutral
Dormice	Loss of habitat in hedgerows and woodlands within the footprint of the Scheme	Minor negative	Neutral	Neutral

	Mortality of dormice during site clearance activities	Minor negative	Neutral	Neutral
	Disturbance of dormice in nearby retained habitats through construction site noise, lighting or vibration	Minor negative	Neutral	Neutral
Otters	Disturbance to otters if using lying up sites or passing along watercourses crossed by the Scheme during construction	Minor negative	Neutral	Neutral
Operational Impacts				
Montgomery Canal SAC and SSSI	No direct or indirect impacts anticipated	Neutral	Neutral	Neutral
Mochdre Dingles SSSI	No direct or indirect impacts anticipated	Neutral	Neutral	Neutral
Penstrowed Quarry SSSI	No direct or indirect impacts anticipated	Neutral	Neutral	Neutral
Gweunydd Penstrowed SSSI	No direct or indirect impacts anticipated	Neutral	Neutral	Neutral
Broadleaved woodlands and scrub	No direct impact on retained broadleaved woodlands and scrub, and indirect impacts such as air pollution from traffic using the Scheme would not be expected to have any measurable effects	Neutral	Neutral	Neutral
Hedgerows	No direct impact on retained hedgerows, and indirect impacts such as air pollution from traffic using the Scheme would not be expected to have any measurable effects	Neutral	Neutral	Neutral
Mochdre Brook, Coleg Powys stream, Green Brook and Dolfor Brook	Potential for indirect impact if pollution events on the Scheme were to enter these watercourses	Moderate negative	Neutral	Neutral
Lichens	No direct impact on retained vegetation supporting notable lichens, and indirect impacts such as air pollution from traffic using the Scheme would not be expected to have any measurable effects	Neutral	Neutral	Neutral
Fish	Potential for impacts if pollution events on the Scheme were to enter watercourses	Moderate negative	Neutral	Neutral
	Potential for new culverts to act as barriers to fish movement along watercourses	Moderate negative	Neutral	Neutral
Reptiles	Potential for mortality associated with routine management of verges if reptiles recolonize these areas	Moderate negative	Neutral	Neutral

	Grassland verges of Scheme post-construction have the potential to significantly increase the habitat available for slow worms compared to the baseline situation	Moderate positive	Moderate positive	Moderate positive
Breeding birds	Risk of road mortality for birds foraging over the verges of the Scheme or flying low across the Scheme. Of the breeding species present, or likely to be present in future, barn owls and goshawks are considered likely to be most at risk of road mortality.	Minor negative	Neutral	Neutral
	Disturbance of breeding birds present in retained habitats close to the Scheme, through noise and/or light pollution, is considered very unlikely to occur as birds would not be expected to choose nesting sites where disturbance was already occurring	Neutral	Neutral	Neutral
Badgers	Fragmentation of social group territories through 'barrier effect' created by operational Scheme, leading to reduction in badger population or disruption of social group territories	Minor negative	Neutral	Neutral
	Risk of mortality to badgers crossing the Scheme carriageway	Minor negative	Neutral	Neutral
Roosting bats	Disturbance to bats or disruption of roost use for retained roosts (in buildings or trees) close to the Scheme. Such effects could result from lighting (lighting columns or vehicle headlamps) or noise associated with operation of the Scheme	Moderate negative	Neutral	Neutral
Commuting and foraging bats	Continued fragmentation of commuting routes and associated prevention of access to foraging areas through 'barrier effect' created by operational Scheme	Minor negative	Neutral in all but one commuting route location; therefore minor negative	Slight negative in the short term but expected to become neutral in the short to medium term
	Risk of bat mortality through collision with vehicles is considered very unlikely to occur, as structures allowing bats to commute beneath the Scheme are proposed in the majority of identified commuting route locations, and the species identified commuting are usually at lower risk of road mortality due to their flight height and behaviour.	Neutral	Neutral	Neutral

	Improved foraging resource for bats along the verges of the Scheme, as these would be less intensively managed than existing grazed pastures	Minor positive	Minor positive	Slight positive
Dormice	Continued fragmentation of population through 'barrier effect' created by operational Scheme, which may affect viability of population in the long-term	Minor negative	Neutral	Neutral
	Recent research has shown that dormice can cross road carriageways during seasonal dispersal movements, and therefore could theoretically be at some risk of road traffic mortality. However, it is likely that such dispersal movements are so rare that the risk of dormouse road mortality is negligible.	Neutral	Neutral	Neutral
	Improved foraging resource for dormice along the verges of the Scheme, as these would be less intensively managed than existing grazed pastures	Minor positive	Moderate positive	Moderate positive
Otters	Loss of connectivity for otters to use foraging habitats on tributaries to the south of the Scheme, through 'barrier effect' created by operational Scheme (not applicable at Mochdre Valley where a clear span structure is proposed)	Minor negative	Neutral	Neutral
	Risk of mortality to otters crossing the Scheme carriageway	Minor negative	Neutral	Neutral

9. Geology and Soils

9.1. Introduction

This section of the Environmental Statement (ES) reviews the potential environment impacts associated with the construction and operation of the Scheme on the Geology, Geomorphology, Soils and land contamination, in accordance with the Design Manual for Roads and Bridges (DMRB) (Volume 11, Section 3, Part 11 – Geology and Soils)[9.1] and supplementary advice from the Welsh Government in Interim Advice Note (IAN) 125/09 (W)[9.2]. Where appropriate, mitigation measures have been identified to minimise adverse impacts, and this mitigation is taken into account in the assessment of residual effects.

9.1.1. General

The Good Practice Guide for Environmental Impact Assessment (EIA)[9.3] states that the following potential environmental effects should be considered:

a) Physical effects of the development, e.g. changes in topography, soil compaction, soil erosion, ground stability etc.
b) Effects on geology as a valuable resource, e.g. mineral resource sterilisation, loss or damage to regionally important geological sites, geological Site of Special Scientific Interest (SSSIs) etc.
c) Effects on soils as a valuable resource, e.g. loss or damage to soils with good agricultural value.
d) Effects associated with ground contamination that may already exist on site, e.g. introducing / changing pathways and receptors.
e) Effects associated with the potential for polluting substances used (during construction / operation) to cause new ground contamination issues on site, e.g. introducing / changing the source of contamination.
f) Impacts associated with re-use of soils and waste soils, e.g. re-use of site-sourced materials on- or off-site, disposal of site-sourced materials off-site, importation of materials to site etc.

9.1.2. Scope

The Scheme design would not have a significant impact on topography, soil compaction or soil erosion. In respect of topography the vertical and plan alignments have been developed to minimise earthworks wherever possible, and in terms of soil erosion the design of cuttings has sought to minimise the potential effect of groundwater seepage from cutting slopes during formation works (see Section 9.6.1.1). Therefore, of point (a) above only ground stability will be considered further in detail in this chapter.

There are records of two historical mining operations for barites at some distance to the Scheme. Whilst both these sites would not directly impact on the route, there exists the potential for unrecorded workings along the route alignment. However, it is unlikely that the development would affect geology as a valuable resource.

The Envirocheck report contained within the 2013 Preliminary Source Study Report (PSSR)[9.4] makes no reference to any Regionally Important Geological Sites (RIGS) within the development corridor. This has also been confirmed by reviewing the Central Wales RIGS listing for Powys[9.5]. Penstrowed Quarry SSSI is located approximately 1.4km North West of the western end of the Scheme and would not be impacted upon by the Scheme. This chapter therefore does not address the risks to designated geological sites.

The Land Use Planning Unit (LUP) was contacted regarding the Agricultural Land Classifications (ALC) of the soils within the Scheme and the surrounding area. The LUP identified that the Scheme is shown as being Grade 4 (poor) agricultural land. The LUP had no records of site specific ALC field surveys within the Scheme. This chapter therefore does not address the effects on soils as a valuable resource.

The impact assessment relevant to potential hydrological and hydrogeological features and flooding risk for the site is contained within Chapter 14, Road Drainage and the Water Environment, of this ES.

The environmental aspects with regard to soils and geology are therefore related to (a) the physical effects of the development (ground stability), (d & e) ground contamination and (f) the potential for re-use of soils.

9.1.3. Policy context

9.1.3.1. Planning Guidance

The Planning system aims to control development and land use in the future. The Planning Policy Wales (Edition 7)[9.7] was implemented in July 2014. Chapter 13 – Minimising and managing environmental risk and pollution, states that land contamination must be considered in the preparation of development plans to ensure that:

- *New development is not undertaken without an understanding of the risks, including those associated with previous land use, mine and landfill gas emissions, and rising groundwater from abandoned mines,*
- *Development does not take place without remediation (if required).*

The principal aims of considering land stability at the planning stage are:

- *A new development is not undertaken without an understanding of the risks, including those associated with subsidence, landslips or rock falls,*
- *The development does not take place without appropriate precautions.*
- *Ground Contamination*

9.1.3.2. Ground Contamination

To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of an area or proposed development to adverse effects from pollution, should be taken into account. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.

The objectives with respect to land contamination are set out in the Welsh Government Contaminated Land Statutory Guidance[9.8] and form the basis of the 'suitable for use' approach to the assessment and remediation of contaminated land. The 'suitable for use' approach consists of three elements:

- Ensuring the land is suitable for its current use – this is achieved through the contaminated land regime and Part 2A of the Environmental Protection Act (EPA) 1990[9.9],
- Ensuring that land is made suitable for any new use, as planning permission is given for that new use – through implementation of the Planning Policy Wales,
- Limiting requirements for remediation to the work necessary to prevent unacceptable risks to human health or the environment.

Part 2A of the EPA 1990[9.9] includes a statutory definition of Contaminated Land, i.e. land that presents an unacceptable risk. The Contaminated Land statutory guidance[9.8] identifies four possible grounds for the determination of land as contaminated land:

- Significant harm is being caused to a human, or relevant non-human, receptor,
- There is a significant possibility of significant harm being caused to a human, or relevant non-human, receptor,
- Significant pollution of controlled waters is being caused,
- There is a significant possibility of significant pollution of controlled waters being caused.

Section 86 of the Water Act 2003[9.10] was brought in to force on 6 April 2012, and amended the definition of contaminated land with respect to controlled water so that in order for land to be designated as contaminated, regulators will have to demonstrate that either there is significant water pollution or that there is a significant risk of water pollution.

The objectives and sub objectives with respect to land contamination set out within the Welsh National Transport SEA consists of the following:

- Reduce transport related contamination and safeguard soil quality, function and quantity,
    - Avoid, reduce and mitigate transport related contamination of soils and freshwater acidification,
    - Protect and enhance soil quality and quantity especially of carbon rich soils,
    - Minimise soil loss (due to erosion, compaction and sealing) attributed to transport.
- Minimise transport related effects on water quality, flood plains and areas of flood risk.
    - Limit transport related pollution of water resources,
    - Minimise transport impacts on the marine and coastal environment,
    - Encourage transport to reduce water use and improve water use efficiency,
    - Minimise transport impacts on flood plains and areas of flood risk,
    - Encourage use of sustainable drainage systems/permeable surfaces.

The approach to determining significant harm or pollution includes the concept of a contaminant, a receptor and an exposure or migration pathway which, if combined, form a pollutant linkage. For each receptor, a description of the harm that is to be regarded as significant harm, and therefore is a significant pollutant linkage, is given in the statutory guidance. Receptors include human beings, ecological systems, property such as crops and livestock, buildings and their services. Significant harm includes in appropriate cases death, disease, serious injury, specified ecological system effects, substantial diminution of crop yield and structural building failure. Pollution of controlled waters, including groundwater and surface water courses, arising from the contaminated condition of land is also included in the regime.

The Scheme comprises a change of use for the site, and it is therefore necessary to assess the development area for its suitability for the proposed use.

9.1.3.3. Exposure of Construction Workers to Contaminated Land

The contaminated land regime, as implemented through Part 2A of the EPA[9.9]and planning, does not explicitly address the risks to construction workers or other occupational groups that may have direct exposure to contaminated land such as people employed to carry out environmental monitoring on such sites. The risks to these human receptors are managed through health and safety legislation, such as the Control of Substances Hazardous to Health (COSHH) Regulations[9.11] which require the employer to carry out an assessment of the risks associated with exposure to hazardous substances and then to prevent, and if this is not reasonably practicable, to adequately control such exposures. This chapter therefore does not address the risks to construction/maintenance workers but does provide some information which would be useful for the development of risk assessments.

9.1.3.4. Waste Soils and Materials Re-use

The Waste Framework Directive 2008 (WaFD)[9.12] establishes the legislative framework for the management, recovery and disposal of waste. It also provides a definition of waste: '*waste means any substance or object which the holder discards or intends or is required to discard'*. The most recent revisions to the WaFD are transposed within England and Wales through the Waste (England and Wales) Regulations 2011. Accordingly, where uncontaminated soils and other natural materials (for example, rock) are excavated during earthworks and it is proposed to re-use them in the construction of the Scheme then they would fall outside the definition of waste and so outside the waste management regime. The WaFD specifically excludes from its scope: '*uncontaminated soil and other naturally occurring material excavated in the course of construction activities where it is certain that the material will be used for the purposes of construction in its natural state on the site from which it was excavated'*.

Material that is surplus to requirements or needs to be discarded (e.g. because of contamination or engineering properties) is strictly classified as waste and should be disposed of in accordance with waste duty of care requirements, including the Landfill Regulations[9.3] Hazardous Waste Regulations[9.14] and Publication WM2[9.15].

- Re-use of materials on site can be managed through either the Environmental Permitting Regulations 2007 (EPR) [9.16]or the CL:AIRE Code of Practice (CoP)[9.17];
- Inert excavated material can be re-used without consent, providing that the works for which it is used are part of the development design and approved under planning consents;
- Under the CL:AIRE CoP materials excavated on-site are not deemed to be waste if it can be demonstrated that they are suitable for re-use within the development.

Further details on the CL:AIRE CoP are given in Volume 3 Appendix F.1.

9.2. Methodology

The detailed methodology undertaken in order to assess the potential impacts and relevant mitigation actions for the Scheme is given in the Environmental Scoping Report[9.18]. The impact assessments to be undertaken are:

- Physical effects of the development (9.2.1 paragraph a),
- Existing ground contamination and potential for new polluting substances (9.2.1 paragraphs d and e),
- Re-use of soils and waste soils (9.2.1 paragraph f).

The methodologies to be adopted in this assessment are as outlined below.

9.2.1. Physical Effects of the Development (paragraph a)

The principal physical effects which are anticipated to arise from the development are associated with material movement, soil compaction and ground stability. For the purpose of this assessment, only ground stability is being considered. Field and laboratory data from the intrusive ground investigation have been assessed and the potential for additional design requirements identified; this information is presented in the Newtown Bypass Ground Investigation Report (GIR). This chapter takes the findings of that interpretation and concludes on the possible physical impacts of the development on the site and surrounding area.

9.2.2. Land contamination (paragraphs d) and e))

There are two stages to the environmental impact assessment of the Scheme, as outlined below. Field and laboratory data from the intrusive ground investigation have been assessed in the Newtown Bypass GIR. .

9.2.2.1. Stage 1 – Risk Assessment

This approach is based on the Defra and Environment Agency guidance document Contaminated Land Report (CLR)11[9.19] and the Good Practice Guide to EIA[9.3]. These documents provide a technical framework for the application of a risk management process through the following steps:

- Development of a conceptual site model (CSM),
- A qualitative or quantitative (should data be available) risk assessment.

A CSM is the description of the pollutant linkages formed (or potentially formed) when a source of contamination is linked to a receptor via a pathway of exposure / migration. The assessment of risk is then based on the likelihood of a pollutant linkage occurring and the consequence of that pollutant linkage occurring, based on the principles given in the National House Building Association (NHBC) and Environment Agency report R&D66[9.20]. This is undertaken using the risk matrix given in Table 9.2.1: Estimation of level of risk by comparison of consequence and probability.

Table 9.2.1: Estimation of level of risk by comparison of consequence and probability

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability (Likelihood)	**High Likelihood**	Very High Risk	High Risk	Moderate Risk	Moderate / Low Risk
	Likely	High Risk	Moderate Risk	Moderate / Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate / Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate / Low Risk	Low Risk	Very Low Risk	Very Low Risk

The definitions of probability and consequence are provided in Volume 3 Appendix F.2. The descriptions of the classified risk (very high – very low) as given in R&D66[9.20] and the table above are also given in Volume 3 Appendix F.2.

The assessment approach outlined above enables an estimation of the level of risk associated with the Scheme. This methodology has been applied for three stages of development:

- Baseline (current) conditions,
- Construction phase,
- Operational phase.

9.2.2.2. Stage 2 – Impact Assessment

The impact assessment is undertaken by comparing the baseline risk assessment with the Construction phase and Operational phase risk assessments. This approach enables changes in the contaminated land status during the Construction or Operational phases to the identified, an assessment of impact made, and appropriate mitigation measures incorporated.

This CSM comparison approach allows the changes in contaminated land status during remediation (if required), construction and operation of the Scheme to be identified as either positive, neutral or negative effects, and consideration made of whether they are major, moderate or minor. Table 9.2.2 Assessment criteria presents an explanation of these assessment criteria.

An assessment of the potential effects of the Scheme in respect of geology and related environmental setting, soils and land contamination is based on the information currently available regarding the Scheme and the information collated for the baseline. The assessment is split into two sections:

- Potential effects that may arise during the construction of the Scheme; and
- Potential effects that may arise during the operation of the Scheme.

The assigned effect (major, moderate, minor or neutral) will be based on:

- Its extent – area over which the effect would occur;
- Whether the effect would be permanent or temporary; or
- Whether the duration of the effect would be short term, medium term or long term.

In the context of the duration, consideration will be given as to whether the effects would be short term, medium term or long term on the following basis:

- **Short term** is considered to be an effect which would affect the receptor only for the period of the construction or the task which is resulting in the effect. For example, this relates to effects which would be considered to be directly related to the enabling or construction works being undertaken;
- **Medium term** is considered to be an effect which would continue beyond the construction works or the task being undertaken, but would not result in an effect which would last for an indefinite period of time; and
- **Long term** is considered to be an effect that would affect the receptor for an indefinite length of time.

The assessment of significance of effect will be based on the criteria in Table 9.2.2 below.

Table 9.2.2: Assessment criteria

Significance of effect	Assessment criteria
Major adverse	Results in a change in the baseline condition which causes a major alteration affecting one of more of the receptors detrimentally.
Moderate adverse	Results in a change in the baseline condition which causes a moderate alteration affecting one of more of the receptors detrimentally.
Minor adverse	Results in a change to the baseline conditions that results in a detectable detrimental effect on one or more of the receptors but does not materially affect the conditions.
Neutral	Results in a change in baseline conditions that is barely detectable and is considered to be neither adverse nor beneficial.
Minor benefit	Results in a change to the baseline conditions that results in a detectable positive effect on one or more of the receptors, but does not materially affect the conditions.
Moderate benefit	Results in a change in the baseline condition in which causes a moderate alteration affecting one of more of the receptors in a positive way.
Major benefit	Results in a change in the baseline condition in which causes a major alteration affecting one of more of the receptors in a positive way.

An effect that is Moderate or Major is considered to be a significant effect. Minor and Neutral effects are not considered to be significant.

The range of beneficial and adverse effects which are considered likely to arise from the Scheme and their likely significance are outlined. An indication is given of how the significance of effects, prior to mitigation, will be assessed. This will also provide a preliminary indication of assessment of the measures that would be incorporated into the detailed design of the Scheme to reduce the negative effects or enhance the positive effects.

9.2.3. Re-use of Soils and Waste Assessments (paragraph f))

In order to assess whether materials may be suitable for re-use at the site, in-situ and laboratory testing was undertaken as part of the 2013 intrusive ground investigation. The fieldwork for this ground investigation was completed late December 2013, with instrumentation commissioning, fieldwork monitoring, laboratory testing and factual reporting ongoing into September 2014. The data obtained from these tests has been assessed in order to establish whether the material analysed is environmentally suitable for re-use within the Scheme. Environmental suitability of material has been assessed through the application of environmental quality standards for human health and controlled water receptors in order to establish whether soils may have the potential to impact upon sensitive receptors if included in the development.

A waste assessment using Atkins' CAT-WASTE^{SOIL} database which provides an initial indication of whether waste soil could be classified as hazardous in accordance with Environment Agency guidance[9.21] has been carried out and is included as part of the land contamination assessment. This provides a preliminary indication of which off-site disposal route may be appropriate, if required.

9.2.4. Limitations and Assumption

The following limitations have been noted:

- The suitability for re-use of the excavated materials is based on detailed assessment of the geotechnical and geo-environmental testing undertaken during the 2013 ground investigation. This is reported in the Ground Investigation Report (GIR).
- The contamination baseline information is based on the initial conclusions drawn from the results of the 2013 ground investigation. These are considered adequate for the purpose of the ES, but during construction the ground conditions and contamination situation would be verified. Notwithstanding the limitations above, it is considered that the assessment of environmental suitability is sufficiently robust to develop the Scheme design.

The following assumptions have been made

- The construction and operation of the Scheme would be carried out in accordance with normal good working practice implemented on such projects.
- The Construction Environmental Management Plan (CEMP) would set out the environmental measures that would be adopted during the construction phase.
- A detailed construction methodology would be developed during the detailed design phase. However, for the purposes of this ES, a number of basic assumptions on construction activities have been formulated. The proposed construction strategy is outlined in Sections 2.2 of this ES Volume 1.

9.2.5. Summary of Methodology

The assessments have been undertaken adopting the methodologies outlined in the Scoping Report[9.18] and above, and are based on:

- professional judgment;
- existing information on ground conditions; and
- Scheme proposals for the development, in particular the landscaping and hard development, civil and drainage ground works, outline cut and fill proposals (and potential to treat and re-use materials on-site) and foundation options.

9.3. Baseline Conditions

The study area for each aspect of the assessment has been confined to the following distances from the Scheme:

- Geography and topography – description of the route and Scheme only,
- Historical land uses and potential sources of contamination – within 500m of the Scheme boundary,
- Geology – within the Scheme boundary,
- Controlled waters, groundwater and human receptors – within 250m of the Scheme boundary.

The review of geographical and geological information has been restricted to the current scheme corridor (Volume 2 Figure 2.1a – d). The following aspects of the Scheme design have been considered:

- The alignment of the Scheme construction including links to minor roads and re-alignment of minor roads,
- Land and features adjacent to or surrounding the Scheme construction which may be susceptible to instability such as historical and solification,

A Ground Investigation (GI) was undertaken at the site between September and December 2013 to gather information on the baseline conditions at the site. The details of the site investigation and the data assessment conducted based on the findings are presented in Section 9.3.7.

9.3.1. Consultation

Consultation detailed below was undertaken during the EIA process and information obtained was used in the assessment:

- Powys County Council –provided information from a contaminated land search within the Scheme boundary. This is discussed further in Section 9.3.7.
- Welsh Government for Agricultural Land Classification (ALC) information – provided information on the ALC within the Scheme boundary (refer to ES Volume 3, Appendix J.1).

9.3.2. Geography and Topography

The Scheme corridor passes through a largely rural area to the south of Newtown. The land is elevated with respect to the town and is undulating, with an overall downward slope towards the north; the Scheme would run approximately with the contours but is dissected by several incised river valleys containing minor tributaries of the River Severn (refer to ES Volume 2, Figure 2.4 a – d). A number of possible historical landslips, which have previously been mapped by the British Geological Survey (BGS), are present within and adjacent to the route corridor (refer to ES Volume 2, Figure 9.3 a – d).

The Scheme would pass both residential and commercial development, and both cutting and embankment works would be required. For a description of the Scheme refer to Section 2.1.

The Scheme crosses a number of minor tributaries of the River Severn, which flow east – west approximately 0.5km north of the Scheme corridor. Mochdre Brook, the largest tributary flows in a south - north direction crossing the Scheme just north of the existing Mochdre Bridge on Mochdre Lane.

9.3.3. Historical Land Uses

The Scheme corridor is mostly undeveloped agricultural land, with some minor infrastructure which would be incorporated into the Scheme design. Where the Scheme joins the existing roads it is anticipated that there would be Made Ground. The eastern end of the Scheme would cross railway land. Historic landslips are shown in Volume 2 Figure 9.3 a – d.

9.3.4. Geology

The anticipated ground conditions along the Scheme were initially determined from examination of the 2013 PSSR Report [9.4] and information published by the BGS[9.22, 9.23, 9.24 and 9.25]. No historical exploratory holes or other ground investigation information were available along the Scheme corridor, or within the general vicinity of the Scheme's proposed alignments. To facilitate a better understanding of the anticipated ground conditions the 2013 ground investigation was undertaken between September and December 2013, with specific attention being applied to the identification and description of possibly disturbed and sheared landslip material.

The solid and superficial deposits that may be encountered within the Scheme corridor have been summarised in Table 9.3.1 Superficial Geology and Table 9.3.2 Solid Geology below. The summarisations provided are based on an assessment of the data received from the ground investigation.

Table 9.3.1: Superficial Geology

Superficial Deposits		
Made Ground		Only limited extents of localised Made Ground were anticipated within the Scheme corridor, which was confirmed by the 2013 ground investigation, with Made Ground only being encountered at the following locations: • Quarry floor at approximate Chainage (ch)1330m • Mound of excavated material at approximate ch1550m • A short distance south of proposed alignment at approximate ch1550m • In stream valley approximate ch2050m Where encountered, this deposit was typically described as: • Angular gravel and cobbles with plastic and glass. • Sandy slightly gravelly SILT/CLAY with low cobble content (reworked in situ material) • Sandy slightly gravelly SILT/CLAY. Gravel is subrounded to subangular with occasional fine angular brick.
Post Glacial Deposits	Head Deposits	Head is a very variable deposit that typically forms as a result of solifluction under periglacial conditions, but may also have formed as more recent gravity transported deposit commonly found towards the toe of sloping ground. It can vary in composition widely from sandy clay to very coarse sized rock scree. Where these deposits exist they are likely to currently be stable. However it is possible that they may contain locally persistent pre-existing shear surfaces that are predominately shallow in nature (less than 3m deep). Head deposits were only anticipated between approximate ch3200m and ch3400m within the Scheme corridor. However it is possible that localised thin veneers of such deposits may be encountered where the works are situated towards the base of sloping ground. The 2013 ground investigation does not appear to have encountered any Head deposits.

Superficial Deposits		
	Fan Deposits	Fan deposits are of fluvial origin comprising poorly sorted coarse granular deposits and are shown to be of a limited extent on the geological mapping, but potentially present within the western area of the proposed Scheme corridor. The 2013 ground investigation encountered limited extents of probable Fan deposits between: • Approximate Ch.0 to Ch 50 along the main alignment at the western end of the Scheme; • Approximate Ch. 250 to Ch. 450 along the southern link road to the A489 at the western end of the Scheme • Approximate Ch 0 to Ch. 350 along the northern link road to the A489 at the western end of the Scheme. Where encountered, this deposit was typically described as: • Loose silty sandy subangular to rounded GRAVEL with low to medium cobble content.
	Alluvium	Alluvium is a waterborne deposit that is typically described as silts and fine sands becoming more granular with depth, but may also include fine compressible material. Alluvium was encountered during the 2013 ground investigation: • Within the floodplain of the River Severn at the western end of the Scheme. • Locally along several minor tributaries that intersect the Scheme. Where encountered, this deposit was typically described as: • Soft thinly laminated clayey SILT with occasional thinly laminated layers/pockets of sand. • Sandy silty subangular to rounded GRAVEL with medium cobble content.
	Landslide Deposits	The Scheme is shown on the BGS mapping to be crossed by four areas of mapped "landslip", all of which appear to be situated within areas of glacial till. Where such landslips exist, it was anticipated that they would likely be currently dormant and have been formed under periglacial conditions as a result of saturation during thawing of the permafrost. Whilst they may currently be stable they may contain potentially extensive, predominately shallow pre-existing residual shear planes. The areas of landslip mapped on the geological mapping were investigated during the 2013 ground investigation but only limited evidence of disturbance appears to have been encountered. Where investigated, preliminary evidence indicates that the materials are typically: • Dry, compact/ firm to stiff sandy gravelly SILT/CLAY, with low to much cobble content and occasional boulder with only limited and localised orientation of the coarser fragments within the debris mass. • No defined and persistent shear surfaces were encountered with only rare impersistent (less than 300mm) randomly orientated shear surfaces being reported between approximate Ch. 3700 and Ch. 3900 that are perhaps more related to solifluction than larger more prevalent landslipping. • Locally there was limited evidence of a slight coarsening with depth (e.g. larger and more frequent cobble sand boulders at depth) and faint layering. Preliminary indications from the 2013 ground investigation are that these areas are likely historical "landslips" formed during or soon after deposition of the glacial till as a saturated flow, which may best be represented, at least in part, by a Lodgement Till, Melt-out Till or a Flow-Till deposits rather than a true landslide deposit. The current indications are that these features would not present a major constraint to the works and should be readily engineered using standard earthwork related techniques. However, further assessment, in particular of the detailed logging and instrumentation data, would continue up to and during construction to confirm the above. The geological memoirs also refer to possible landslides within solid rock formations. Such bedrock landslides are attributed to planar (bedding parallel) rock slides along thin impersistent layers of bentonite clay. During the 2013 ground investigation detailed logging of approximately sixty carefully constructed coreholes only indicated one borehole where a notable (10mm thickness) clay infill was encountered in the weathered bedrock zone within 1.5m of the surface and no such clay layers were encountered during rock face mapping of exposed rock outcrops. While the risk of landslip along clay layers cannot be ignored, the initial assessment indicates that there is a low risk of this hazard being encounter by the Scheme.

Superficial Deposits		
Glacial Deposits	Morainic Deposits	Morainic deposits are formed during the glacial retreat towards the end of the last Ice Age. Such deposits typically comprise unsorted silty sandy gravels with cobbles. The Morainic deposits are generally limited to the low ground in the valley bottoms and it is anticipated that their presence within the Scheme corridor would be limited to the eastern extent of the Scheme. Only a limited extent of this deposit was encountered during the 2013 ground investigation at the following location: • Eastern end between approximate Ch. 5750 to Ch. 5850. Where encountered, it was typically described as: • Slightly silty sandy angular to subrounded GRAVEL, with low gravel content.
	Till	Glacial Till is generally found on the valley sides and would form a large proportion of the superficial deposits encountered along the Scheme alignment. The surface of Glacial Till, especially on slopes, may have been impacted by solifluction and landslip to shallow depth (typically less than 3m). Glacial Till was encountered throughout the site during the 2013 ground investigation and was typically described as follows: • Slightly sandy gravelly SILT / CLAY. • Slightly sandy gravelly SILT / CLAY with medium cobble and boulder content. During the ground investigation only infrequent, impersistent, randomly orientated, minor and localised shear surfaces were encountered indicating that the majority of this material has probably not been soliflucted to a significant degree.

The solid geology anticipated to be encountered within the Scheme corridor has been summarised in Table 9.3.2 below:

Table 9.3.2: Solid Geology

Solid Geology			
Silurian	Ludlow	Bailey Hill Formation Lowest member formed by Dingle Mudstone	The Bailey Hill Formation was anticipated to be encountered within the central and western central sections of the Scheme and mainly comprise thinly interbedded mudstone and sandstone or siltstone. According to the BGS this formation can rarely include thin partings of bentonite clay that could lead to planes of instability within otherwise competent bedrock. This formation was encountered during the 2013 ground investigation as anticipated within the central and western central sections of the Scheme. No evidence of bentonite clay layers were encountered within this formation Dingle Mudstone Member is the lowest member of the Bailey Hill Formation and was anticipated to underlie much of the central part of the Scheme corridor. It was encountered during the 2013 ground investigation as anticipated.
		Nantglyn Flags Formation	This formation straddles the Ludlow and Wenlock strata and was anticipated to comprise thinly bedded laminated, fissile mudstone and sandstone and be encountered at both the western and eastern ends of the Scheme and at depth within the middle section of the Scheme. Thin beds of bentonite may rarely be encountered in this formation and these may provide a weak plane along which failure of cutting slopes could occur. During the 2013 ground investigation this formation was encountered as anticipated at both ends of the Scheme. No evidence of bentonite clay layers were encountered within this formation
	Wenlock	Nantglyn Flags Formation	

The BGS sheets[9.22, 9.23, 9.24 and 9.25]indicate a series of alternating anticlines and synclines orientated in a north-easterly / south-westerly alignment. This complex structural geology means that rock dips along the Scheme may vary in magnitude and direction. To minimise the impact of this variable geological structure, rock slopes would typically be formed at a maximum slope profile of approximately 1m vertical to 1m horizontal or (1:1). Further assessment of the impact that the variable structural geology may have on the Scheme is assessed in detail within the GIR.

There are records of two historical mining operations for barites at some distance from the Scheme; one is situated to the west of Newtown town centre, and the other 1.5km east of Newtown. Both were formed within the Nantglyn Flags Formation. Whilst both these sites do not directly impact on the Scheme and no evidence of unrecorded working were encountered during the 2013 desk study or ground investigation, there exists the potential for unrecorded workings along the Scheme alignment. Furthermore, there are several disused quarries located in the surrounding areas along the Scheme. Environment Agency[9.6] records were reviewed and indicated that there is no record of historical infilling at any one of these locations.

9.3.5. Controlled Waters

Further consideration of controlled waters features (aquifers, groundwater source protection zones, surface water streams etc.) is given in Section 14 Road Drainage and the Water Environment. The principal features of interest to this Chapter within 250m of the Scheme corridor are summarised below.

- The River Severn to the north of the Scheme,
- A number of surface water streams which are crossed by the Scheme, including Mochdre Brook and other tributaries of the River Severn,
- Isolated areas of Secondary (undifferentiated) superficial aquifer and Secondary A superficial aquifer, in particular at the western end of the Scheme. These are likely to relate to the fan deposits and Alluvium underlying the site respectively,
- Secondary B Bedrock aquifer beneath the entire scheme corridor.

There are no Groundwater Source Protection Zones within 250m of the Scheme.

9.3.6. Contamination

In order to determine the potential for ground contamination along the Scheme, the 2012 PSSR [9.26] considered historical maps, trade directories and publically available information sources, including an Envirocheck report.

Additionally, Powys County Council was commissioned by the AGC Team to undertake a contaminated land search within the Scheme boundary. The search identified 32 areas of potentially contaminated land.

Volume 2 Figures 9.1a and b show the potential contamination sources.

Although the Scheme alignment is primarily through agricultural land the following potential sources of contamination which may impact upon the Scheme include:

- Textile Industry (bleaching and dying),
- Quarrying,
- Industrial estates,
- Railway land,
- Agricultural use,
- Sewage works,
- A former slaughterhouse,
- Potential fly tipping,
- Landfilling.

The land uses and potential contaminants associated with each are summarised in Table 9.3.3 below.

Table 9.3.3– Possible Sources of Contamination

Potential source of contamination	Potential Contamination[9.27]	Approximate Location	Scheme vertical alignment at closest point to potential contamination source
(S1) Railway Land	The ballast may be contaminated by fungicides and herbicides from maintenance works, organic contaminants from fuels and lubricants, metal fines and asbestos fibres. Other contaminants include PAHs and PCBs.	The Scheme would pass over the railway.	Embankment
(S2) Agricultural Land	Chemicals, e.g., sheep dip, and fuels may have been stored on farmland. Burial pits may be present where infectious carcasses or waste materials may have been disposed of. Pesticides and herbicides may also have been applied to the ground.	The Scheme would cross over and cut through agricultural land.	Embankment and cutting
(S3) Textiles (Historical Flannel Factory and Bleach Mill)	Contaminants present could include metals, asbestos, fuels/ oils, phenols, acetone, oil/fuel hydrocarbons, aromatic hydrocarbons, and Polychlorinated Biphenyls (PCBs).	Approximately 400 m south of the Scheme.	Embankment
(S4) Plantation Lane landfill	The Plantation Lane landfill was active between 1941 and 1975; Environment Agency records indicate that inert, household and commercial wastes may have been deposited[9.6]. Potential contaminants include metals, oil/fuel hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), chlorinated aliphatic hydrocarbons, chlorinated aromatic hydrocarbons, PCBs, dioxins and furans.	Approximately 410m north west of the Scheme.	Embankment
(S5) Quarrying	There are no records of historical infilling at the quarry. Furthermore, a visual inspection of the quarry was undertaken during a site visit which confirmed there was no visual evidence of tipping.	Approximately 175 m north of the Scheme.	Embankment
Industrial Estate (S6) Mochdre	The unit is reportedly now occupied by a company which has supplied cold immersion paint and powder coating strippers, originally based on methylene chloride. It is reported that the use of these two eastern most units has not been confirmed and so the potential contaminants cannot be confirmed. The sub-stations have a potential to contain PCB in transformers or capacitors. Other contaminants include metals, asbestos, aromatic and aliphatic hydrocarbons.	Approximately 250 m north of the Scheme.	Embankment and cutting

Potential source of contamination		Potential Contamination[9.27]	Approximate Location	Scheme vertical alignment at closest point to potential contamination source
	(S7) Dyffryn	It is reported that the fellmongery would have used lime and sulphide depilatory paint, enzymes, and acid saline pickle to remove wool from sheep hides. Other contaminants include metals, asbestos, aromatic and aliphatic hydrocarbons.	Approximately 150 m north west of the Scheme.	Cutting
(S8) Sewage Works		Metals, nitrate, sulphate, asbestos, oil/fuel hydrocarbons, TPHs and PCBs.	200 m east of the Scheme.	Embankment
(S9) Animal Slaughtering		Metals, chemicals, TPHs, PAHs and phenol. There is also potential for animal carcasses to be present.	80 m south of the Scheme.	Embankment
(S10) Fly Tipping		Potential fly tipping at Tyn-y-Green. Potential contaminants include metals, asbestos, PAHs, TPHs, VOCs and SVOCs.	Approximately 100 m east of the Scheme	Cutting

9.3.7. Summary of 2013 Ground Investigation

A detailed ground investigation (GI) was undertaken by Quantum Geotechnical as part of the Key Stage 3 works.

Fieldwork for the GI was undertaken between September and December 2013. The findings of the factual report for the 2013 GI are included in the Newtown Bypass GIR.

The 2013 GI was designed to provide sufficient data to enable detailed design and environmental assessment of the Scheme. The GI comprised a targeted investigation to assess:

- Areas of significant earthworks,
- Structure locations to allowed both shallow and piled foundation options to be assessed,
- Earthworks material properties to assess the suitability of site-won materials for re-use within the works,
- Contamination potential across the site as well as areas of suspected contamination to determine the nature, extent and concentration of any contaminants encountered in the soil or groundwater during the fieldwork period,
- Groundwater and ground gases.

The GI included the following:

- 77no. Boreholes formed by rotary coring through soil and rock and dynamic sampling through soil with groundwater and ground gas monitoring installations,
- 138no. Machine excavated trial pits/ trenches with groundwater and ground gas installations,
- Environmental sampling and laboratory testing.

The ground investigation plan including borehole and trial pit locations can be found in Volume 2 Figure 9.2a and b.

9.3.7.1. Data Assessment

A generic quantitative risk assessment (GQRA) for human health and controlled waters was undertaken by Atkins using the results from the 2013 ground investigation. This comprised:

- 107 soil samples analysed for a range of organic and inorganic contaminants,
- 40 soil leachate samples analysed for a range of organic and inorganic contaminants,
- 18 surface water samples (six from each of three sampling visits) analysed for a range of organic and inorganic contaminants, and
- 48 groundwater samples (16 from each sampling visit) analysed for a range of organic and inorganic contaminants.

9.3.7.1.1. Human health

The generic quantitative human health risk assessment comprised a comparison of detected contaminant concentrations in the soil with the Atkins Soil Screening Values (SSVs) for a Parks land use with 6% soil organic matter (SOM). This was considered to be a sufficiently conservative scenario against which to screen the soil analysis results. Further details on the Parks SSVs and their derivation are located in Volume 3 Appendix F.3. The results of the soil assessment can be found in Volume 3 Appendix F.4.

There was a single exceedance of the benzo (a) pyrene (BaP) SSV reported in a sample from TP050. It is unlikely that the ground in which this isolated BaP exceedance was detected would be disturbed during construction given its distance from the Scheme. There were no other exceedances detected.

9.3.7.1.2. Controlled Waters

A generic controlled waters risk assessment was undertaken by comparing contaminant concentrations in surface water and groundwater samples against a combination of Environmental Quality Standards (EQS) and Drinking Water Standards (DWS). Groundwater and surface water samples were collected on three occasions during February, March and May 2014.

The following exceedances were identified over the three rounds of groundwater and surface water monitoring:

Table 9.3.4 Surface and Groundwater Exceedances

Determinant	Number of exceedances	DWS	Maximum Reported Concentration
Aluminium	21 (16 groundwater and 5 surface water samples)[1] 11 (groundwater samples)[2] 19 (15 groundwater and 4 surface water samples) [3]	0.2 mg/l	10 mg/l (groundwater sample)
Arsenic	1 groundwater sample on each sampling visit	10 µg/l	13 µg/l (groundwater sample)
Lead	7 (groundwater samples)[1] 4 (groundwater samples)[2] 4 (groundwater samples)[3]	10 µg/l	28 µg/l (groundwater sample)
Ammoniacal Nitrogen	1 groundwater sample on each sampling visit	500 µg/l	660 µg/l (groundwater sample)
Chloride	1 groundwater sample on 2nd and 3rd sampling visit	250 mg/l	260 mg/l (groundwater sample)

[1] First round of groundwater monitoring (3rd-4th February 2014)
[2] Second round of groundwater monitoring (10th-11th March 2014)
[3] Third round of groundwater monitoring (27th-28th May 2014)

During the first round of surface water and groundwater monitoring, all results for phenol were below the laboratory detection limit of 10µg/l, however this is higher than the phenol DWS (1 µg/l) by a factor of 10. This was due to the laboratory testing samples using an analytical method with a detection limit of 10µg/l. The laboratory was contacted and a different analytical method with a 1µg/l detection limit was used; all samples were below the phenol DWS of 1µg/l when analysed using this method and therefore the original phenol exceedances can be discounted.

Aluminium was not tested in the soils analysis undertaken, however it is likely that the elevated concentrations reported in the water samples,(particularly in groundwater) are associated with the naturally occurring alumino-silicate minerals found in the Silurian mudstones and the overlying superficial deposits at the site. The soil leachate assessment found 12 exceedances of the DWS for ammoniacal nitrogen present across the site. These exceedances are likely to be attributable to farming practices. However, based on only a single exceedance of the ammoniacal nitrogen DWS (500µg/l) from each groundwater sampling visit (this was in BH66A on the first visit and BH35A on the second and third visits) there is no evidence that the soils present across the site have a site wide impact on groundwater quality. Arsenic, lead and chloride were not found to

be leachable in the soils tested, suggesting that the soils on site are not contributing to the groundwater exceedances reported above.

9.3.7.1.3. Ground Gas

A generic ground gas risk assessment was undertaken by comparing the ground gas monitoring results obtained from the site with gas screening values (GSV). The screening threshold values adopted are:

- Methane: 1%.
- Carbon Dioxide: 5%.

Ground gas monitoring was undertaken at the site on 3 occasions between 15th-17th January, 21st-23rd January and 3rd-5th February 2014. A review of the data has identified a maximum flow of 1.4l/hr recorded in BH007. A minimum O_2 concentration of 13.6v/v was recorded in BH034a; the same borehole returned CH_4 readings of 0.5v/v which was the maximum recorded across the site. A maximum CO_2 concentration of 5.5v/v was detected in TP107, a slight increase above the 5.0v/v threshold value for CO_2. No H_2S or CO was detected across the site. Given these results, ground gas is unlikely to be an issue at the site.

9.4. Predicted Environmental Effects

9.4.1. Construction impacts

9.4.1.1. Physical Effects of the Development

A Ground Investigation was undertaken between September and December 2013 to inform the preliminary design of the Scheme.

A further phase of ground investigation is not currently envisaged prior to commencement of construction works. However it is anticipated that further limited ground investigation, undertaken during the early stages of construction to confirm design assumptions, may be necessary at specific locations, such as structures and confirmed areas of landslip etc.

To provide a preliminary understanding of how the Scheme design may affect each potential source of contamination, a summary of the current Scheme design through / adjacent to each potential source of contamination is presented in Table 9.4.1.

9.4.1.2. Land Contamination

9.4.1.2.1. Stage 1 Conceptual Site Model (CSM)

A CSM identifies potential or known sources of contamination, sensitive environmental or human receptors and pathways by which a contaminant from the source could reach the receptor. Where all three are present or are likely to be present (source-pathway-receptor linkage) they are called a Potential Contaminant Linkage (PCL).

The ground investigation has only found a single soil sample and contaminant to have exceeded the human health screening criteria based on the proposed end use of the site. On this basis, we have excluded any contaminant linkages associated with soils and soil dust from the conceptual model.

CSMs (baseline, construction and operational) have been produced for the scheme. These assessed each historical potentially contaminative land use identified in Table 9.3.3 using further information, where available from the ground investigation to identify if PCLs were present
.
The following sources, pathways and receptors have been developed from the Environmental Scoping Report for the Scheme[9.18], the PSSR[9.26], the contaminated land search conducted by PCC and the GI information.

Potential Sources of Contamination

- S1 – Railway land,
- S2 – Agricultural land,
- S3 – Textile factories,

- S4 – Plantation Lane Landfill,
- S5 – Quarry,
- S6 – Mochdre Industrial Estate,
- S7 – Dyffryn Industrial Estate,
- S8 – Sewage works,
- S9 – Former animal slaughter house,
- S10 – Tipping.

Potential Contamination Pathways

- Human exposure to contaminants:
  - inhalation of asbestos fibres
  - ingestion, inhalation and dermal contact with contaminated soil and soil-derived dust,
  - ingestion of contaminated surface water or groundwater,
  - dermal contact with contaminated surface water groundwater,
- leaching of contaminants from soil in the unsaturated zone to groundwater,
- lateral migration of contaminants in shallow groundwater with discharge to surface watercourses,
- migration of contaminants entrained in surface water runoff followed by discharge to surface watercourses,
- creation of new contaminant pathways to groundwater (such as through piling),
- direct contact of contaminants in soil and/or groundwater with buildings, foundations or buried services,

Potential Receptors to Contamination

- Controlled waters: groundwater (underlying B bedrock aquifer and superficial Secondary undifferentiated and Secondary A aquifers located in isolated areas of the Scheme),
- Controlled waters: surface waters the River Severn, Mochdre Brook, Dolfor Brook and small tributaries of the River Severn,

Volume 3 Appendix F.5, Table F1 shows the CSM for each potential source of contamination identifying specific PCLs associated with each source to be taken forward to the risk assessment. The Scheme itself is not taken forward as a potential source of contamination in this Chapter, that is, by discharge of contaminants from operation of the road via surface water run-off because this is addressed in Chapter 14 Road Drainage and the Water Environment. This is in compliance with and furthermore, in conformance with Planning requirements which state that no development should worsen the environmental conditions or be determined as contaminated land once complete.

9.4.1.3. Stage 1 Risk Assessment

A land contamination risk assessment has been undertaken by assessing the risk of each potential PCL identified at baseline and during the construction and operational phases. The conceptual site models and risk assessment are presented in Appendix F5 Table F1 and uses the results of the ground investigation, the risk matrix presented in Table 9.2.1 Section 9.2.2.1 and the definitions of probability and consequence presented in Volume 3 Appendix F.2.

9.4.1.4. Stage 2 Impact Assessment

The contaminated land impact assessment for the construction phase is based on the change in the contaminated land risk between the baseline and the construction phases. This is summarised in Table 9.4.1. The impact assessment does not include mitigation measures.

Table 9.4.1 – Land Contamination Impact Assessment – Construction Phase

Source	Receptor	Potential Contaminant Linkage	Baseline (current) Risk Assessment	Construction Phase Risk Assessment	Effect
On site Railway land	**Controlled Waters**	Leaching of contaminants to groundwater in underlying aquifers.	Very low risk	Low risk	Minor adverse effect

Source	Receptor	Potential Contaminant Linkage	Baseline (current) Risk Assessment	Construction Phase Risk Assessment	Effect
	Secondary Undifferentiated Superficial Aquifer Secondary B Bedrock Aquifer	Migration of contaminated water through preferential pathways (such as piling) to groundwater in underlying aquifers.	Very low risk	Low risk	Minor Adverse effect
	Controlled Waters River Severn	Lateral migration of contaminated groundwater with discharge to surface water as base flow.	Very low risk	Low risk	Minor adverse effect
		Discharge of contaminants entrained in surface water runoff followed by overland flow and discharge.	Very low risk	Low risk	Minor adverse effect
On site Agricultural land	**Controlled Waters** Secondary A and Secondary Undifferentiated Superficial Aquifers Secondary B Bedrock Aquifer	Leaching of contaminants to groundwater in underlying aquifers.	Very low risk	Low risk	Minor adverse effect
		Migration of contaminated water through preferential pathways (such as piling) to groundwater in underlying aquifers.	Very low risk	Low risk	Minor Adverse effect
	Controlled Waters River Severn Mochre Brook Dolfor Brook Unnamed streams	Lateral migration of contaminated groundwater with discharge to surface water as base flow.	Very low risk	Low risk	Neutral effect
		Discharge of contaminants entrained in surface water runoff followed by overland flow and discharge.	Very low risk	Low risk	Minor adverse effect

In general, minor adverse effects are anticipated during construction of the Scheme.

The temporary mobilisation of contaminants can occur where areas of contaminated ground are opened up for construction and rainfall occurs. This is likely to increase suspended solids and leaching of contaminants from the soil to groundwater and may temporarily increase migration of contaminants in groundwater to surface waters. A temporary minor adverse effect is predicted to groundwater and surface water receptors where the Scheme would cross the railway and intersect the agricultural land, assuming no mitigation measures are applied. Furthermore, temporary mobilisation of ground gas may occur as a result of ground disturbance. This provides a potential PCL to the foundations and utilities in place as part of the Scheme for example from the Plantation Lane Landfill.

Seven of the identified potential contamination sources have not been included as part of the impact assessment given their distances from the site. They are unlikely to have an effect on land contamination as a result of the construction of the Scheme and have therefore been discounted.

9.4.1.5. Assessment Limitations

The above construction assessment has assumed that mitigation measures have not been applied. The assessment assumes that the ground investigation data reviewed provides a reasonable indication of the ground conditions present at the site. There is the potential that other ground contamination, as yet undetected, may exist at the site between investigation points and within areas that could not be assessed during the ground investigation. This is taken into account by the professional judgement used to inform the assessment.

9.4.2. Operational impacts

The contaminated land impact assessment for the operational phase is based on the change in contaminated land risk between the baseline and operational phases. This is summarised in Table 9.4.2.

Table 9.4.2 – Land Contamination Impact Assessment – Operational Phase

Source	Receptor	Potential Contaminant Linkage	Baseline (current) Risk Assessment	Construction Phase Risk Assessment	Effect
On site Railway land	**Controlled Waters** Secondary Undifferentiated Superficial Aquifer Secondary B Bedrock Aquifer	Leaching of contaminants to groundwater in underlying aquifers.	Very low risk	Low risk	Minor adverse effect
		Migration of contaminated water through preferential pathways (such as deep excavation or piling) to groundwater in underlying aquifers.	Very low risk	Low risk	Minor Adverse effect
	Controlled Waters River Severn	Lateral migration of contaminated groundwater with discharge to surface water as base flow.	Very low risk	Low risk	Minor adverse effect
		Discharge of contaminants entrained in surface water runoff followed by overland flow and discharge.	Very low risk	Low risk	Minor adverse effect
On site Agricultural land	**Controlled Waters** Secondary A and Secondary Undifferentiated Superficial Aquifers Secondary B Bedrock Aquifer	Leaching of contaminants to groundwater in underlying aquifers.	Very low risk	Low risk	Minor adverse effect
		Migration of contaminated water through preferential pathways (such as piling) to groundwater in underlying aquifers.	Very low risk	Low risk	Minor Adverse effect
	Controlled Waters River Severn Mochre Brook Dolfor Brook Unnamed streams	Lateral migration of contaminated groundwater with discharge to surface water as base flow.	Very low risk	Low risk	Neutral effect
		Discharge of contaminants entrained in surface water runoff followed by overland flow and discharge.	Very low risk	Low risk	Minor adverse effect

Source	Receptor	Potential Contaminant Linkage	Baseline (current) Risk Assessment	Construction Phase Risk Assessment	Effect
Off site Plantation Lane Landfill (including landfill gas)	**Property** Foundations and utilities including the built Scheme	Lateral migration of landfill gas within Superficial Deposits followed by accumulation	Very low risk	Very low risk	Neutral effect

In general, neutral effects are anticipated at the operational stage of the Scheme.

There are minor adverse effects anticipated with the introduction of road users as a receptor during operation of the Scheme.

9.4.3. Materials re-use assessment

Atkins undertook a CAT-WASTE^{SOIL} assessment to determine whether waste arisings from the site would be classified as hazardous or not for off-site disposal purposes during construction of the Scheme. The assessment identified that waste arisings from the site would not be classified as Hazardous. The results of the CAT-WASTE^{SOIL} assessment are outlined in Volume 3 Appendix F.4.

9.4.4. Cumulative Impacts

There are not anticipated to be any cumulative effects associated with land contamination along the Scheme Given the nature of nearby proposed developments, it is not anticipated that they would negatively impact upon the land quality at the site.

9.5. Proposed Mitigation

9.5.1. Pre-construction

Prior to construction, the following investigations and assessments would be undertaken to refine the design and mitigation measures:

- Boreholes would be provided for groundwater and surface water monitoring during and after construction,
- The contractor would provide a method statement for the control of unexpected contamination and pollutant run-off,
- A construction environmental management plan (CEMP) would be prepared prior to the start of construction including a pollution incident control plan,
- Slope stability assessment of all cut and fill slopes would also be undertaken based on the known properties of the material to ensure safe angle of slopes for the lifetime of the road,
- The contractor would develop a Site Waste Management Plan (SWMP) for the removal, transportation and disposal of all waste materials excavated from the site. Additionally the contractor would develop a Materials Management Plan (MMP). This is discussed in further detail in Section 10 Materials.

9.5.2. Construction mitigation

The risk assessments presented in Volume 3 Appendix F.5 have highlighted the need for the following mitigation measures to be implemented during the construction phase:

- Relevant guidance such as CLR119.17, the Environment Agency's Pollution Prevention Guidelines (PPG) (in particular PPG1[9.28], PPG5[9.29], PPG6[9.30], PPG21[9.31] , Environment Agency guidance on Piling into Contaminated Land[9.32] would be followed. These guidance documents include recommendations regarding use of fuel spill kits and safe storage requirements. The application of appropriate working methods developed using these guidance documents would mitigate against potential human health and controlled water contaminant linkages,
- Good site working practices would be applied, e.g. damping down of dust during dry conditions to prevent exposure to workers and off-site dispersion,

- If any material is removed due to its chemical unsuitability for retention at the site, full records should be maintained and a verification report prepared following Environment Agency guidance[9.21],
- Should unforeseen contamination be discovered during construction e.g. animal burial pits, works should cease and the method statement followed,
- It is possible that an increased pollution risk would occur due to the storage of fuel for plant and machinery; these may also be prone to leaks and spillages. Appropriate method statements and working practices would be in place in order to minimise the potential impact of spills or leakages.

9.5.3. Operational mitigation

The risk assessments presented in Volume 3 Appendix F.5 have highlighted the need for the following mitigation measures during the operational phase:

- All surface water runoff from the Scheme would be directed to the Scheme drainage system.
- Cutting drainage would be installed to minimise the risk of seepage and consequent exposure of contaminated groundwater to human health receptors.
- No confined spaces associated with the Scheme would be accessible to the public.
- Monitoring of groundwater, surface waters and slope stability would continue for 12 months after the completion of construction.
- Routine maintenance and regular inspections of the slopes would continue for the lifetime of the Scheme.

9.6. Residual Environmental Effects (following mitigation)

9.6.1. Construction impacts

9.6.1.1. Physical Effects of the Development

Prior to the GI, seven potential areas of ground instability were shown in the general vicinity of the Scheme on the available BGS mapping[9.22, 9.23, 9.24 and 9.25], four of which were shown to be potentially impacted by the proposed alignment. This is discussed in the 2013 PSSR[9.4].

Based on the assessment of the 2013 GI data and information gathered prior to this, it is considered that ground stability may be caused by:

- Presence of pre-existing landslip (lateral displacement) is unlikely to significantly impact on the Scheme alignment. Residual instability during construction would be managed by the implementation of appropriate temporary measures (such as staged construction, drainage, soil reinforcement, etc.). Following construction, the risk of residual instability is considered to be minimal,
- Excessive settlement (vertical deformation) of soft / loose in situ materials is considered limited to minor extents of alluvial deposits associated with the River Severn at both the eastern and western end of the Scheme, and a small area west of Castell-y-Dail. Residual instability during and following construction is not currently anticipated,
- Excessive settlement (vertical deformation or lateral squeezing) of localised soft / loose in situ material encountered below high embankment would primarily be controlled by appropriate construction sequencing, removal and replacement, and installation of drainage blankets. Residual instability during and following construction is not currently anticipated,
- Passive, localised, dewatering implemented by deep drainage trenches in areas of deep cutting to draw groundwater away from the cutting face and base of the pavement construction is currently being considered at certain areas (e.g. Dolfor etc.). Active dewatering is not currently anticipated. Residual instability, or impact on groundwater beyond the site boundary caused by the proposed dewatering is not currently anticipated,
- Soil erosion may be encountered in deep cuttings during formation works as a consequence of groundwater seepage and silt/fine sand content of the in situ materials. Residual instability following construction would be mitigated by installation of deep drainage trenches to lower groundwater and inhibit seepage, and placement of erosion protection matting at specified locations.

- Methods to control erosion / mobilisation of soils and associated sediment migration to watercourses would be developed and detailed in the CEMP, which shall include a Pollution Control and Contingency Plan. The Pollution Control and Contingency Plan would identify and categorise surface waters that may be vulnerable to site work. The plan would then assess those earthworks that may give rise to sediment-laden run-off, the routes that such run-off may take and the methods to prevent damage from silt.

Preliminary consideration of ground stability indicates that there is minimal risk of ground significant instability during or post construction.

9.6.1.2. Ground Contamination

Providing that the mitigation measures, set out in Section 9.5, are adhered to the temporary minor adverse impacts identified to surface water and groundwater during construction would be reduced to neutral. Consequently no significant effects are anticipated in relation to land contamination during construction of the Scheme.

9.6.1.3. Potential for re-use of soils (paragraph f)

The results of the CAT-WASTE^{SOIL} indicate that excavated materials on site are unlikely to be classified as Hazardous. It is recommended that material at the site should be segregated during excavations. An MMP and SWMP would be developed for the site by the contractor. Further details of this are outlined in Section 10 Materials.

9.6.2. Operational impacts

No operational impacts have been identified that require mitigation; consequently no significant effects are anticipated in relation to land contamination during operation of the Scheme. Should unexpected contamination be encountered during construction and removed from site there would be a local minor beneficial long term effect. This would not, however, be classed as a significant beneficial effect.

9.7. Summary and Conclusions

9.7.1. Physical Effects of the Development (ground stability) (paragraph a)

Following an assessment of available information, there is currently considered to be a minimal risk of residual ground instability following completion of construction works. During construction works, temporary measures (such as localised groundwater control, slope reinforcement etc.) and appropriate construction sequences would be implemented to minimise the risk of temporary ground instability.

9.7.2. Ground Contamination (paragraphs d & e)

The Scheme passes through primarily agricultural land. This assessment has used the results of the 2013 GI data to better understand the ground conditions (including land contamination) and propose mitigation measures.

Overall, the effect of the Scheme with regards to land contamination is anticipated to be neutral providing that the mitigation measures outlined in Section 9.5 are adhered to. The 2013 GI confirmed that there is little contamination present along the Scheme and only limited Made Ground was encountered. Additionally, there are a lack of contaminative sources present along the Scheme. No significant effects are anticipated in relation to land contamination during construction and operation of the Scheme.

9.7.3. Potential for re-use of soils (paragraph f)

Following a CAT-WASTESOIL assessment using the analytical data from the GI, the materials excavated on site are unlikely to be classified as Hazardous and would therefore be either Non-Hazardous or Inert. A SWMP would be developed for the site by the contractor for the removal, transportation and disposal of all waste materials excavated from the site. Further details of this can be found in the Materials chapter (Section 10).It should be noted that material classified as Non-hazardous waste would require pre-treatment prior to disposal. It is recommended that this preliminary classification of materials is confirmed with the relevant landfill operator prior to disposal of materials from the site. It is anticipated that all policies set out and discussed in Section 9.1.3 would be met in relation to Geology and Soils for the Scheme.

Table 9.7.1 – Summary of Impacts in relation to Geology and Soils

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation	Notes / Comments
Construction Impacts					
Geology and Soils	Creation of new geological exposures	Minor Beneficial	Minor Beneficial	Slight Beneficial	
Geology and Soils	Ground instability causing slope failures	Major Adverse	Minor Adverse	Neutral or slight adverse	
Geology and Soils	Soil erosion leading to ground instability	Minor Adverse	Negligible	Neutral or slight adverse	
Operational Impacts					
Geology and Soils	Ground instability causing slope failures	Minor Adverse	Negligible	Neutral or slight adverse	
Geology and Soils	Soil erosion leading to ground instability	Negligible	Negligible	Neutral or slight adverse	

10. Materials

10.1. Introduction

10.1.1. General

This chapter provides an assessment of the potential impacts on the material resources required for the Scheme. It discusses the effects of the use of materials and the production and management of waste, and presents details of material movements.

The assessment of the potential impacts on materials deriving from the Scheme has considered both the construction and operational phases. It is anticipated that most of the impacts for materials are likely to arise during construction. However, longer term residual impacts could occur during the operational phase such as the disposal of materials arising from routine maintenance operations.

The impacts of primary raw materials, secondary or reused/recycled materials and manufactured construction products during construction and operation of the Scheme are considered. Mitigation measures for any detrimental impact are described.

The assessment considered the following factors:

- Earthworks movements (including extent, method and programme of the proposed earthworks and construction activities);
- Quantities of materials to be imported;
- Quantities of materials to be exported or disposed of;
- Required lorry movements;
- Required treatment; and
- Storage on site.

It is assumed that the construction and operation of the Scheme would be carried out in accordance with normal good working practice implemented on such projects.

The assessment of impacts of the Scheme on the geology and soils, together with contamination, is presented in Chapter 9 of this ES, whilst assessment of the impacts relating to hydrogeology is presented in Chapter 14.

Following consultations with the Statutory Environmental Bodies (SEBs) during Key Stage 3, an Environmental Scoping Report was prepared which documented the approach to the assessment of materials. A separate Materials assessment has been produced in line with Interim Advice Note (IAN) 125/09(W)[10.1].

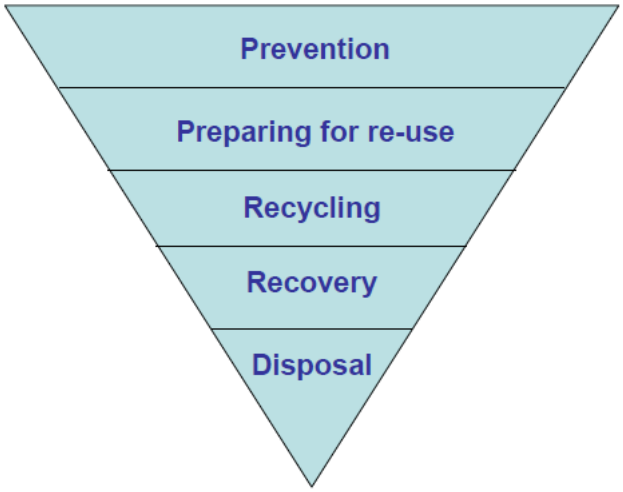
10.1.2. Policy context

The assessment methodology for defining the effects of construction and operational activities of the Scheme on the material resources is in accordance with the Welsh Government (WG) Environmental Advice Note on the 'Assessment and reporting of DMRB Volume 11, Section 3, Part 6 Materials' Wales Only (September 2011)[10.2].

The EU Waste Framework Directive 2008/98/EC provides the overarching legislative framework for the collection, transport, recovery and disposal of waste, and includes a common definition of waste. The overall purpose of the Waste Framework Directive is to lay down measures to protect the environment and human health by preventing or reducing the adverse effects of the generation and management of waste and by improving the efficiency and reducing the overall impacts of resource use. The Waste Framework Directive requires all Member States to take the necessary measures to ensure that waste is recovered or disposed of without endangering human health or causing harm to the environment. In addition to the high-level objectives which influence

national waste management policy and legislation, Article 11 of the Waste Framework Directive was amended in 2008 to require Member States to take the necessary measures designed to achieve 70% recycling of non-hazardous construction and demolition waste by 2020.

The Waste Framework Directive sets out the waste hierarchy to be applied as the priority order in waste management legislation and policy (see below).



The hierarchy indicates that where waste is unavoidable products and materials can, subject to regulatory controls, be used again, for the same or a different purpose (re-use). Otherwise resources should be recovered from waste through recycling. Value can also be recovered by generating energy from waste and only if none of the above offer an appropriate solution should waste be disposed of.

In addition to this guidance, reference is made to the following guidance and legislation framework relating to waste:

- Interim Advice Note (IAN) 125/09(W) 'Supplementary guidance for users of DMRB Volume 11 "Environmental Assessment" Wales only' [10.1];
- Design Manual for Road and Bridges (DMRB) Volume 11, Section 3, Part 3, 'Disruption due to Construction' (1993) [10.3]; this covers the effect on people and on the natural environment which can occur, mainly during construction works.
- DEFRA Environmental Permitting (England and Wales) Regulations 2010 [10.4];
- DEFRA Environmental Permitting Guidance 'The Waste Framework Directive' for the Environmental Permitting (England and Wales) Regulations 2010 [10.5];
- The Waste (England and Wales) Regulations 2011, was introduced in April 2011. This implements revisions to the Waste Framework Directive in England and Wales;
- Towards Zero Waste: The Overarching Waste Strategy Document for Wales (June 2010) - Article 28 of the Waste Framework Directive requires EU Member States to prepare a national waste management plan;
- Planning Policy Wales (Edition 7, July 2014) supplemented by Technical Advice Notes;
- Site Waste Management Plans (SWMP) Regulations 2008 [10.6].

Note that whilst the Site Waste Management Plan (SWMP) Regulations 2008 are not currently adopted in Wales, and apply to England only, a SWMP is a requirement of this ECI contract.

A SWMP sets out how building materials, and resulting waste, would be managed during the project. Related guidance includes:

1. CIRIA C536 (2001). Demonstrating Waste Minimisation Benefits in Construction [10.7].

2. CIRIA (1997). Special publication 133: Waste Minimisation in Construction – Site Guide [10.8].

The Powys County Council Adopted Unitary Development Plan (UDP) [10.9] has been reviewed and considered during the preparation of this ES Chapter. Powys County Council recently published its Local Development Plan (LDP) Deposit Draft [10.10], which has also been reviewed and considered during the preparation of this ES Chapter. Once fully adopted (programmed for December 2015) the LDP will replace the current Unitary Development Plan. In addition the National Transport Plan Strategic Environmental Assessment [10.11] (NTP SEA) Environmental Report Addendum has been reviewed and NTP SEA Objective 9 (Prudent and sustainable use of natural resources and energy) considered during the preparation of this ES Chapter.

10.2. Methodology

For the assessment of materials, there is currently no specifically defined methodology for assigning significance to the environmental value of a material resource or for determining the magnitude of an impact. However, WG have produced an Environmental Advice Note on the 'Assessment and reporting of DMRB Volume 11, Section 3, Part 6 Materials – Wales Only' (September 2011)[10.2]. As suggested in the WG IAN 125/09(W), the directions given in the DMRB, Volume 11, Sections 1 and 2 have been adopted. In particular, the approach set in DMRB, Volume 11, Section 2, Part 5, Tables 2.1, 2.2 and 2.4, as reproduced in Section 10.2.6 of this Chapter have been adopted to determine environmental value, magnitude and significance of the environmental effects on materials.

10.2.1. Methodology for establishing baseline conditions

The study area for the assessment comprises the Scheme and local road networks. The access roads to the site and existing traffic flows have also been considered.

10.2.2. Methodology for assessment of effects due to construction

The assessment of the effects of constructing the Scheme on materials considers the extent, method and programme of the proposed earthworks and construction activities required to complete the Scheme.

The impacts have been assessed before mitigation measures are applied and then a separate assessment has been made with proposed mitigation measures.

The methodology for assessing the effects from construction was undertaken by following the methods suggested in the WG IAN125/09(W) [10.2].

The following factors have been assessed:

1. Works area;
2. Contamination;
3. Suitability for re-use of site won materials;
4. Construction materials balance;
5. Materials disposal;
6. Movement of materials during construction;
7. Material sources;
8. Storage of materials during construction;
9. Processing of materials.

The significance criteria used to assess the effects are discussed further in Section 10.2.4.

10.2.3. Methodology for assessment of effects due to operation

The methodology for assessment of effects from operation is the same as for construction effects.

It is not anticipated that there would be any requirements for importing or exporting material to or from the site other than replacing any damaged signs or safety fences and, during severe winters, the application of salt from road gritters, which are based at Llanidloes. Therefore, no assessment of effects has been undertaken and the effects from operation are not discussed further.

10.2.4. Significance criteria

For the assessment of materials, no specific methodology has been developed to assign significance to both the environmental impact value of a material resource and the magnitude of an impact. As suggested in the WG Interim Advice Note 125/09(W) [10.2], professional judgement and the procedures for assessing impacts given in DMRB Volume 11 Section 1 and 2 have been used.

Consistent with the standard DMRB assessment methodologies, Tables 10.2.1 and 10.2.2 have been used to assess the sensitivity and magnitude respectively of the identified impacts. The matrix presented in Table 10.2.3 has been used to assess the significance of the effect based on the sensitivity and magnitude.

Table 10.2.1: Environmental Value (or Sensitivity) of Feature (Table 2.1 of DMRB Volume 11, Section 2, Part 5, HA 205/08 - modified).

Value (Sensitivity)	Typical Descriptors
Very high	Very high importance and rarity, international scale and very limited potential for substitution (including internationally designated sites).
High	High importance and rarity, national scale, and limited potential for substitution (including nationally designated sites).
Medium	High or medium importance and rarity, regional scale, limited potential for substitution (including regionally important sites).
Low (or Lower)	Low or medium importance and rarity, local scale (including sites which are not designated, but which have a local interest).
Negligible	Very low importance and rarity, local scale (including sites with little or no interest).

Table 10.2.2: Magnitude of Impact (Table 2.2 of DMRB Volume 11, Section 2, Part 5, HA 205/08).

Magnitude of Impact	Typical Criteria Descriptors
Major	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (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 (Adverse).
	Benefit to, or addition of, key characteristics, features or elements; improvement of an 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 reduced 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 to 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.

Table 10.2.3: Arriving at the Significance of Effect Categories (Table 2.4 of DMRB Volume 11, Section 2, Part 5, HA 205/08).

		Magnitude of Impact (Degree of Change)				
		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

The identified impacts were considered separately for the construction and operational phases of the Scheme. Mitigation measures are proposed to negate or minimise the effect of any identified impacts.

10.2.5. Limitations and Assumption

The following limitations have been noted:

- Detailed assessment of the suitability for re-use of the excavated materials has been undertaken (based on detailed assessment of the geotechnical and geo-environmental testing undertaken during the 2013 ground investigation). This is reported within the Ground Investigation Report (GIR).
- The contamination baseline information is based on the initial conclusions drawn from the results of the 2013 ground investigation, which are discussed in more detail in Chapter 9. These are considered adequate for the purpose of the ES, but during construction the ground conditions and contamination situation would be verified. Notwithstanding the limitations above, it is considered that the assessment of materials is sufficiently robust to develop the Scheme design.

The following assumptions have been made:

- The construction and operation of the Scheme would be carried out in accordance with normal good working practice implemented on such projects.
- The Construction Environmental Management Plan (CEMP) would set out the environmental measures that would be adopted during the construction phase.
- A detailed construction methodology would be developed during the detailed design phase. However, for the purposes of this ES, a number of basic assumptions on construction activities have been formulated. Proposed construction activities are outlined in Sections 2.2 of this ES Volume 1.

Assumptions have been made about the quantities of material to be excavated during construction and the proportion of this material that would be suitable for re-use. This has been based on an initial review of the results of the recent ground investigation undertaken between September 2013 and December 2013. Earthworks volume modelling has utilised all readily available GI information and has been based on the Scheme design developed during Key Stage 3.

10.3. Baseline Conditions

10.3.1. Geology and contamination

The drift and solid geology beneath the Scheme has been described in Chapter 9 'Geology and Soils' of this ES.

A brief description of the nature of the materials that would be excavated during the construction of the Scheme is given below:

- Made Ground
  Reworked soils and manmade materials, such as tarmac and aggregates. It is anticipated that only small quantities of Made Ground would be encountered during construction of the Scheme.

- Post-Glacial Deposits, namely:
  - Alluvium
    Very localised and confined to the River Severn floodplain and several minor tributary streams that intersect the alignment, comprising silts and fine sands, becoming more granular with depth.

  - Fan Deposits
    Limited extents of probable Fan Deposits were encountered within the western area of the Scheme corridor, comprising loose silty sandy subangular to rounded gravel with low to medium cobble content.

  - Head Deposits:
    Head can vary widely in composition from sandy clay to very coarse sized rock scree. It was not encountered during the ground investigation but may still be encountered on site during construction.

- Glacial Deposits, namely:
  - Morainic Deposits
    Such deposits typically comprise unsorted silty sandy gravels with cobbles. Only a limited area of this deposit was encountered during the 2013 ground investigation at one location towards the eastern extent. Where encountered, it was typically described as slightly silty sandy angular to subrounded gravel, with low gravel content.

  - Till
    This material is generally found on the valley sides and would form a large proportion of the superficial deposits encountered during construction. Till was encountered throughout the site during the 2013 ground investigation and was typically described as follows: slightly sandy gravelly silt / clay (with medium cobble and boulder content).

- Solid Geology, namely:
  - Bailey Hill Formation
    This formation was encountered during the 2013 ground investigation within the central and western central sections of the Scheme, mainly comprising thinly interbedded mudstone and sandstone or siltstone.

- Nantglyn Flags Formation
  During the 2013 ground investigation this formation was encountered at both the western and eastern ends of the Scheme, comprising thinly bedded laminated, fissile mudstone and sandstone.

The review of the available information (refer to Section 9.3 of this ES) indicates that the Scheme, crosses or passes near a number of historical or current land uses which may have impacted the land quality beneath the study area, leading to potential contamination of the earthworks materials. These include:

- Commercial and industrial activities,
- Agricultural activities (including animal slaughtering),
- Railway track,
- Quarrying,
- Unknown filled ground.

PCC completed an environmental search to identify potentially contaminated land within 500m of the Scheme. Thirty-two sites were identified, none of which was located within the Scheme footprint.

As discussed and assessed in Chapter 9, the results of the investigation undertaken between September 2013 and December 2013 indicate low levels of ground contamination. This indicates that the historical and current activities have had no significant impact on the ground chemistry.

10.3.2. Traffic

The Scheme can be accessed from the north-east, west and south. The main access routes for construction traffic to the site would be from the following Trunk Roads:

- A483 (from the North-East)
- A483 (from the South)
- A489 (from the West)

The A483 and A489 form part of the strategic trunk road network in mid Wales. At the western end, the A489 connects to the A470 near Caersws.

The base traffic flow data for the A483 and A489 shows that HGVs form about 8% of total daily traffic at the western approach, and 10% at the north-eastern approach and 8% at the southern approach to Newtown. A summary of the traffic data relevant to the access routes is presented in Table 10.3.1.

Table 10.3.1 A483-A489 Traffic Model Data (2013 Base data)

Location Description	Direction	AADT (Annual Average Daily Traffic)	% HGV	Estimated Number of HGVs per Day
A489 West of Newtown	Two-way	8,056	5%	403
A483 North-East of Newtown	Two-way	11,281	8%	902
A483 South of Newtown	Two-way	3,695	9%	333

10.4. Predicted Environmental Effects

10.4.1. Construction impacts

The Scheme would link into the A489 Llanidloes Road to the west of Newtown by way of a roundabout. It would cross over Mochdre Brook and proceed south of Mochdre Industrial Estate before interfacing with the A483 at the A483 Dolfor Road Roundabout and Mochdre Industrial Estate via the Lower Dolfor Road Roundabout. From the A483 Dolfor Road Roundabout the Scheme would cross over Middle Dolfor Road and under Upper Dolfor Road and then run in a north easterly direction across agricultural land to the south of the Vastre and Dyffryn Industrial Estates. The Scheme would interface with the A489 Kerry Road via another roundabout and then cross over the main Cambrian railway line east of Dyffryn Industrial Estate before tying into a re-aligned A483 Pool Road to the east of Newtown by way of a roundabout. For further details on the Scheme description refer to Section 2.1.

The length of the Scheme would be approximately 6.5km and, owing to the undulating topography, would require construction of cuttings, embankments and areas of essential landscape mitigation.

Eleven new structures would be constructed in order to bridge major watercourses, cross existing roads and address issues of land severance. Up to 19 culverts would also be required where the alignment crosses streams, ditches and low points within the topography (refer to Section 2.3).

Impacts associated with the Construction Phase of the Works are discussed and conclusions presented below. For all of the identified impacts, the value of receptor, magnitude of impact and significance of effect are summarised in Volume 3, Appendix G1.

Works area

The alignment of the Scheme commences near the flood plain of the River Severn, about 500m west of Newtown. It then extends eastwards passing south of Newtown over low, north facing slopes of the River Severn Valley, crossing undulating sidelong ground and a number of steep valleys and minor streams. The Scheme reaches its maximum elevation at the western end, south of the Molchdre Industrial Estate. At the eastern end the highest elevation is east of Great Brimmon Farm, and then it passes across gently sloping ground until it descends to re-join the existing A483 Pool Road just above the River Severn floodplain at the eastern end.

For construction of the embankments and landscaping, site-won materials would be transported via haul roads from areas of cutting to areas of fill, within the Scheme fencelines, eliminating the need for traffic to travel on the public highway, other than at designated road crossing locations. Additionally, the west-facing steep slopes in the area of Dolfor Valley effectively divide the Scheme alignment into two lengths and it is anticipated that these would generally be treated as self-contained earthworks areas.

The alignment predominantly crosses agricultural land which would provide site-won earthworks material and provide areas for storage and treatment of materials during construction. It is proposed that the main site compound would be situated off the A483 south of the Mochdre Industrial Estate and that smaller satellite compounds would be sited along the Scheme predominantly at major structure locations (refer to Volume 2 Figure 2.7 a – d).

The magnitude of the impact on the area is considered minor and the resulting significance of effect is assessed to be slight adverse.

Contamination

Based on the results of the ground investigation undertaken in 2013, which are discussed in Chapter 9, it is considered unlikely that significant contaminant concentrations, which

would impact on human health or the environment, are present within the materials that would be excavated and re-used during construction of the Scheme.

Historical land uses have however been identified which could result in localised contamination being present within the excavated materials that has not been identified during the ground investigation.

Whilst the sensitivity of the works area is considered to be medium, the magnitude of impact of re-using materials excavated during road construction in terms of potential contamination is considered to be negligible, and the significance of the impact slight.

Imported materials could also be a potential source of contamination. Suitable testing would be undertaken to demonstrate that the imported materials are within acceptable limits both in terms of human health and the environment. The sensitivity of the site to contamination from imported materials is considered to be medium. In the absence of testing of the imported materials, the magnitude of impact of imported materials in terms of potential contamination is considered to be moderate, and the significance of the impact moderate adverse.

The assessment of contamination is discussed in more detail in Chapter 9 'Geology and Soils'.

Suitability for re-use of site-won materials

It is proposed that none of the excavated soil and rock would be removed from site, and current proposals involve the reuse of all excavated soil and rock within the works, either within the embankments, land improved and returned to agriculture or areas of general Scheme landscaping such as verges or essential landscape mitigation.

More detailed assessment of the suitability for re-use of the excavated materials has been undertaken (based on detailed assessment of the geotechnical and geo-environmental testing undertaken during the 2013 ground investigation), which is reported in the Ground Investigation Report (GIR).

Much of the excavated rock would be suitable for re-use within the works, either as general embankment fill, or in some cases more specialist uses such as capping for the road pavement.

The suitability for re-use of site-won materials within the embankments would be largely dependent on the moisture content being maintained within a suitable range to allow re-compaction. Even where the materials are currently at moisture contents that render them suitable for re-use, maintaining these materials at suitable moisture contents would be dependent on the suitable control of surface and groundwater flows during excavation, and also on the prevailing weather conditions. The methods of stockpiling and methodology adopted to protect these stockpiles against deterioration would also require particular consideration. All excavated materials would be suitable for re-use within the areas of essential landscape mitigation identified. However, if suitable controls are not implemented, there may be insufficient material to form the necessary embankments, which could result in the need to dispose of materials off site and import suitable alternative engineering fill.

Excavated earthworks materials would be susceptible to deterioration due to adverse weather conditions if adequate consideration is not given to the protection of excavated materials. The sensitivity of the Scheme to a quantity of unsuitable materials that would require disposal is considered to be medium. The magnitude of the impact on the area is considered moderate and the resulting significance of effect is assessed to be moderate adverse.

The following comprises a list of materials which may be present along the Scheme in its current condition and which therefore are also likely to be 'won' during the demolition and

site clearance works, and would be considered in plans for prevention, reuse, recycling or disposal:

- Bituminous pavement material;
- Aggregate sub-base;
- Fill and landscaping material;
- Reinforced concrete and concrete;
- Masonry and brickworks;
- Reinforcement and structural steelwork;
- Signs of steel, aluminium or concrete;
- Drainage piping;
- Traffic debris including tyres and plastic;
- Asbestos in some structures that would be demolished.

Some of these materials may be unsuitable for re-use within the Scheme, but the quantity of unsuitable materials that would require disposal is considered to be negligible. The magnitude of the impact on the area is considered moderate as inappropriate handling and processing of these materials could render them (and/or other materials with which they come into contact) unsuitable for re-use. Thus the resulting significance of effect is assessed to be moderate adverse. The re-use of site won materials would be considered within the Scheme's Materials Management Plan. Measures to deal appropriately with any asbestos that may be identified during the works would also be considered within the Materials Management Plan.

Construction material quantities

A variety of different materials would be required for the proposed works. The Scheme would be designed to prevent where possible the volumes of both the waste materials generated and the imported construction materials by reusing or recycling the available existing materials along the Scheme.

Table 10.4.1 shows the estimated material quantities needed for the construction of the Scheme, giving details on the material quantities required, estimates of material that can be won on site and additional quantities of material that would need to be imported for the Scheme.

Table 10.4.1 - Material Quantities required for the Scheme

Type of Material	Approximate Quantity Required (m^3)	Approximate Quantity Won on Site (m^3)	Approximate Quantity Imported (m^3)
Road Pavement Construction			
Capping	10,000	10,000	
Sub-base	25,000		25,000
Base	23,000		23,000
Binder	6,000		6,000
Surface	4,000		4,000
Earthworks			
General Fill	850,000	910,000	40,500 note 1
Landscaping Material	111,500 note 3	100,500 note 2	
Topsoil	57,500	68,500	
Structures	**Approximate Quantity Required**		**Approximate Quantity Imported**
Structural Steelwork	1095 T		1095 T
Reinforcement	2446 T		2446 T
Concrete	10,600 m note 3		10,600 m note 3

Type of Material	Approximate Quantity Required (m^3)	Approximate Quantity Won on Site (m^3)	Approximate Quantity Imported (m^3)
Drainage	**Approximate Quantity Required (m^3)**		**Approximate Quantity Imported (m^3)**
Granular materials	14,000		14,000

Note 1- this is required for earthworks at the eastern end to prevent fill material to be taken over the railway

Note 2 – this is the surplus from general fill

Note 3 – this includes general fill and 10 000cum of topsoil suitable for regrading etc.

Note 4 - It is anticipated that all earthworks materials won from the site would be reused and therefore no material would be removed from site. This is considered to be achievable provided that the excavated materials are suitably excavated, processed and stockpiled taking into account likely weather conditions during the earthworks operations.

It is anticipated that the earthworks part of the balance would be neutral. This is considered to be achievable provided that the excavated materials are suitably excavated, processed and stockpiled taking into account likely weather conditions during the earthworks operations. Materials processing requirements for the Scheme are discussed below.

Material sources

The potential materials sources required for the Scheme are summarised in Table 10.4.2.

Table 10.4.2 - Material Sources/Origin required for the Scheme

Type of Material	Material Source
Road Pavement Construction	
Capping	Site won, sourced from a local supplier
Sub-base	Sourced from a local supplier
Base	Sourced from a local supplier
Binder	Sourced from a local supplier
Surface	Sourced from a local supplier
Earthworks	
General Fill	Site won and sourced from a local supplier
Landscaping Material	Site won
Topsoil	Topsoil strip would be re-used on site
Structures	
Structural Steelwork	Sourced from a local supplier
Reinforcement	Sourced from a local supplier
Concrete	Sourced from a local supplier
Drainage	
Granular Materials	Sourced from a local supplier

Whilst the earthworks over the majority of the Scheme should be neutral and no site material would be taken off site, a net import of construction materials is required for the Scheme in order to construct the carriageway and proposed structures. Materials would be imported from local suppliers. Given that the Scheme has been developed to achieve a balance of cut and fill and so minimise the export of site-won materials from the works areas, import of materials would be minimised. Furthermore, given that the sources of material would be existing suppliers of materials, the sensitivity of the source is considered to be low. The magnitude of impact on the material source is considered moderate. The significance of effect is assessed to be slight adverse.

Materials disposal

During construction, it is proposed that all materials/arisings from construction would be re-used on site in accordance with the waste hierarchy defined within the Waste Framework Directive.

There may be some waste associated with the works which cannot be re-used on site but the volumes would be negligible.

Any excess materials would be taken to the nearest or most economical disposal facility. The sensitivity of the receptor (disposal site) is considered to be low. Given the very small quantities of materials that are likely to require disposal offsite, the magnitude of the impact is considered minor. The significance of the environmental impact on the disposal site is considered to be slight adverse.

Movement of materials during construction

The existing A483 and A489 trunk roads are regularly used by HGVs to transport materials to and from the industrial and commercial developments in the Newtown area and other areas in Mid-Wales. There is therefore no need for alternative HGV route options. An estimate has been made of the number of HGV movements on the existing A483 and A489 trunk roads, which is discussed in Section 10.3.2.

An estimate has been made of the number of HGV movements per day on public roads during construction. The estimates assume that all paving works would be undertaken by one team. Table 10.4.3 presents an estimate of deliveries during construction.

Table 10.4.3 Estimated Traffic generated by Material Deliveries

Construction Activity (Time Period)	Average HGV per Day during 24 month construction period	Average LDV	A483/A489 AADT
Workforce	NIL	30	3,695 to 11,281
Drainage (18 months)	5	6	3,695 to 11,281
Structures (18 months)	4	6	3,695 to 11,281
Road works (12 months)	12	6	3,695 to 11,281
Plant (12 months)	1	6	3,695 to 11,281
Total	22	54	3,695 to 11,281

Table 10.4.4 Estimated Material Deliveries Required

Type of Material	Volume Required (m^3)	Output per Day (m^3)	Wagons per Day	Total Working Days
Road Pavement Construction				
Capping	NIL			
Sub-base	25,000	208	21	120
Base	23,000	290	29	80
Binder	6,000	150	15	40
Surface	4,000	200	20	20
Earthworks				
General Fill	NIL		NIL	
Landscaping Material	NIL		NIL	
Topsoil	NIL		NIL	
Structures				
Structural Steelwork	1095 T	37 T	2	30
Reinforcement	2446 T	19 T	1	130
Concrete	10,600 m^3	29 m^3	5	360

Drainage				
Granular Materials	14,000	70	7	200

For construction of the embankments and landscaping, site-won materials would be transported via haul roads from areas of cutting to areas of fill, within the site boundary.

A summary of the main points to allow an assessment of impacts is presented below. Most of the material required for the construction of the Scheme including all earthworks materials would be sourced on site, through the re-use of the excavated acceptable materials. However, as identified in Table 10.4.2, certain materials required for construction of the works would be imported to site from local suppliers.

Materials would be imported to site from local suppliers and transportation distances would be relatively modest. The receptors anticipated to be affected by the movement of materials to site would be local road users on a local scale. The number of HGV movements, and resulting additional traffic during construction, required to import the materials to site have been assessed as presented in Table 10.4.3, and this information has been used to make an assessment of the potential impact on the local roads.

Based on these estimates of additional HGV flow figures, the magnitude of traffic flow impacts have been assessed, considering the current traffic flow based on the available traffic model, which are summarised on Table 10.3.1. The sensitivity of the receptors (existing A483, A489 and local public roads users) is considered medium.

The magnitude of the impact on the road network due to importing/exporting of construction materials to site is considered minor in all cases, and therefore the significance of such impact is considered to be slight adverse.

The movement of materials for off-site disposal could have potential impacts on the local road users on a local scale. The sensitivity of the receptor is considered to be medium. Given the very low number of additional HGV movements that are likely to be required to dispose of the unsuitable materials off site, these are not considered to have a significant impact on the local road network and thus the magnitude of impact is considered minor. The significance of effect from disposal of unsuitable materials is therefore assessed to be slight adverse.

Storage of materials during construction

The Scheme crosses agricultural land which would be used to provide storage and treatment of materials during construction. It is proposed that the main site compound would be situated off the A483 south of the Mochdre Industrial Estate and that smaller satellite compounds would be sited along the alignment predominantly at major structure locations.

The sensitivity of the receptors as a result of storage and treatment is considered to be low, and the potential magnitude of impacts associated with storage and treatment during the works is minor. The overall significance of effect has been consequently assessed to be neutral.

Processing of materials as part of the Scheme

The following processing of materials may be required during construction

- Segregation of excavated materials into different classifications for re-use. Some materials would be suitable for re-use within embankments, whilst some would be unsuitable, (e.g. due to high moisture content or organic matter content), and would be used for areas of essential mitigation/landscaping. The processing of materials in this way would minimise the risk that additional materials would need to be imported to construct the works and as such are considered to mitigate against the potential for unsuitability of site won materials.

- Crushing and processing of excavated rock would be required to satisfy grading requirements for re-use for the variety of different classes of earthwork fill required to construct the Scheme. The processing of materials would generate a certain degree of noise and airborne dust, the impacts of which are discussed in Chapters 11 and 5 respectively of this ES Volume 1. The processing of the excavated rock into suitable earthworks materials would reduce the risk that additional earthworks materials would need to be imported to construct the works, and as such are considered to be mitigation against the potential for unsuitability of site won materials.

10.4.2. Operational impacts

There would not be any significant requirement for importing or disposal of materials during the operation of the Scheme.

However, materials arising from routine maintenance operations of the Scheme, such as replacing damaged signs or safety fences would require disposal during this phase, but this is anticipated to occur very infrequently.

The potential impacts of waste materials resulting from the operational activities of the Scheme would be minimised by appropriate management of the site to include regular street sweeping and collection of any road debris which would be necessary to maintain safety standards of the highway to reduce the potential for future accidents.

Any landscape maintenance or routine equipment maintenance would employ the industry standards of reduction, re-use and recycling of waste prior to disposal. On the basis that these procedures would be adhered to, the impact of these materials has been assessed on the basis of the environmental value of the receptor (the environment along the Scheme), which is considered to be of medium sensitivity, and the magnitude of the impact, considered to be negligible. The significance of the impact is therefore considered neutral or slight adverse.

10.5. Proposed Mitigation

This section details the measures proposed to mitigate the potential impacts described in section 10.4. The proposed mitigation measures are summarised in Volume 3 Appendix G1.

10.5.1. Construction mitigation

Materials excavated from site would be re-used as fill as part of the overall earthwork movements. Opportunities to reuse excavated materials would be maximised in accordance with the waste hierarchy defined within the Waste Framework Directive. Material unsuitable for re-use due to moisture content would be treated by drying out or wetting to produce a suitable fill material for inclusion in the works if required. Where treatment is not practical and the material is unacceptable for embankment construction, it may be used in areas of general landscaping and landscape mitigation.

Materials resulting from the demolition of existing structures (concrete, aggregates, asphalt, metals) would be screened and crushed by a mobile plant to enable on-site treatment and re-used in embankments or road construction (e.g. as capping material). The reuse of materials would be considered in the Scheme Materials Management Plan. Processing of materials would be considered where possible for re-use within the Scheme within the Site Waste Management Plan (SWMP).

No contamination has been identified within the earthworks materials of the Scheme. However a watching brief would be maintained during site works to identify any as yet unidentified hotspots of contamination and prevent any potential spreading of contaminated materials during the works. Appropriate plans and method statements to

stockpile separately and manage any contamination identified, and to prevent spreading of such contamination if identified would be prepared.

The importing of certain materials would be necessary in order to construct the Scheme. Materials to be imported may include materials for road pavement construction, aggregates, reinforcing and structural steelwork and concrete and topsoil. Based on the earthworks strategy discussed in Section 10.4.1, there should not be any requirement to import earthworks materials.

For any imported materials, appropriate chemical testing would be undertaken to confirm that no contamination is present within the imported materials.

For construction the plan areas of site compounds on agricultural land would be minimised where possible. Good construction practices would be adopted, including all necessary precautions to prevent any deterioration of works areas land, i.e. due to fuel leaks from plant.

The magnitude and sensitivity of the impacts discussed in section 10.4.1 following implementation of mitigation measures are discussed in Section 10.6.1, and summarised in Table 10.6.1.

10.5.2. Operational mitigation

No mitigation measures are necessary as a result of the Scheme.

10.6. Residual Environmental Effects (following mitigation)

It is considered that, by application of standard good construction practice and implementation of the mitigation measures described in section 10, the potential effects identified in section 10.4 would be either significantly reduced or neutralised.

As summarised in Table 10.6.1 and Volume 3 Appendix G1, the remaining residual effects during the construction and operational phases following mitigation are considered to be either neutral or slightly adverse.

10.6.1. Construction impacts

No residual effects are anticipated during construction.

Table 10.6.1 – Magnitude and Significance of the Construction Impacts following mitigation

Impact	Description	Magnitude of impact following mitigation	Significance of impact following mitigation
Impacts on on-site material sources due to “works” area	Minimise use of agricultural land for site compounds where possible. Take necessary precautions to prevent any derogation of works areas land, e.g., due to fuel leaks from plant.	Minor Adverse	Neutral
Contamination of site won materials – spreading of contamination to other areas.	Watching brief during site works to identify any hotspots of contamination. Appropriate plans and method statements to stockpile and manage separately any contamination identified to prevent spreading.	Negligible	Neutral

Impact	Description	Magnitude of impact following mitigation	Significance of impact following mitigation
Contamination of imported materials – spreading of contamination to other areas.	Ensure that appropriate chemical testing of any imported materials is undertaken to confirm no contamination present.	Negligible	Neutral
Unsuitability for re-use of site won earthworks materials within the Scheme requiring additional import of suitable materials.	Ensure adequate separation, processing, and storage of site won materials to maximise potential for re-use.	Minor Adverse	Slight Adverse
Unsuitability for re-use of materials derived from site clearance works, on-line improvement works and interfaces between new bypass construction and existing roads requiring disposal.	Processing of materials to be considered where possible for re-use within the Scheme within SWMP.	Negligible	Slight Adverse
Imported construction materials required to construct the Scheme.	Efficient detailed design to reduce requirements for imported materials.	Minor Adverse	Neutral Or Slight Adverse
Traffic movements due to import of construction materials / export of material to be disposed.	Undertake detailed assessment of traffic flows. Plan delivery to avoid peak traffic. Stagger delivery times for materials. Restrict material deliveries during critical traffic periods.	Minor Adverse	Slight Adverse

10.6.2. Operational impacts

No residual effects are anticipated during the operational phase.

10.7. Summary and Conclusions

This Chapter has considered the potential environmental effects associated with the materials requirements for the Scheme.

In overall terms, during construction activities, the assessment has demonstrated that materials present on site would be used efficiently taking into account waste prevention, re-use and recycling. Similarly, disposal to landfill can be minimised. The resultant overall significance of effect associated with the materials requirements during construction, provided that adequate mitigation is considered for the potential impacts identified, is considered to be slight adverse.

The Scheme has been developed to achieve an optimal balance between earthworks activities, minimise waste generated and maximise opportunities to recycle and re-use construction waste as secondary aggregates. The sustainable use of materials engendered by the Scheme is considered to comply with the strategic aims contained in the Powys County Council Adopted UDP [10.9], in particular the strategic aim "*to plan positively for waste management and promote waste reduction*." The UDP also states that the Council encourages "*the reduction during construction of waste on site and to maximise reuse*." Similar sustainability related planning policy positions are adopted within the Deposit LDP. A key environmental consideration for the LDP is that it "*should seek to reduce levels of waste sent to landfill*" and LDP Objective 4 (Climate Change and Flooding) is "*To support the transition to a low carbon and low waste Powys through all*

development, including the reduction of waste to landfill." A requirement of Policy DM2 (Detailed and Site Specific Planning Matters) is that *"All development must demonstrate a sustainable and an efficient use of resources by including measures to achieve … waste reduction."* The LDP goes on to say that *"All development must be located and designed to contribute to the achievement of sustainable development and climate change mitigation by demonstrating sustainable and efficient use of resources. This can be achieved by incorporating … waste reduction through re-use and recycling e.g. materials recovered from the site should be re-used."*

NTP SEA [10.11] Objective 9 requires the "*prudent and sustainable use of natural resources and energy*". Sub-objectives that are relevant to this Chapter are:

9.1 *Minimise the use of finite resources and promote the use of secondary and recycled materials (preferably sourced locally) for transport, particularly in new infrastructure projects and maintenance works*
9.2 *Avoid, reduce, reuse, recycle transport related waste*
9.4 *Promote resource use efficiency*

As the Scheme has been developed in a sustainable manner to achieve an optimal balance between earthworks construction, minimise traffic movements of excavated materials, minimise waste generated and maximise opportunities to recycle and re-use construction waste as secondary aggregates it is considered that Objective 9 has been met.

No significant adverse effects are anticipated being associated with the materials usage for the operational phase of the Scheme, and the overall significance of effect is considered to be neutral.

A summary of the impacts in relation to Materials is shown in Table 10.7.1 below:

Table 10.7.1 – Summary of impacts in relation to Materials

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation	Notes / Comment
Construction Impacts					
Materials	Impacts on on-site material sources due to "works" area	Minor Adverse	Minor Adverse	Neutral	
Materials	Contamination of site won materials – spreading of contamination to other areas.	Negligible	Negligible	Neutral	
Materials	Contamination of imported materials – spreading of contamination to other areas.	Moderate Adverse	Negligible	Neutral	
Materials	Unsuitability for re-use of site won earthworks materials within the Scheme requiring additional import of suitable materials.	Moderate Adverse	Minor Adverse	Slight Adverse	

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation	Notes / Comment
Materials	Unsuitability for re-use of materials derived from site clearance works, on-line improvement works and interfaces between new bypass construction and existing roads requiring disposal.	Moderate Adverse	Negligible	Slight Adverse	
Materials	Imported construction materials required to construct the Scheme.	Moderate Adverse	Minor Adverse	Neutral or Slight Adverse	
Materials	Traffic movements due to import of construction materials / export of material to be disposed.	Minor Adverse	Minor Adverse	Slight Adverse	

11. Noise and Vibration

11.1. Introduction

This chapter examines the effects of the Scheme on traffic noise and vibration levels. It addresses both the direct effects of traffic using the Scheme and the effects of redistributed traffic on the existing road network. It considers short-term construction effects and outlines methods proposed to reduce potential impacts. The assessment has been carried out in accordance with DMRB Volume 11 Section 3 Part 7 [11.1].

An Environmental Scoping report was prepared and correspondence with the statutory bodies confirmed that a detailed assessment was required.

Further information on the technical terms used in this chapter is provided in Volume 3, Appendix H.1. The results of the traffic noise studies are illustrated in the form of Noise Maps and are shown in Volume 3, Appendix H.6 and Volume 2, Figures 11.4 and 11.5. These are also shown for sample receivers in Table 11.6.5 below and for all receivers within the study area in Volume 3, Appendix H.2.

The effects of the Scheme are assessed by examining the changes in noise resulting from the construction and use of the Scheme. Established methods are used for determining the subjective responses to the expected changes in traffic noise.

Noise impacts may result from changes in:

- Road alignment (vertical and horizontal);
- Sound generation (traffic flow, speed, gradient and road surface type);
- Sound propagation (ground absorption, screening, reflection and scattering).

The assessment of operational noise and vibration effects is based upon comparisons between noise levels with the Scheme in place (the 'Do Something' levels) and noise levels without the Scheme in place (the 'Do Minimum' levels). These comparisons are undertaken for the opening year of the Scheme (2017) and for the Scheme design year (2032).

Traffic flows and the level of noise they generate fluctuate in intensity hourly, daily and seasonally, therefore the impact of traffic noise is assessed in terms of a time-averaged indicator.

11.1.1. General

The human ear responds to a wide range of sound pressures, from 0dB (the threshold of hearing) up to about 130dB (approximating to the threshold of pain).

Table 11.1.1 below shows indicative noise levels associated with different noise sources. They are intended to give an appreciation of noise levels commonly experienced in various situations.

The noise level response of the human hearing system is logarithmic rather than linear in nature, and able to detect a noise level difference of about 1 dB(A) between two steady sounds, when they are presented in rapid succession under controlled laboratory conditions. The smallest change in environmental noise that is generally noticed by an individual is about 3dB(A). A 10dB(A) change approximates to a subjective doubling or halving of loudness.

Table 11.1.1 Typical dB(A) Noise Levels

Noise Source	dB(A) Level
Rural night-time background	20-40
Quiet country bedroom at night	30-35
Quiet library	40
Quiet office, air conditioner	50
Car at 40mph at 100m	55
General office or supermarket	60
Conversational speech at 1m	60-65
Car at 25 mph at 7.5m	70
Pavement of busy street	85
Hand held hydraulic breaker (20kg) at 7m	95
Jet aircraft at 250m	105

Noise levels close to a road fluctuate with time and may be characterised by various statistical descriptors of the noise. For example, the $L_{A10,\ 1h}$ level is the "A" weighted noise level exceeded for 10% of a 1-hour period.

Research has shown that the arithmetic average of the 18, 1-hour L_{A10} levels (depicted as $L_{A10,\ 18h}$) between 06:00 and 24:00 hours shows a reasonably good correlation with community responses to traffic noise. This unit is used in the UK for the assessment of road traffic noise.

To aid the interpretation of predicted noise changes, DMRB 11:3:7 (Tables 3.1 and 3.2 in that document) suggests the following classification for the magnitude of noise impacts, recognizing that it may not be applicable in all circumstances:

Table 11.1.2 Classification of Magnitude of Noise Impacts

Noise Change, $L_{A10,18h}$	Magnitude of impact (short term)	Magnitude of impact (long term)
0	No change	No change
0.1-0.9	Negligible	Negligible
1-2.9	Minor	Negligible
3-4.9	Moderate	Minor
5-9.9	Major	Moderate
10+	Major	Major

Minor, moderate and major changes in noise are perceptible. Negligible changes in noise are not perceptible. The DMRB states that a methodology has not yet been developed to assign a significance according to both the value of a resources and the magnitude of a noise impact. For this environmental impact assessment:

- negligible and minor changes are regarded as not-significant,
- moderate and major changes are regarded as significant.

11.1.2. Policy context

Policy documents for Wales and Powys are set out in Chapter 4. Many of these make no reference to noise and so are not considered here. Those considered include:

- Planning Policy Wales (Edition 7, July 2014) provides guidance for development in respect of noise. This is considered in more detail below.
- Technical Advice Note 11: Noise (TAN 11), which sets noise bands for residential development. This is considered in more detail below.
- Powys Unitary Development Plan (2001-2015 adopted in 2010), which makes several references for the need for noise to be considered, but only goes into detail on noise levels with respect to mineral workings and waste disposal sites
- Powys Local Development Plan – Deposit Draft (2014), has no specific policies but noise is mentioned in the policy for detailed and site specific planning matters.

11.1.2.1. Planning Policy Wales

Planning Policy Wales sets out three sections relating to noise, 13.13 – Reducing Noise and Light Pollution, 13.14 – Development plans and noise and lighting, and 13.15 - Development management and noise and lighting.

Section 13.15 indicates that "*Noise can be a material planning consideration*" and that local planning authorities should "*make a careful assessment of likely noise levels*", considering any relevant Noise Action Plans.

11.1.2.2. TAN 11

In TAN 11, under the heading Development Control – Noise Generating Development, Paragraph 8 of it states "*Local planning authorities must ensure that noise generating development does not cause an unacceptable degree of disturbance. They should also bear in mind that if subsequent intensification or change of use results in greater intrusion, consideration should be given to the use of appropriate conditions.*"

11.1.2.3. Powys UDP

There are no specific policies that relate to noise other than Detailed Policy MW14 which relates to mineral extraction and waste disposal site. Item 3 under Detailed Policy GP1 (Development Control) states that *'the amenities enjoyed by the occupants of nearby or proposed properties shall not be unacceptably affected by levels of noise, light, dust … etc.'.*

11.1.2.4. Powys Deposit LDP – Draft (2014)

There are no specific policies which relate to noise, however Policy DM2 (Detailed and Site Specific Planning Matters), item 10 state that: *'the amenities enjoyed by the occupants or users of near-by properties shall not be unacceptably affected by levels of noise, dust, air pollution … etc.'.* Section 4.2.28 (amenity) of this policy also states that: *'development must respect the existence and amenities of neighbouring uses including approved development. These amenities include ….. noise (including that which arises from hours of operation ….'.*

11.2. Methodology

11.2.1. Construction Noise

Noise from construction activities is of a different character to that experienced in the general environment such as road traffic noise and from general noise in rural or suburban areas. People may be able to hear noise from construction activities at some distance from the activities even if there is no measurable change in noise level.

BS 5228: [11.2] provides a database of measured noise levels from typical construction plant items together with a methodology for predicting noise levels at receptors based on the source noise levels; taking into account the noise attenuation due to distance, ground absorption and screening.

The significance of noise changes on human receptors has been assessed using example method 2 of Annex E, BS 5228+A1; the details of the significance criteria are shown below:

Table 11.2.1 Example threshold of significant effect at dwellings

Assessment category and threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A A)	Category B B)	Category C C)
Night (23:00 – 07:00)	45	50	55
Evenings and weekends D)	55	60	65
Daytime (07:00 – 19:00) and Saturday (07:00 – 13;00)	65	70	75

NOTE 1 A potential significant effect is indicated if the $L_{Aeq, T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.

NOTE 2 If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq, T}$ noise level for the period increases by more than 3 dB due to site noise.

NOTE 3 Applied to residential receptors only.
A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.
B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.
C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.
D) 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.

Section E.4 of BS 5228+A1 goes on to provide example time periods and noise trigger levels at which additional noise insulation, or reasonable costs thereof, should be offered to residents. For construction works between 08:00 and 18:00 the threshold is 75dB $L_{Aeq, 10hour}$, for a period of 10 or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any 6 consecutive months.

Further to this it is suggested that temporary rehousing (e.g. hotel accommodation during the noisiest works) should be offered to residents receiving noise levels 10dB or greater above the noise insulation threshold values, over the same time periods. The rehousing criteria would therefore be 85dB $L_{Aeq, 10hour}$, for a period of 10 or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any 6 consecutive months.

11.2.2. Construction Vibration

BS 5228+A1: Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration provides a database of measured noise levels from typical construction plant items together with a methodology for predicting vibration levels at receptors based on the source levels; taking into account the ground type and distance.

The significance of vibration on human receptors will be assessed using significance criteria are shown in the table below:

Table 11.2.2 Guidance on effects of vibration levels

Vibration level Effect	Vibration Level Effect
0.14 mm·s^{-1}	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mm·s^{-1}	Vibration might be just perceptible in residential environments.
1.0 mm·s^{-1}	It is likely that vibration of this level in residential environments would cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10 mm·s^{-1}	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

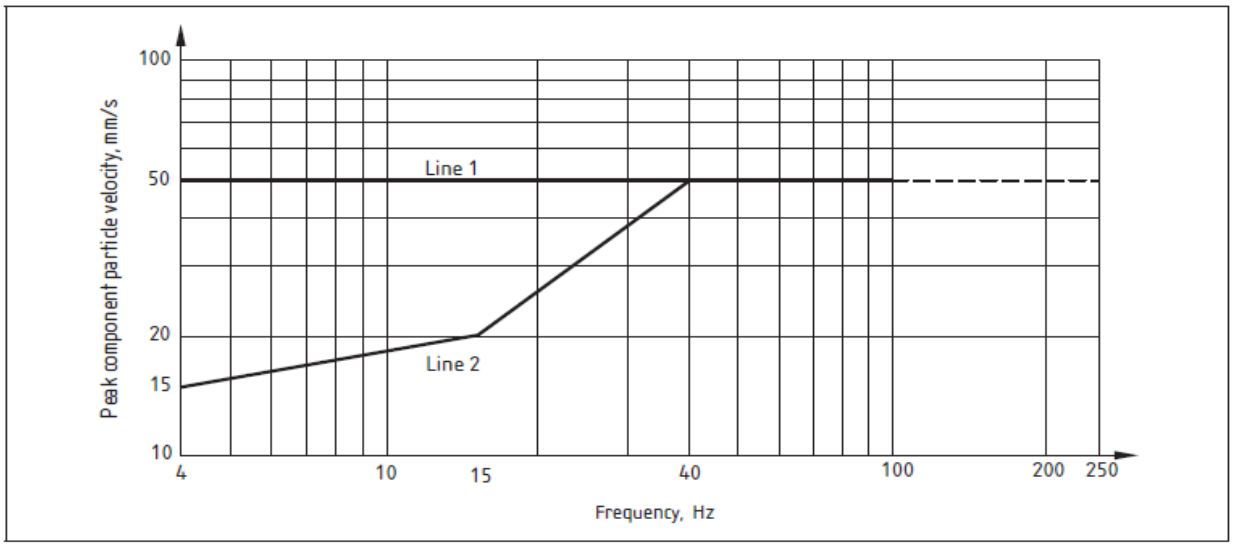
Further to this the significance of vibration on buildings will be assessed using significance criteria are shown below:

Table 11.2.3 Transient vibration guide values for cosmetic damage

Line (see Figure B.1)	Type of building	Peak component particle velocity in frequency range of predominant pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	50 mm/s at 4 Hz and above
2	Unreinforced or light framed structures Residential or light commercial buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
NOTE 1 Values referred to are at the base of the building.			
NOTE 2 For line 2, at frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded			

The referenced Figure B.1 from BS5228: Part 2, showing the vibration response curves for buildings, is reproduced below.

Figure B.1 Transient vibration guide values for cosmetic damage



11.2.3. Operational Road Traffic Noise and Vibration – The DMRB Assessment Method

For proposed road schemes, the purpose of the noise assessment is to assess the impact of the Scheme at the nearest noise sensitive receptors and where possible minimise adverse impacts and contribute to the quality of life. Under certain circumstances set out in the Noise Insulation Regulations 1975, as amended in 1988, an offer of noise insulation may be made to residential properties. Section 3 and Annex 1 of DMRB 11:3:7 [11.1] describes three levels of study as follows:

- Scoping to determine the need for a noise and vibration impact assessment;
- Simple assessment to identify the noise and vibration impacts associated with the project;
- Detailed assessment of noise and vibration impact at dwellings and other sensitive receptors when threshold values are exceeded.

From the Environmental Scoping and inspection of the engineering drawings it is evident that the Scheme could potentially result in noise and vibration impacts, but it is not clear if changes in noise would exceed the threshold values. In accordance with the flow chart shown in Figure A1.1 of the DMRB, this assessment therefore follows the 'detailed assessment' method described in paragraphs A1.16 to A1.24 of the DMRB. The assessment steps are outlined below:

- Assessment of permanent traffic noise impacts
- Assessment of permanent traffic induced vibration impacts.
- Assessment of temporary impacts.
- Assessment of cumulative impacts.
- Assessment of impacts without the Scheme
- Assessment of noise nuisance
- Assessment of vibration nuisance

In accordance with paragraph A4.14 in DMRB 11:3:7 [11.1], the noise predictions have been based upon the forecast 'most likely' annual average weekday traffic (AAWT) flows, speeds and percentage of heavy vehicles for the Do Minimum and Do Something situations in both the opening and design years. Only roads with flows of at least 1,000 vehicles per 18 hour AAWT have been considered, in accordance with the advice in Calculation of Road Traffic Noise (CRTN)[11.3].

The following paragraphs explain the process in more detail.

Study Area

The definition of the study area is given in the DMRB (section A1.11). The study area comprises sensitive receptors that are within either the detailed study area or the wider area, as described below. The study area measurement locations are shown in Volume 2, Figure 11.1 and the 100m and 50m boundary limits from the Scheme is shown in Volume 2, Figure 11.2.

Wider Area

The Wider Area is not distance-limited and comprises any roads outside the Detailed Study Area that are predicted to have noise level changes of at least 1.0 $dBL_{A10,18h}$. Properties are considered that are within 50m of these roads.

Detailed Study Area

The detailed study area is defined as being within 600m of both the Scheme boundary and any other roads in the network that are predicted to experience noise level changes of at least 1 $dBL_{A10,18h}$ in the opening year, out to a maximum distance of around 1km from the actual Scheme boundary.

Noise predictions have been conducted at ground floor and first floor levels. The receiver heights for these levels are 1.5m and 4m above local ground level respectively. The results for each receptor have been reviewed, and the most affected facade and floor have been used in the analysis, so representing the worst case for each receptor.

The majority of the predicted noise levels relate to the façades of buildings so include the 2.5dB 'façade correction' as described in CRTN. These façade levels are used in the quantitative assessment of the Scheme. Open areas, such as playing fields, do not include this correction. The noise contour maps shown in Volume 2, Figures 11.4 (a – d) and 11.5 (a – d) refer to 'free-field' noise levels (i.e. without the reflective effect of a façade) and serve to illustrate the geographic extent of noise level bands and changes within the study area, which consists of open countryside and residential areas.

Noise levels were predicted at the following noise sensitive receptors:

- Residential;
- Schools and Colleges;
- Hotels;
- Hospitals and Doctors Surgeries;
- Public open spaces; and
- Footpaths

The non-residential receptors were identified using address data and online mapping tools, and those that have been assessed are shown in Volume 3, Appendix H.2.

Comparison Years

The key dates for the Newtown bypass assessment are:

- 'Opening year' 2017; and
- 'Design year' 2032

Noise changes associated with the Scheme are assessed using the following comparisons:

- Opening year 2017 Do Something compared to Do Minimum 2017;
- Design year 2032 Do Something compared to Do Minimum 2017 (this comparison represents the combined effect of both 'natural' traffic growth and the effects of the Scheme);
- Do Minimum 2032 compared with Do Minimum 2017 (this comparison represents the change in noise which would occur if the Scheme was not built)

Night-time Traffic Noise

Paragraph A1.19 (xii) in DMRB 11:3:7 Revision 1 requires an assessment of the impact of night-time noise where receptors would be exposed to an $L_{night,\ outside}$ of 55dB or greater in any scenario. Since traffic data has not been modelled for the night time scenarios the night time noise levels have been calculated using the advice in the TRL report '*Converting the UK traffic noise index $L_{A10,18hour}$ to EU noise indices for noise mapping'* which allow night time noise levels to be estimated based on daytime noise levels.

Traffic Noise Nuisance

Paragraph 3.49 of DMRB 11:3:7 Revision 1 requires an assessment showing the number of people bothered by noise. The methodology to translate $dBL_{A10,\ 18h}$ noise changes into traffic noise nuisance changes is described in Annex 3 of that document. The numbers of people predicted to experience nuisance increases and decreases of <10%, 10<20%, 20<30%, 30<40% and ≥ 40% have been calculated.

Traffic-induced Vibration

Traffic-induced airborne vibration may manifest itself as the rattling of badly fitted windows or light objects if the exhaust note of (usually heavy) vehicles happens to coincide with a

resonant frequency of an element of the building. Vibration nuisance has been assessed on the basis that '*for a given level of noise exposure, the percentage of people bothered by vibration is 10% lower than the corresponding figure for noise nuisance*'[2]

Traffic-induced ground-borne vibration may result from the passage of vehicles over discontinuities, such as badly reinstated trenches, in the road surface. TRL Research Report 102 concludes that with a surface irregularity of about 20mm within about 5m of a building, there was the possibility of perceptible ground-borne vibrations being generated during the passage of heavy vehicles. As newly constructed roads would not have surface irregularities of this magnitude, it may reasonably be concluded that ground-borne vibration would not be an issue.

11.2.4. Calculation of Road Traffic Noise (CRTN)

Road traffic noise levels have been calculated at representative receptors using the method detailed in CRTN 1988 [11.3]. This is the Government's prescribed method and has been developed from extensive measurement data and validated out to distances of about 300m from trafficked roads for the purposes of the Noise Insulation Regulations. Studies undertaken by TRL in connection with the current version of DMRB 11:3:7 have shown that the CRTN algorithms can be reliably used up to 600m.

The CRTN method for predicting noise from a road consists of five main stages:

- Division of the road into a number of segments.
- Calculation of the Basic Noise Level for each road segment, at a reference distance of 10m away from the nearside carriageway edge.
- Calculation of the noise level from each road segment at the reception point by modifying the Basic Noise Level to take account of distance, ground attenuation and screening.
- Correction of the noise level at the reception point to take account of site layout features including reflections from buildings and façades, and the size of the source segments.
- The combination of the contributions from all road segments to give the total noise level at each reception point.

Traffic noise predictions have been conducted using the commercially available NoiseMap Five computer program. This program implements the algorithms contained within CRTN, extended to a distance of 600m, and the additional advice to CRTN procedures described in Annex 4 of the DMRB. It has been used to build three-dimensional models of the existing road layout, the Scheme and surrounding areas including features such as buildings, landforms and barriers. Other inputs to the model include traffic flows and speeds, the nature of the road surface and the type of intervening ground between each road segment and each receiver.

11.2.5. Data Sources and Assumptions

The noise assessment has used the following data sources:

- Traffic data – Volume 2, Figure 2.9
- Existing topography – Ordnance Survey 3D Open Source Data
- Existing road network – DM_links_Finalv2.tab provided by the project team
- Existing building locations – 2D OS dxf provided by the project team
- Existing address data – OS address layer 2 data

Scheme topography and alignment - as shown in Volume 2, Figures 2.1, 2.2 and 2.4.

[2] DMRB 11:3:7 Annex 3 paragraph A3.22

The recently completed residential properties in Meadow View (SY16 1NU) were not included in the ordnance survey data, and these were digitised manually based on on-line mapping sources.

All existing roads were assumed to have an asphalt or bituminous surface, with a 2mm texture depth.

The Scheme is assumed to have a thin wearing course lower noise surfacing, and in line with the advice in DMRB a correction of -3.5dB has been used. This surface is only effective when vehicles are travelling at speeds of 75kph or greater.

All residential buildings, with the exception of caravans, have been modelled as being of two storeys height and noise levels have been presented for ground floor and first floor levels. In some instances this may mean that single storey bungalows have first floor noise levels reported. Where this is the case the first floor data should be ignored.

Noise levels have been predicted for each façade of each building, although only the worst affected façade (that with the greatest adverse change in noise level due to the Scheme) has been reported. It is assumed that the worst affected façade has a window in it, although this has not been checked on a property by property basis.

Noise from other sources, such as trains on the railway, are not considered as part of this assessment.

11.3. Baseline Conditions

11.3.1. Areas

For ease of presentation the Study Area has been broken down into six areas. These are as follows and shown in Volume 2 Figure 11.1:

- Area 1: Western Extent to Mochdre Bridge
- Area 2: Mochdre Bridge to Lower Dolfor Road Roundabout
- Area 3: Lower Dolfor Road Roundabout to A483 Dolfor Road Roundabout
- Area 4: A483 Dolfor Road Roundabout to Kerry Road Roundabout
- Area 5: Kerry Road Roundabout to A483 Pool Road Roundabout
- Area 6: Llanidoes Road, Pool Road and Town Centre

11.3.2. Baseline Noise Survey

Baseline noise measurements were taken between Thursday 5th and Wednesday 18th December 2013 in order to verify the accuracy of the baseline traffic noise model. The pre-existing noise conditions at a selection of nearby receptors were established. Logging positions were set-up and noise levels were monitored for one week at each. A further seven positions where at least two 15 minute sample measurements were taken during the daytime period have been used to compare to the long-term locations. Noise levels from the existing A489 were also measured at one location within Newtown.

The measurement positions are described below along with the individual measurement details. Volume 2, Figure 11.1 shows the measurement locations. The results are summarised in Tables 11.3.3 and Table 11.3.4.

Equipment Details

Table 11.3.1 – Equipment Details

Location	Equipment	Type	Serial No.	Last Laboratory Calibration before survey Date
Long-term	Sound Level Meter	Brüel & Kjær 2238	2381613	20/03/2013
	Pre-amplifier	Brüel & Kjær ZC 0030	2372201	20/03/2013
	Microphone	Brüel & Kjær 4188	2372201	20/03/2013
	Calibrator	Norsonic 1251	31008	20/03/2013
Long-term	Sound Level Meter	Rion NL-52	620855	20/07/2012
	Pre-amplifier	Rion NH-25	20915	20/07/2012
	Microphone	Rion UC-59	3691	20/07/2012
	Calibrator	Rion NC-74	35125803	07/12/2012
Short-terms locations	Sound Level Meter	Norsonic 118	31653	10/05/2012
	Pre-amplifier	Norsonic 1206	30512	10/05/2012
	Microphone	Norsonic 1225	59992	10/05/2012
	Calibrator	Norsonic 1251	31227	10/05/2012
Short-terms locations	Sound Level Meter	Rion NL-52	620857	20/07/2012
	Pre-amplifier	Rion NH-25	20917	20/07/2012
	Microphone	Rion UC-59	03693	20/07/2012
	Calibrator	Rion NC-74	35125804	07/12/2012

The sound level meters have been calibrated to UKAS standards within the previous two years. Field calibrations were carried out on site before and after each measurement and no significant drift in calibration level was observed.

Meteorological Conditions

Table 11.3.2 – Meteorological Conditions

Day	Wind Direction	Wind Speed (m/s)	Precipitation (mm)	Temperature (°C)
Thursday 5th	WSW	2-3	1-2	7
Friday 6th	WSW	<1	0	5
Saturday 7th	WSW	<1	<1	7
Sunday 8th	WSW	<1	<1	8
Monday 9th	WSW	<1	0	9
Tuesday 10th	WSW	<1	0	7
Wednesday 11th	WSW	<1	<1	2
Thursday 12th	WSW	<1	0	8
Friday 13th	WSW	1-2	1-2	9
Saturday 14th	WSW	3-4	<1	9
Sunday 15th	WSW	1-2	<1	9
Monday 16th	WSW	1-2	6-7	9
Tuesday 17th	WSW	<1	0	3
Wednesday 18th	WSW	3-4	8-9	7

Weather data is taken from the Newtown weather station; http://newtownweather.co.uk/archive/2013_12.txt. Full details are shown in Volume 3, Appendix H.4.

Weather during the survey set-up on Thursday 5th December was poor and data from this date has been excluded from analysis. Short term measurements planned for Wednesday 18th December were abandoned due to heavy rain. Likewise, due to winds on 14th December and rain on the 16th noise data for these dates have been excluded.

Survey Results

The noise levels measurements taken at all logging positions have been averaged and summarised below. The daytime $L_{Aeq, 16hour}$ period is representative of the hours between 07:00-23:00. The night time $L_{Aeq, 8hour}$ period is representative of the hours between 23:00-07:00. The daytime $L_{A10, 18hour}$ period is representative of the hours between 06:00-00:00.

Table 11.3.3 Summary of Weekday Noise Level Measurements – Loggers

Position	Measured $L_{A10, 18hour}$ daytime	Measured $L_{Aeq, 16hour}$ daytime	Measured $L_{Aeq, 8hour}$ night-time	Predicted 2017 DM $L_{A10, 18hour}$ daytime
L1, Stepaside	50	51	42	48
L2, Black Hall Farm*	(55)	(62)	-	63
L3, Great Brimmon Farm	54	56	50	40
L4, Tyn-y-Green, Wern Ddu Lane	44	70	65	43

* 13 hours daytime monitoring only at location L2 due to unsuitable weather conditions, and all night-time data excluded from analysis for the same reason. Values given are for the 13 hours measured and not the full 18 and 16 hour periods.

The large discrepancy between the L_{A10} and L_{Aeq} data at L4 indicated that ambient noise at this location is not dominated by traffic noise. Site observations note the dominant noise sources as being distant road traffic, wildlife and farm noise.

The short-term measurements are presented in Table 11.3.4 below. Each short-term location is synchronised with a measurement at an associated logger location, except for the CRTN measurement (C1) which uses the CRTN correction to give a predicted $L_{A10, 18hour}$ noise level. The difference between these simultaneous measurements is then applied to the logger data to give an estimated equivalent long-term noise level at the short-term location. The associated logger location is shown in brackets.

Table 11.3.4 – Summary of Weekday Noise Level Measurements – Spot Measurements

Position (Associated Logger Location)	$L_{A10, 18hour}$	Predicted 2017 DM $L_{A10, 18hour}$ daytime
S1, Garth Owen (L1)	49	47
S2, Lon Pantyllyn (L1)	45	43
S3, Stepaside (L1)	41	41
S4, Dolfor Road (L1)	43	38
S5, Pool Road, Hazeldene (L4)	58	61
S6, Cefn-y-Faesdre (L4)	48	37
S7, Ceiriog (L4)	43	32
C1, A489, Nr Wynfields	75	69

This analysis shows that the L_{A10} noise levels do not fall below 40dB(A) during the day.

Variations between measured (2013) noise levels and predicted Opening Do Minimum 2017 can be due to a number of factors, including variations in traffic flow, metrological conditions, and other noise sources in the area. The results are thought to match suitably at most locations to give confidence in the monitoring and modelling results.

11.4. Predicted Environmental Impacts

11.4.1. Construction impacts

The assessment assumes that Best Practicable Means are used to minimise noise generated from the works as is commonly undertaken on highways schemes of this nature. The assessment considers that the following measures are taken:

- The selection and maintenance of quiet equipment;
- Careful layout of sites to minimise noise;
- The use of site hoardings, mobile noise barriers and equipment enclosures,
- Shutting down equipment whilst not in use;
- The selection of low vibration equipment and methods;
- The selection of hydraulic rather than pneumatic equipment; and
- Keeping residents fully informed about the nature and timing of the works.

The construction noise assessment is based on the plant details in Volume 3, Appendix H.5, with relevant noise data taken from BS5228+A1 [11.2].

This equipment gives rise to the following overall noise levels at 10m from the activities:

Table 11.4.1 Construction Activities noise levels

Activity	Total L_{Aeq} at 10m (dBA)
Site Clearance	84
Earthworks	80
Road Formation and surfacing	81
Ducting	74
Signs and Lighting	76
Landscaping	81
General	74
Structure work	87
Piling	83

The site clearance works is one activity which would generate high noise levels, principally from the handheld pneumatic breakers which would typically be used to break up existing road surfaces or the use chainsaws to clear existing trees and vegetation etc. However these would be for very short durations, mostly during the first few weeks. This would occur in Areas 1 to 5.

Structure construction works would also generate high noise levels, but these would only affect properties near to structures. The main structures are:

- Glandulas Overbridge (Area 1)
- Mochdre Bridge, Coleg Powys and Bridleway Underpasses (Areas 1 and 2)
- Dolfor Underbridge & Upper Dolfor Overbridge (Area 3)
- Brimmon Lane and Brimmon Farm Underpasses (Area 4)

- Wern Ddu Overbridge (Area 5)
- Railway Bridge (Area 5)
- Pool Road Underbridge (Area 5)

Dolfor Underbridge, in Area 3, is the only structure likely to require piling. There would also be localised impacts from the demolition of buildings. Two properties and a barn are to be demolished to construct the Scheme. These are located at Middle Dolfor Road in Area 3 and at Pool Road in Area 5.

Using the guidance in BS5228 [11.2] when noise levels from construction activities during the day (07:00 to 19:00) are below 65dB(A) the impacts are not significant. Where levels of construction noise are higher than 65dB(A) the significance depends on the ambient noise levels.

Table 11.4.2 shows the overall average noise levels from each activity and the distance required for noise levels to drop below 65dB(A) for each activity, assuming soft ground attenuation and no screening. This table forms the basis of the daytime construction noise assessment.

Table 11.4.2 Radius of potentially significant impacts for construction activities

Activity	Total L_{Aeq} at 10m (dBA)	Distance for noise levels to drop below 65dB(A)
Site Clearance	84	60m
Earthworks	80	45m
Road Formation and surfacing	81	45m
Ducting	74	25m
Signs and Lighting	76	30m
Landscaping	81	50m
General	74	25m
Structure work	87	80m
Piling	83	70m

This shows that significant noise issues are not expected at distances beyond 100m from the works or from compounds, and for many of the activities significant noise issues are not expected at distances beyond 50m from the works or compounds.

Locations where receptors are within 100m of the works are:

- Hafren View (Area 1)
- Glandulas Holiday Home Park (Area 1)
- Mochdre Lane (properties both sides of the alignment) (Area 2)
- Castell-y-Dail (Area 2)
- Properties in Garth Owen near Lower Dolfor Road Roundabout (Area 3)
- Properties along Middle and Upper Dolfor Roads (Area 3)
- Farms and other rural properties in the area near Brimmon Lane, Kerry Road and Wern Ddu Lane (Areas 4 and 5)
- Properties near Pool Road (Area 6)

Construction noise impacts would be of short duration. Construction noise limits would also be agreed with Powys County Council Planning Authority prior to commencement of work.

No properties are predicted to exceed the temporary rehousing noise criteria.

Volume 2, Figure 11.2 shows the 50m and 100m boundaries from the Scheme and indicate the extent of potential construction noise impacts in various areas. Piling would only take place in one area, at the Dolfor Underbridge western abutment. Bored piling techniques would be adopted so the noise generated would be well below the threshold levels.

The main site compound would be located to the north of Mochdre Industrial Estate and west of the A483 Dolfor Road Roundabout.

The only anticipated night time works would be for the erection of the Railway Bridge deck beams during weekend possessions. These night time impacts would be more noticeable and significant noise impacts would therefore occur over greater distances because BS5228 [11.2] sets a lower noise threshold for significance – 45dB(A) between 23:00 and 07:00. Impacts may be experienced over several hundred metres, in Areas 5 and 6. The noise impacts from the plant/equipment used should be controlled to specified noise levels to minimise the night time noise impacts on properties in Areas 5 and 6.

The construction programme is anticipated to be 24 months in duration, with 3 months at the start for set up and site clearance and 3 months at the end for re-profiling, remedial work and landscaping.

In areas where existing topsoil is removed, it would be stripped and formed into bunds up to 2 metres high along each side of the Scheme which would minimise construction noise impacts affecting local residents.

The design of the Scheme is such that most of the materials required for the construction works, including earthworks materials, are to be sourced on site, through the reuse of excavated materials. Where appropriate, excavated/demolished materials would be segregated and processed for re-use.

This materials balance results in a reduced number of HGV movements, minimising construction traffic and reducing the impacts on the local road network.

Volume 3, Appendix H.5 contains details of typical plant for the construction of a new road scheme, based on initial information provided by the Contractor.

The plant noise and vibration calculations would be reviewed following the detailed design stage and measures to control the construction noise would be detailed in the Construction Environment Management Plan (CEMP), along with further details of mitigation techniques and procedures, community liaison requirements and an environmental monitoring plan. However, based on the construction plant that is likely to be used, it is not anticipated that any properties would experience sufficient construction noise to qualify for temporary rehousing during construction works.

11.4.2. Operational impacts

The results of the noise assessment are contained in following tables, figures and appendices:

- Table 11.6.5 – Sample Receiver Results
- Volume 3, Appendix H.1 – Glossary of Acoustic Terms
- Volume 3, Appendix H.2 – Full Receiver Results
- Volume 3, Appendix H.6 (1) – Do Minimum noise impact contours
- Volume 3, Appendix H.6 (2) – 2017 Change in noise level without mitigation
- Volume 3, Appendix H.6 (3) – 2017 Do Minimum to 2032 Do Something Change in noise level without mitigation
- Volume 3, Appendix H.6 (4) – 2017 Change in noise level with mitigation
- Volume 3, Appendix H.6 (5) – 2017 Do Minimum to 2032 Do Something Change in noise level with mitigation
- Volume 2, Figures 11.1 (a to f) – Study Area Measurement Locations

- Volume 2, Figures 11.2 (a – d) - Construction Noise – distance boundaries
- Volume 2 Figure 11.3 (a to d) – Noise Mitigation
- Volume 2 Figure 11.4 (a to d) – Change to noise level with mitigation (2017)
- Volume 2 Figure 11.5 (a to d) – Change to noise level with mitigation (2032)

11.4.2.1. Changes on Scheme Opening

This compares the predicted Do Minimum and Do Something scenarios in the opening year (2017). The results of this assessment classifies each Noise Sensitive Receptor (NSR) according to the magnitude of the short term noise impact at its façade. A total of 3829 residential NSRs within the study area have been classified in using the DMRB table presented in Table 11.1.2. There are 177 residential properties where night time noise levels are high enough to be included in the assessment.

Table 11.4.3 DMRB Classification of Changes on Scheme Opening

Change in noise level		Number of dwellings	Number of other sensitive receptors	Number of dwellings
		Daytime		Night-Time
Increase in noise level, $L_{A10, 18h}$	0.1 - 0.9	186	2	12
	1 - 2.9	336	1	6
	3 - 4.9	199	2	0
	>=5	202	5	0
No Change	= 0	32	1	2
Decrease in noise level, $L_{A10, 18h}$	0.1 - 0.9	318	3	12
	1 - 2.9	1611	16	7
	3 - 4.9	697	5	89
	>=5	248	4	49

These results show that the majority of receptors would experience a decrease in noise in the opening year. Minor decreases in noise would be experienced at over 1600 properties, with moderate or major decreases in noise occurring at over 900 properties. These reductions in noise would occur as traffic re-routes from the existing A483/A489 trunk roads in Area 6 (through Newtown) onto the Scheme. These moderate and major decreases in noise are considered to be significant.

The construction of the Scheme would introduce a new noise source, and properties near the Scheme would experience an increase in noise. Minor increases in noise are expected at around 300 properties. Moderate and major increases in noise are expected at around 400 properties in Areas 1 to 5 close to the Scheme. These moderate and major increases in noise are considered to be significant. There are more properties with major decreases in noise than there are major increases in noise.

The changes in noise at night time show that the majority of changes are negligible or there would be a perceptible decrease in noise.

The most significant increases in noise during the day occur in the following locations:

Table 11.4.4 Increases in Noise Greater than 10dBA on Scheme Opening

Increase in noise	Property Locations	Number of Properties
>15dB	Castell Y Dail, Great Brimmon, Mochdre Lane, Glandulas Drive, Ceiriog, Meadow View	25

10-15dB	Brimmon Lane, Middle Dolfor Road, Mochdre Lane, Wern Ddu Lane, Ceiriog, Glandulas Drive, Meadow View, Upper Dolfor Road	66

The changes in noise are shown on the noise contour in Volume 2, Figures 11.4 (a-d) and 11.5 (a – d). These figures also show that noise levels on the existing route through Newtown between the A489 Llanidloes Road and A483 Pool Road would decrease by at least 3dB and in the majority cases would decrease by more than 5dB.

Changes by the Design Year with the Scheme Constructed

Analysis of these changes allows for the identification of the number of NSRs affected by noise over the design period due to the Scheme. The design year allows for other traffic growth and uses a different assessment scale, which leads to different impacts in the table.

Table 11.4.5 DMRB Classification of Changes with Scheme by Design Year

Change in noise level		Number of dwellings	Number of other sensitive receptors	Number of dwellings
		Daytime		**Night-Time**
Increase in noise level, $L_{A10, 18h}$	0.1 - 2.9	554	4	21
	3 - 4.9	205	1	0
	5 - 9.9	156	6	0
	>=10	100	0	0
No Change	= 0	18	0	0
Decrease in noise level, $L_{A10, 18h}$	0.1 - 2.9	2011	20	19
	3 - 4.9	622	6	118
	5 - 9.9	163	2	19
	>=10	0	0	0

The changes in noise over the design period follow a similar pattern as the opening year changes in noise. By the design year there would be approximately 250 moderate or major increases in noise and approximately 160 moderate or major decreases in noise, which are regarded as significant. The significant increases in noise occur in the same locations as the opening year. The majority of the night time changes in noise would be either negligible or a perceptible decrease.

Table 11.4.6 Increases in Noise Greater than 10dBA by the Design Year

Increase in noise	Property Locations	Number of Properties
>15dB	Castell-y-Dail, Great Brimmon, Mochdre Lane, Glandulas Drive, Ceiriog, Meadow View	33
10-15dB	Brimmon Lane, Middle Dolfor Lane, Mochdre Lane, Wern Ddu Lane, Ceiriog, Glandulas Lane, Glandulas Drive, Meadow View, Upper Dolfor Road,	68

The changes in noise at Design Year can be seen in the noise map in Volume 2, Figure 11.4. These are described in greater detail below.

Area 1 - Western Extent to Mochdre Bridge

The noise impacts in this area are predominately on the Holiday Home Park. It has been assumed that four caravans would need to be removed as part of the Scheme and the remaining units have been modelled in their current plot locations. A major impact is predicted for two caravans if they remain in their current locations.

Area 2 - Mochdre Bridge to Lower Dolfor Road Roundabout

This area is predominately industrial in nature, with residential farm houses at Castell-y-Dail and Black Hall Farm. Castell-y-Dail is predicted to receive an 18dB impact due to the Scheme at design year. No significant operational impact is predicted at Black Hall Farm.

Area 3 and 4 – Lower Dolfor Road Roundabout to Kerry Road Roundabout

The majority of the noise impacts in this area are around the existing housing in Garth Owen south of Ceiriog, along Middle and Upper Dolfor Roads, in Meadow View, and isolated farm houses at Upper and Great Brimmon and Brimmon House. The worst affected properties in each of these areas would experience Scheme impacts at design year in excess of 10dB.

Future development of further houses between the Scheme and Ceiriog already has outline planning permission but plot locations are not know at this time. This is therefore considered in the cumulative impacts section.

Area 5 - Kerry Road Roundabout to A483 Pool Road Roundabout

There is a small number of isolated houses in this area, around Lower Brimmon and east of Wern Ddu Lane, and a small number of houses close to the Pool Road Underbridge. The impacts are generally not significant in this area.

Area 6 - A489 Llanidoes Road, A483 New Road, Pool Road and Town Centre

Noise impacts from through traffic in Newtown along the Llanidoes Road, New Road and Pool Road would reduce due to the Scheme. The impacts are beneficial in this area.

Changes by the Design Year if the Scheme was not Constructed

Assessing the Do Minimum scenario change in noise level over the design period shows how many properties would be affected by noise due to natural changes in traffic levels if the Scheme was not constructed. The magnitude of the noise impact over the design period is assessed using the 'long term' column of Table 11.1.2.

Table 11.4.7 DMRB Classification of Changes Without Scheme by Design Year

Change in noise level		Number of dwellings	Number of other sensitive receptors	Number of dwellings
		Daytime		Night-Time
Increase in noise level, $L_{A10, 18h}$	0.1 - 2.9	3794	39	166
	3 - 4.9	0	0	0
	5 - 9.9	0	0	0
	>=10	0	0	0
No Change	= 0	21	0	10
Decrease in noise level, $L_{A10, 18h}$	0.1 - 2.9	14	0	1
	3 - 4.9	0	0	0
	5 - 9.9	0	0	0
	>=10	0	0	0

This table shows that all receivers would experience a negligible change in noise. These impacts are regarded as not significant. The above table takes into account the predicted

traffic flow changes that are predicted on all the existing roads in Newtown. The vast majority of properties would experience a negligible increase in traffic noise due to the predicted traffic growth over the intervening period. There would be no change or negligible decreases at a small number of properties where the traffic flow predictions have anticipated some traffic re-routing from local roads as the anticipated congestion increases at junctions within Newtown.

The changes in noise can be seen in the noise contour in Volume 2, Figure 11.5.

11.4.2.2. Noise Nuisance Assessment

The noise nuisance assessment determines the change in the proportion of the population that would be bothered by noise, and is reported in the table below. The assessment is limited to properties within the detailed study area.

Table 11.4.8 DMRB Noise Nuisance

Change in noise nuisance level		Do-min	Scheme
		Number of dwellings	Number of dwellings
Increase in nuisance level	>0 - <10 %	3794	124
	10 - <20 %	0	119
	20 - <30 %	0	371
	30 - <40 %	0	267
	>=40 %	0	134
No Change	=0 %	21	18
Decrease in nuisance level	>0 - <10 %	14	2659
	10 - <20 %	0	137
	20 - <30 %	0	0
	30 - <40 %	0	0
	>=40 %	0	0

This shows that if the Scheme was not constructed all changes in nuisance would be less than 10%. If the Scheme was constructed the levels of nuisance would go up by at least one band at approximately 900 properties However the levels of noise nuisance would also go down by at least one band at approximately 3000 properties. Therefore overall the majority of properties would experience a decrease in nuisance.

The DMRB method for nuisance assessment takes a worst case approach. A change in noise in the short term is shown to give a greater change in nuisance than a gradual change in noise over a period of years. The table reports the highest levels of nuisance, which for increases in noise occurs on Scheme opening. The greatest increases in nuisance would occur at the properties with the greatest increases in noise.

Predicted impacts would be greatest in areas which are closest to the Scheme and where there is also an absence of existing roads. Other areas along the Scheme would be affected less by noise nuisance where properties would be further from the Scheme. Large areas of the existing town centre and through traffic route along Llanidloes Road, New Road, Pool Road and the Town Centre are predicted to experience beneficial impacts due to the Scheme.

11.4.2.3. Airborne Vibration Nuisance Assessment

The DMRB states that traffic induced airborne vibration impacts are correlated with noise impacts, except that only a very small proportion of the population is likely to be affected at noise exposure levels below 58 dB L_{A10}. The method for assessing airborne vibration is

based on data up to 40m from a scheme and the DMRB advises that caution should be exercised when assessing properties beyond this distance.

This assessment considers all properties within the detailed study area that experience noise levels of at least 58 dB L_{A10} and assesses the change in the proportion of the population that would be bothered by traffic induced airborne vibration. The vibration is undertaken for the following scenarios:

Table 11.4.9 DMRB Airborne Vibration Nuisance

Change in vibration nuisance level		Do-min	Scheme
		Number of dwellings	Number of dwellings
Increase in nuisance level	>0 - <10 %	669	135
	10 - <20 %	0	0
	20 - <30 %	0	0
	30 - <40 %	0	0
	>=40 %	0	0
No Change	=0 %	3151	3139
Decrease in nuisance level	>0 - <10 %	9	418
	10 - <20 %	0	137
	20 - <30 %	0	0
	30 - <40 %	0	0
	>=40 %	0	0

The table above shows that with the Scheme the number of dwellings with an increase in airborne vibration nuisance is reduced.

This assessment identifies that the reduction of traffic on the main roads through Newtown would give rise to a decrease in nuisance from airborne vibration. Increases would occur for properties close to the Scheme and this would occur in all areas.

11.4.2.4. Wider Area Network

There are no changes greater than +1dB predicted on the wider area network.

11.4.2.5. Noise Insulation Regulations Assessment

An assessment has been carried out to determine the likelihood of properties meeting the requirements of the Noise Insulation Regulations 1975 as amended 1988. The results of this assessment show that no properties are likely to qualify for an offer of noise insulation.

11.5. Proposed Mitigation

11.5.1. Construction mitigation

No additional mitigation measures are recommended for the construction activities beyond those assumed for the assessment in paragraph 11.4.1.

11.5.2. Operational mitigation

Mitigation measures have been developed and would be included in the Scheme where benefits would be significant and where other design factors would not inhibit their use. All new roads would be laid with a low noise road surface and this has been included in the unmitigated Do Something scenario as it is considered to be part of the road design.

Additional operational noise mitigation measures included in the Scheme would be false cuttings and acoustic barriers as listed below and are shown in Volume 2, Figure 11.3 a-d:

- Two false cuttings, 100 metres long, and 3m high, along both sides of the road through the Glandulas Holiday Home Park.
- A 240m long roadside acoustic barrier, along both sides of the road, at Mochdre, generally of 2m height but dropping to 1m over the bridge due to visual impact and other issues. This would reduce the adverse impact at 4, Bontdulas by 2dB(A).
- A 230m long, 2m high roadside acoustic barrier to the north at Castell-y-Dail. This would reduce the adverse impact at this property by approximately 5dB(A).
- A false cutting, 200 metres long, 2m high along the northern edge of the lay-by south of the Mochdre Industrial Estate.
- A 170m long, 2m high roadside acoustic barrier at Garth Owen to the north of the Lower Dolfor Road Roundabout and the link road into Mochdre Industrial Estate.
- A false cutting, 400 metres long, 2m high along the northern edge of the road, west of the Brimmon Farm Underpass.
- A false cutting ,180 metres long, a roadside barrier 30m long and a further 150m long false cutting 2m high to the south of the road, west and east of Brimmon Lane Underpass.
- A false cutting, 300 metres long, 2m high along the south-eastern edge of the lay-by south-west of the Railway Bridge
- A false cutting, 200 metres long, 2m high along the northern edge of the A483 Pool Road Roundabout.

The residual impacts of the Scheme with mitigation have been modelled and are outlined below.

11.6. Residual Environmental Effects (following mitigation)

11.6.1. Construction impacts

As no additional mitigation is recommended during construction, the residual impacts are the same as the impacts reported in Section 11.4.1. Further mitigation requirements would be negotiated with Powys County Council prior to construction. Work would be undertaken to specified noise limits and within agreed operational hours.

11.6.2. Operational impacts

11.6.2.1. Opening year

The NSRs affected by noise in the opening year due to the Scheme, with mitigation in place are listed in Table 11.6.1.

Table 11.6.1 DMRB Classification of Changes at Scheme Opening with Mitigation

Change in noise level		Number of dwellings	Number of other sensitive receptors	Number of dwellings
		Daytime		Night-time
Increase in noise level, $L_{A10,18h}$	0.1 - 0.9	207	2	12
	1 - 2.9	357	1	6
	3 - 4.9	191	2	0
	>=5	162	5	0
No Change	= 0	35	1	2
Decrease in noise level, $L_{A10,18h}$	0.1 - 0.9	314	3	12
	1 - 2.9	1605	16	7
	3 - 4.9	709	5	89
	>=5	249	4	49

A comparison of Table 11.4.3 and Table 11.6.1, shows the overall number of significant increases in noise reduces from 401 to 353 with mitigation.

11.6.2.2. Design year

The results show the change in the number of NSRs affected by noise over the design period due to the Scheme, with mitigation in place. The design year allows for other traffic growth and uses an extended assessment scale as shown below.

Table 11.6.2 DMRB Classification of Changes by the Design Year with mitigation

Change in noise level		Number of dwellings	Number of other sensitive receptors	Number of dwellings
		Daytime		Night-time
Increase in noise level, $L_{A10,18h}$	0.1 - 2.9	580	4	21
	3 - 4.9	211	1	0
	5 - 9.9	137	6	0
	>=10	77	0	0
No Change	= 0	22	0	0
Decrease in noise level, $L_{A10,18h}$	0.1 - 2.9	2004	19	19
	3 - 4.9	635	7	118
	5 - 9.9	163	2	19
	>=10	0	0	0

A comparison between Table 11.4.5 and Table 11.6.2 shows that the overall number of significant increases in noise goes from 256 to 214 when mitigation is included. The noise and vibration nuisance results would also be improved with the addition of the proposed mitigation as shown in Table 11.6.3 below.

Table 11.6.3 DMRB Noise nuisance with proposed mitigation

Change in noise nuisance level		Do-min	Scheme without mitigation	Scheme with mitigation
		Number of dwellings	Number of dwellings	Number of dwellings
Increase in nuisance level	>0 - <10 %	3794	124	128
	10 - <20 %	0	119	130
	20 - <30 %	0	371	394
	30 - <40 %	0	267	245
	>=40 %	0	134	108
No Change	=0 %	21	18	22
Decrease in nuisance level	>0 - <10 %	14	2659	2665
	10 - <20 %	0	137	137
	20 - <30 %	0	0	0
	30 - <40 %	0	0	0
	>=40 %	0	0	0

Table 11.6.3 shows the total number of properties with greater than 30-40% increase in noise nuisance reduces from 401 to 353 with mitigation.

Table 11.6.4 DMRB Airborne Vibration Nuisance with mitigation

Change in vibration nuisance level		Do-min	Scheme without mitigation	Scheme with mitigation
		Number of dwellings	Number of dwellings	Number of dwellings
Increase in nuisance level	>0 - <10 %	669	135	128
	10 - <20 %	0	0	0
	20 - <30 %	0	0	0
	30 - <40 %	0	0	0
	>=40 %	0	0	0
No Change	=0 %	3151	3139	3146
Decrease in nuisance level	>0 - <10 %	9	418	418
	10 - <20 %	0	137	137
	20 - <30 %	0	0	0
	30 - <40 %	0	0	0
	>=40 %	0	0	0

The mitigation would reduce the number of properties experiencing an increase in airborne vibration nuisance by 7.

Table 11.6.5 shows the calculated noise level at a number of sample properties. These receptors have been selected to give an overview of the noise impacts in each area and at properties close to the Scheme. The Receiver ID of the property locations close to the Scheme, included in this table, are shown in Volume 2, Figures 11.1b to f.

Table 11.6.5 – Predicted Noise levels at Sample Properties

Receiver ID	Address	Floor	Façade	2017DM	2017DS	2017DS Mitigation	2032DM	2032DS	2032DS Mitigation	Opening Impact	Opening Impact with Mitigation	Do Minimum Impact	Scheme Impact	Scheme Impact with Mitigation
				(1)	(2)	(3)	(4)	(5)	(6)	(2 - 1)	(3 - 1)	(4 - 1)	(5 - 1)	(6- 1)
1318	HAFREN VIEW, LLANIDLOES ROAD, MOCHDRE, SY16 4HZ	0	E	53.2	53.7	52.9	53.5	54.0	53.2	0.5	-0.3	0.3	0.8	0.0
1318	HAFREN VIEW, LLANIDLOES ROAD, MOCHDRE, SY16 4HZ	1	E	53.5	54.4	54.1	53.8	54.7	54.4	0.9	0.6	0.3	1.2	0.9
1562	THE BEECHES, LLANIDLOES ROAD, MOCHDRE, SY16 4HZ	0	E	37.9	53.1	51.2	38.3	53.9	52.3	15.2	13.3	0.4	16.0	14.4
1562	THE BEECHES, LLANIDLOES ROAD, MOCHDRE, SY16 4HZ	1	E	38.9	53.8	51.9	39.3	54.6	52.9	14.9	13.0	0.4	15.7	14.0
883	4, BONTDULAS COTTAGES, MOCHDRE, SY16 4JE	0	E	38.4	53.0	50.9	38.8	53.5	51.6	14.6	12.5	0.4	15.1	13.2
883	4, BONTDULAS COTTAGES, MOCHDRE, SY16 4JE	1	E	39.1	54.1	51.9	39.4	54.7	52.7	15.0	12.8	0.3	15.6	13.6
929	BROOK COTTAGE, MOCHDRE LANE, MOCHDRE, SY16 4JF	0	S	30.9	40.5	40.6	31.2	41.5	41.6	9.6	9.7	0.3	10.6	10.7
929	BROOK COTTAGE, MOCHDRE LANE, MOCHDRE, SY16 4JF	1	S	32.2	41.5	41.6	32.5	42.5	42.6	9.3	9.4	0.3	10.3	10.4
962	8, BROOK TERRACE, MOCHDRE, SY16 4JG	0	E	39.4	50.0	49.2	39.7	50.7	49.9	10.6	9.8	0.3	11.3	10.5

Receiver ID	Address	Floor	Façade	2017DM	2017DS	2017DS Mitigation	2032DM	2032DS	2032DS Mitigation	Opening Impact	Opening Impact with Mitigation	Do Minimum Impact	Scheme Impact	Scheme Impact with Mitigation
				(1)	(2)	(3)	(4)	(5)	(6)	(2 - 1)	(3 - 1)	(4 - 1)	(5 - 1)	(6- 1)
962	8, BROOK TERRACE, MOCHDRE,SY16 4JG	1	E	40.3	50.8	50.0	40.6	51.5	50.8	10.5	9.7	0.3	11.2	10.5
991	THE FOXES, MOCHDRE LANE, MOCHDRE, SY16 4JF	0	W	40.7	53.6	50.1	41.0	53.9	50.4	12.9	9.4	0.3	13.2	9.7
991	THE FOXES, MOCHDRE LANE, MOCHDRE, SY16 4JF	1	W	41.7	54.3	50.8	42.0	54.6	51.1	12.6	9.1	0.3	12.9	9.4
993	BROOKLYN COTTAGE, MOCHDRE LANE, NEWTOWN AND LLANLLWCHAIARN, SY16 4JD	0	E	35.9	51.8	49.4	36.3	52.3	50.1	15.9	13.5	0.4	16.4	14.2
993	BROOKLYN COTTAGE, MOCHDRE LANE, NEWTOWN AND LLANLLWCHAIARN, SY16 4JD	1	E	37.3	52.9	50.4	37.6	53.5	51.3	15.6	13.1	0.3	16.2	14.0
1210	75, GLANDWR, NEWTOWN AND LLANLLWCHAIARN, SY16 1RQ	0	N	41.9	39.5	39.5	42.3	39.9	39.9	-2.4	-2.4	0.4	-2.0	-2.0
1210	75, GLANDWR, NEWTOWN AND LLANLLWCHAIARN, SY16 1RQ	1	N	43.4	41.0	41.0	43.8	41.4	41.4	-2.4	-2.4	0.4	-2.0	-2.0
1245	SHERWOOD VILLA, GLANDULAS DRIVE, NEWTOWN AND LLANLLWCHAIARN, SY16 4JD	0	E	35.5	51.6	49.3	35.8	52.2	50.1	16.1	13.8	0.3	16.7	14.6
1245	SHERWOOD VILLA, GLANDULAS DRIVE, NEWTOWN AND LLANLLWCHAIARN, SY16 4JD	1	E	37.0	52.7	50.5	37.3	53.4	51.4	15.7	13.5	0.3	16.4	14.4

Receiver ID	Address	Floor	Façade	2017DM	2017DS	2017DS Mitigation	2032DM	2032DS	2032DS Mitigation	Opening Impact	Opening Impact with Mitigation	Do Minimum Impact	Scheme Impact	Scheme Impact with Mitigation
				(1)	(2)	(3)	(4)	(5)	(6)	(2 - 1)	(3 - 1)	(4 - 1)	(5 - 1)	(6- 1)
1406	SILVER DALE, GLANDULAS DRIVE, NEWTOWN AND LLANLLWCHAIARN, SY16 4JD	0	E	34.7	47.6	46.3	35.0	48.0	46.8	12.9	11.6	0.3	13.3	12.1
1406	SILVER DALE, GLANDULAS DRIVE, NEWTOWN AND LLANLLWCHAIARN, SY16 4JD	1	E	36.6	48.6	47.2	37.0	49.1	47.8	12.0	10.6	0.4	12.5	11.2
1435	15, GLANDULAS DRIVE, NEWTOWN AND LLANLLWCHAIARN, SY16 4JB	0	E	34.9	50.6	48.8	35.3	51.3	49.7	15.7	13.9	0.4	16.4	14.8
1435	15, GLANDULAS DRIVE, NEWTOWN AND LLANLLWCHAIARN, SY16 4JB	1	E	36.7	51.8	50.1	37.1	52.7	51.2	15.1	13.4	0.4	16.0	14.5
3260	WOODSIDE COTTAGES, MIDDLE DOLFOR ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16	0	N	44.4	49.9	49.8	44.8	52.7	52.6	5.5	5.4	0.4	8.3	8.2
3260	WOODSIDE COTTAGES, MIDDLE DOLFOR ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16	1	N	46.2	50.8	50.7	46.5	53.6	53.5	4.6	4.5	0.3	7.4	7.3
3276	CAMLO, UPPER DOLFOR ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 3AB	0	E	43.4	44.9	44.9	43.7	46.5	46.5	1.5	1.5	0.3	3.1	3.1
3276	CAMLO, UPPER DOLFOR ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 3AB	1	E	46.1	47.1	47.1	46.4	48.5	48.5	1.0	1.0	0.3	2.4	2.4

Receiver ID	Address	Floor	Façade	2017DM	2017DS	2017DS Mitigation	2032DM	2032DS	2032DS Mitigation	Opening Impact	Opening Impact with Mitigation	Do Minimum Impact	Scheme Impact	Scheme Impact with Mitigation
				(1)	(2)	(3)	(4)	(5)	(6)	(2 - 1)	(3 - 1)	(4 - 1)	(5 - 1)	(6- 1)
3281	79, GARTH OWEN, HAFREN, NEWTOWN AND LLANLLWCHAIARN, SY16 1JN	0	W	46.7	52.9	49.1	47.0	53.6	50.3	6.2	2.4	0.3	6.9	3.6
3281	79, GARTH OWEN, HAFREN, NEWTOWN AND LLANLLWCHAIARN, SY16 1JN	1	W	47.6	54.2	50.5	47.9	54.8	51.5	6.6	2.9	0.3	7.2	3.9
3285	SPRINGFIELD, MIDDLE DOLFOR ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 4BG	0	N	37.6	48.8	48.6	37.9	51.6	51.4	11.2	11.0	0.3	14.0	13.8
3285	SPRINGFIELD, MIDDLE DOLFOR ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 4BG	1	N	39.3	49.8	49.7	39.6	52.6	52.4	10.5	10.4	0.3	13.3	13.1
3295	HILLCREST, UPPER DOLFOR ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 3AB	0	E	39.5	47.8	47.7	39.9	50.0	50.0	8.3	8.2	0.4	10.5	10.5
3295	HILLCREST, UPPER DOLFOR ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 3AB	1	E	41.9	49.4	49.4	42.2	51.8	51.7	7.5	7.5	0.3	9.9	9.8
3307	BRONHAUL, UPPER DOLFOR ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 3AB	0	W	65.7	63.2	63.0	66.0	63.7	63.5	-2.5	-2.7	0.3	-2.0	-2.2
3307	BRONHAUL, UPPER DOLFOR ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 3AB	1	W	66.3	64.3	64.1	66.6	64.7	64.5	-2.0	-2.2	0.3	-1.6	-1.8

Receiver ID	Address	Floor	Façade	2017DM	2017DS	2017DS Mitigation	2032DM	2032DS	2032DS Mitigation	Opening Impact	Opening Impact with Mitigation	Do Minimum Impact	Scheme Impact	Scheme Impact with Mitigation
				(1)	(2)	(3)	(4)	(5)	(6)	(2 - 1)	(3 - 1)	(4 - 1)	(5 - 1)	(6- 1)
3310	BRONDEG, UPPER DOLFOR ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 3AB	0	E	52.9	45.0	45.0	53.2	47.4	47.4	-7.9	-7.9	0.3	-5.5	-5.5
3310	BRONDEG, UPPER DOLFOR ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 3AB	1	E	53.9	46.1	46.1	54.2	48.3	48.2	-7.8	-7.8	0.3	-5.6	-5.7
3322	83, GARTH OWEN, HAFREN, NEWTOWN AND LLANLLWCHAIARN, SY16 1JN	0	W	48.5	52.7	51.7	48.8	53.4	52.6	4.2	3.2	0.3	4.9	4.1
3322	83, GARTH OWEN, HAFREN, NEWTOWN AND LLANLLWCHAIARN, SY16 1JN	1	W	50.1	54.0	53.0	50.4	54.7	53.7	3.9	2.9	0.3	4.6	3.6
3327	WHITE HOUSE, UPPER DOLFOR ROAD	0	W	46.1	54.1	54.1	46.5	56.5	56.4	8.0	8.0	0.4	10.4	10.3
3327	WHITE HOUSE, UPPER DOLFOR ROAD	1	W	48.3	57.7	57.7	48.7	60.2	60.2	9.4	9.4	0.4	11.9	11.9
3340	PEN Y CWN, UPPER DOLFOR ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 3AB	0	W	44.0	51.5	51.5	44.4	54.0	54.0	7.5	7.5	0.4	10.0	10.0
3340	PEN Y CWN, UPPER DOLFOR ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 3AB	1	W	46.1	54.5	54.5	46.5	57.1	57.0	8.4	8.4	0.4	11.0	10.9

Receiver ID	Address	Floor	Façade	2017DM	2017DS	2017DS Mitigation	2032DM	2032DS	2032DS Mitigation	Opening Impact	Opening Impact with Mitigation	Do Minimum Impact	Scheme Impact	Scheme Impact with Mitigation
				(1)	(2)	(3)	(4)	(5)	(6)	(2 - 1)	(3 - 1)	(4 - 1)	(5 - 1)	(6- 1)
3349	ASHBROOK, MIDDLE DOLFOR ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 4BG	0	S	35.7	52.3	52.3	36.1	55.1	55.1	16.6	16.6	0.4	19.4	19.4
3349	ASHBROOK, MIDDLE DOLFOR ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 4BG	1	S	37.6	53.4	53.4	37.9	56.2	56.2	15.8	15.8	0.3	18.6	18.6
3359	SUNRIDGE, UPPER DOLFOR ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 3AB	0	E	43.5	54.4	54.3	43.8	56.7	56.7	10.9	10.8	0.3	13.2	13.2
3359	SUNRIDGE, UPPER DOLFOR ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 3AB	1	E	46.2	56.5	56.4	46.5	58.9	58.8	10.3	10.2	0.3	12.7	12.6
5786	52, PARK STREET, NEWTOWN AND LLANLLWCHAIARN, SY16 1EH	0	E	68.9	69.9	69.9	69.0	70.1	70.1	1.0	1.0	0.1	1.2	1.2
5786	52, PARK STREET, NEWTOWN AND LLANLLWCHAIARN, SY16 1EH	1	E	69.7	70.7	70.7	69.8	70.9	70.9	1.0	1.0	0.1	1.2	1.2
6757	38, PAVILION COURT, NEWTOWN AND LLANLLWCHAIARN, SY16 1EA	0	E	51.0	47.3	47.3	51.2	47.7	47.7	-3.7	-3.7	0.2	-3.3	-3.3
6757	38, PAVILION COURT, NEWTOWN AND LLANLLWCHAIARN, SY16 1EA	1	E	52.9	49.1	49.1	53.2	49.6	49.5	-3.8	-3.8	0.3	-3.3	-3.4
8511	CASTELL Y DAIL HOUSE, MOCHDRE LANE, NEWTOWN AND LLANLLWCHAIARN, SY16 4JA	0	E	42.5	59.1	55.0	42.9	59.4	55.4	16.6	12.5	0.4	16.9	12.9

Receiver ID	Address	Floor	Façade	2017DM	2017DS	2017DS Mitigation	2032DM	2032DS	2032DS Mitigation	Opening Impact	Opening Impact with Mitigation	Do Minimum Impact	Scheme Impact	Scheme Impact with Mitigation
				(1)	(2)	(3)	(4)	(5)	(6)	(2 - 1)	(3 - 1)	(4 - 1)	(5 - 1)	(6- 1)
8511	CASTELL Y DAIL HOUSE, MOCHDRE LANE, NEWTOWN AND LLANLLWCHAIARN, SY16 4JA	1	E	43.9	61.4	56.3	44.2	61.8	56.7	17.5	12.4	0.3	17.9	12.8
9653	BRYNABER, LLANIDLOES ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 1HG	0	E	67.3	62.0	62.0	67.6	62.2	62.2	-5.3	-5.3	0.3	-5.1	-5.1
9653	BRYNABER, LLANIDLOES ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 1HG	1	E	69.4	64.1	64.1	69.7	64.3	64.3	-5.3	-5.3	0.3	-5.1	-5.1
11820	BRYNEIRA, UPPER DOLFOR ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 3AB	0	E	34.2	39.9	39.9	34.6	40.9	40.9	5.7	5.7	0.4	6.7	6.7
11820	BRYNEIRA, UPPER DOLFOR ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 3AB	1	E	36.4	42.3	42.3	36.7	43.2	43.2	5.9	5.9	0.3	6.8	6.8
11870	179, CEIRIOG, NEWTOWN AND LLANLLWCHAIARN, SY16 1NN	0	E	40.4	54.5	52.5	40.9	54.9	52.9	14.1	12.1	0.5	14.5	12.5
11870	179, CEIRIOG, NEWTOWN AND LLANLLWCHAIARN, SY16 1NN	1	E	41.5	55.3	53.0	41.9	55.7	53.4	13.8	11.5	0.4	14.2	11.9
11902	BRIMMON HOUSE, BRIMMON LANE, NEWTOWN AND LLANLLWCHAIARN, SY16 3AE	0	W	40.2	56.2	55.8	40.8	56.6	56.2	16.0	15.6	0.6	16.4	16.0

Receiver ID	Address	Floor	Façade	2017DM	2017DS	2017DS Mitigation	2032DM	2032DS	2032DS Mitigation	Opening Impact	Opening Impact with Mitigation	Do Minimum Impact	Scheme Impact	Scheme Impact with Mitigation
				(1)	(2)	(3)	(4)	(5)	(6)	(2 - 1)	(3 - 1)	(4 - 1)	(5 - 1)	(6- 1)
11902	BRIMMON HOUSE, BRIMMON LANE, NEWTOWN AND LLANLLWCHAIARN, SY16 3AE	1	W	40.6	56.5	56.2	41.2	56.9	56.6	15.9	15.6	0.6	16.3	16.0
11914	GREAT BRIMMON, BRIMMON LANE, NEWTOWN AND LLANLLWCHAIARN, SY16 3AE	0	W	38.1	60.1	58.3	38.7	60.5	58.6	22.0	20.2	0.6	22.4	20.5
11914	GREAT BRIMMON, BRIMMON LANE, NEWTOWN AND LLANLLWCHAIARN, SY16 3AE	1	W	38.7	60.8	59.4	39.3	61.2	59.8	22.1	20.7	0.6	22.5	21.1
13647	163, CEIRIOG, NEWTOWN AND LLANLLWCHAIARN, SY16 1NL	0	E	39.7	54.8	52.9	40.1	55.2	53.3	15.1	13.2	0.4	15.5	13.6
13647	163, CEIRIOG, NEWTOWN AND LLANLLWCHAIARN,	1	E	41.1	55.1	53.3	41.6	55.5	53.7	14.0	12.2	0.5	14.4	12.6
14382	155, CEIRIOG, NEWTOWN AND LLANLLWCHAIARN, SY16 1NL	0	W	37.3	51.7	47.6	37.8	52.1	48.0	14.4	10.3	0.5	14.8	10.7
14382	155, CEIRIOG, NEWTOWN AND LLANLLWCHAIARN, SY16 1NL	1	W	39.3	52.2	48.1	39.8	52.6	48.5	12.9	8.8	0.5	13.3	9.2
16189	AVONDALE, OLD BARN LANE, NEWTOWN AND LLANLLWCHAIARN, SY16 2PT	0	W	45.1	44.7	44.7	45.4	45.1	45.1	-0.4	-0.4	0.3	0.0	0.0
16189	AVONDALE, OLD BARN LANE, NEWTOWN AND LLANLLWCHAIARN, SY16 2PT	1	W	47.4	47.1	47.1	47.7	47.4	47.4	-0.3	-0.3	0.3	0.0	0.0

Receiver ID	Address	Floor	Façade	2017DM	2017DS	2017DS Mitigation	2032DM	2032DS	2032DS Mitigation	Opening Impact	Opening Impact with Mitigation	Do Minimum Impact	Scheme Impact	Scheme Impact with Mitigation
				(1)	(2)	(3)	(4)	(5)	(6)	(2 - 1)	(3 - 1)	(4 - 1)	(5 - 1)	(6- 1)
16518	LOWER BRIMMON, A489, NEWTOWN AND LLANLLWCHAIARN, SY16 4EE	0	W	68.2	61.5	61.8	68.5	62.0	62.3	-6.7	-6.4	0.3	-6.2	-5.9
16518	LOWER BRIMMON, A489, NEWTOWN AND LLANLLWCHAIARN, SY16 4EE	1	W	69.0	63.3	63.4	69.3	63.7	63.9	-5.7	-5.6	0.3	-5.3	-5.1
16563	TYNYGREEN, WERN DDU LANE, NEWTOWN AND LLANLLWCHAIARN, SY16 3DN	0	N	39.1	50.2	49.0	39.4	50.6	49.4	11.1	9.9	0.3	11.5	10.3
16563	TYNYGREEN, WERN DDU LANE, NEWTOWN AND LLANLLWCHAIARN, SY16 3DN	1	N	39.9	51.1	49.7	40.2	51.4	50.1	11.2	9.8	0.3	11.5	10.2
16603	THE BARNS, WERN DDU LANE, NEWTOWN AND LLANLLWCHAIARN, SY16 3DN	0	N	41.4	50.7	49.7	41.7	51.1	50.0	9.3	8.3	0.3	9.7	8.6
16603	THE BARNS, WERN DDU LANE, NEWTOWN AND LLANLLWCHAIARN, SY16 3DN	1	N	42.8	53.1	51.6	43.2	53.4	51.9	10.3	8.8	0.4	10.6	9.1
16719	PEN Y GELLI, WERN DDU LANE, NEWTOWN AND LLANLLWCHAIARN, SY16 3DN	0	NW	46.2	54.9	54.1	46.6	55.3	54.4	8.7	7.9	0.4	9.1	8.2
16719	PEN Y GELLI, WERN DDU LANE, NEWTOWN AND LLANLLWCHAIARN, SY16 3DN	1	NW	48.2	57.4	56.2	48.6	57.7	56.5	9.2	8.0	0.4	9.5	8.3

Receiver ID	Address	Floor	Façade	2017DM	2017DS	2017DS Mitigation	2032DM	2032DS	2032DS Mitigation	Opening Impact	Opening Impact with Mitigation	Do Minimum Impact	Scheme Impact	Scheme Impact with Mitigation
				(1)	(2)	(3)	(4)	(5)	(6)	(2 - 1)	(3 - 1)	(4 - 1)	(5 - 1)	(6- 1)
17641	THE GABLES, POOL ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 3AL	0	E	50.7	58.1	56.9	51.0	58.4	57.2	7.4	6.2	0.3	7.7	6.5
17641	THE GABLES, POOL ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 3AL	1	E	52.4	59.7	58.5	52.8	60.0	58.8	7.3	6.1	0.4	7.6	6.4
17678	HAZELDENE, POOL ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 3AL	0	N	49.5	45.6	45.5	49.8	45.9	45.8	-3.9	-4.0	0.3	-3.6	-3.7
17678	HAZELDENE, POOL ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 3AL	1	N	51.7	47.5	47.5	52.0	47.9	47.8	-4.2	-4.2	0.3	-3.8	-3.9
18071	CEFNAIRE, NEWTOWN AND LLANLLWCHAIARN, SY16 3AA	0	E	41.4	48.6	46.9	41.8	49.2	47.7	7.2	5.5	0.4	7.8	6.3
18071	CEFNAIRE, NEWTOWN AND LLANLLWCHAIARN, SY16 3AA	1	E	43.2	50.5	48.4	43.6	51.1	49.1	7.3	5.2	0.4	7.9	5.9
18753	56, LON HELYG, NEWTOWN AND LLANLLWCHAIARN, SY16 1HY	0	E	62.9	58.0	58.0	63.2	58.4	58.4	-4.9	-4.9	0.3	-4.5	-4.5
18753	56, LON HELYG, NEWTOWN AND LLANLLWCHAIARN, SY16 1HY	1	E	65.1	60.2	60.2	65.4	60.5	60.5	-4.9	-4.9	0.3	-4.6	-4.6
19057	CIL HAUL, UPPER DOLFOR ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 3AB	0	E	37.1	49.1	49.1	37.4	51.8	51.7	12.0	12.0	0.3	14.7	14.6

Receiver ID	Address	Floor	Façade	2017DM	2017DS	2017DS Mitigation	2032DM	2032DS	2032DS Mitigation	Opening Impact	Opening Impact with Mitigation	Do Minimum Impact	Scheme Impact	Scheme Impact with Mitigation
				(1)	(2)	(3)	(4)	(5)	(6)	(2 - 1)	(3 - 1)	(4 - 1)	(5 - 1)	(6- 1)
19057	CIL HAUL, UPPER DOLFOR ROAD, NEWTOWN AND LLANLLWCHAIARN, SY16 3AB	1	E	38.8	50.7	50.7	39.2	53.3	53.3	11.9	11.9	0.4	14.5	14.5
20414	44, MEADOW VIEW, NEWTOWN AND LLANLLWCHAIARN, SY16 1NU	0	E	36.5	52.6	50.0	36.9	53.0	50.5	16.1	13.5	0.4	16.5	14.0
20414	44, MEADOW VIEW, NEWTOWN AND LLANLLWCHAIARN, SY16 1NU	1	E	38.2	53.7	51.0	38.6	54.1	51.5	15.5	12.8	0.4	15.9	13.3
20485	18, MEADOW VIEW, NEWTOWN AND LLANLLWCHAIARN, SY16 1NU	0	E	38.2	52.5	49.0	38.5	52.9	49.5	14.3	10.8	0.3	14.7	11.3
20485	18, MEADOW VIEW, NEWTOWN AND LLANLLWCHAIARN, SY16 1NU	1	E	39.3	53.7	50.1	39.7	54.1	50.6	14.4	10.8	0.4	14.8	11.3

A full set of Noise Level Predictions for all the properties assessed are included in Volume 3, Appendix H.2.

11.7. Summary and Conclusions

During the construction of the Scheme significant noise impacts are not expected at distances beyond 100m from the works or from compounds, and for the majority of the planned activities, significant noise impacts are not expected at distances beyond 50m from the works or compounds. There is a limited number of locations where properties are within 50m of the works. No properties are predicted to experience sufficient construction noise to qualify for temporary rehousing during the construction phase.

A detailed assessment of 3829 residential and 39 non-residential properties has been undertaken and the detailed results are in Volume 3, Appendix H.2.

The Scheme with mitigation gives rise to a greater number of properties experiencing a decrease in noise than an increase in noise. When the Scheme opens there would be significant decreases in noise at over 900 properties within Newtown as traffic re-routes from existing roads onto the Scheme. Overall, there would be some decreases in noise for over 3000 properties. Significant improvements, or decrease, in noise levels (of at least 5dB) would be experienced along Llanidloes Road, Lon Pantyllyn and Maesydail housing estate, Maesyrhandir housing estate, Plantation Lane, Cwrt Penllan, Lon Afallen, Lon Cerddyn, Lon Ceirios, Green Acres, Wynfields, Lon Helyg, Lon Relyg, Hill View Close, Pine Gardens, Pine Close, Latham Drive, Pavillion Court, New Road and Pool Road.

The Scheme would cause increases in noise at over 900 properties close to the Scheme, which would be significant at around 400. By the design year, with mitigation included, the changes in noise would follow the same pattern with a similar percentage of properties with increases and decreases in noise. There would be significant decreases in noise at around 160 properties and significant increases in noise at around 210. If the Scheme was not constructed then changes in noise would be negligible.

The Scheme would give rise to a decrease in noise nuisance at approximately 2800 properties compared to approximately 1000 that would receive an increase. The greatest increases in nuisance would occur at the properties which receive the greatest increases in noise. The Scheme would also give rise to a decrease in airborne vibration nuisance.

No properties are expected to qualify for noise insulation due to operational noise levels. The Scheme would not negatively impact on any relevant polices including the proposed policies contained in the PCC Deposit LDP.

12. Effects on all Travellers

12.1. Introduction

12.1.1. General

This chapter addresses impacts in relation to 'Effects on all Travellers' associated with the Scheme. It includes an assessment of impacts on pedestrians, cyclists, equestrians and vehicular travellers.

12.1.2. Policy context

National and Regional Policies and Plans

The Wales Transport Strategy (One Wales: Connecting the Nation) places high emphasis on the promotion of sustainable transport networks that safeguard the environment while strengthening the country's economic and social life. Promotion of walking and cycling is key to reducing greenhouse gas emissions and other environmental impacts, which is one of the priorities of the Strategy. Improving access between key settlements and sites, integrating local transport, enhancing international connectivity and increasing safety and security are also priorities of the Strategy, which relate to all travellers.

The Walking and Cycling Action Plan for Wales 2009 – 2013 is of particular relevance to this chapter as it is designed to encourage more people to walk and cycle more safely and more frequently. The objectives and actions are set out in Section 4.15 of the Action Plan.

The Active Travel (Wales) Act 2013 completed its passage through the National Assembly for Wales in October 2013 and came into force in 2014. The purpose of the Act is to require local authorities to continuously improve facilities and routes for pedestrians and cyclists and to prepare maps identifying current and potential future routes for their use. In relation to the Scheme, the Bill specifically makes provision for: *'requiring the Welsh Ministers and local authorities, in constructing and improving highways, to have regard to the desirability of enhancing the provision made for walking and cycling'.*

The Trafnidiaeth Conolbarth Cymru (TraCC) Regional Transport Plan also places a high emphasis on the need for sustainable transport in the Mid Wales Region with the TraCC vision stating *'……ensures access for all to services and opportunities, sustains and improves the quality of community life and respects the environment'.*

Powys County Council Adopted UDP (March 2012)

The Powys County Council Adopted UDP Strategic Policy SP6 relates to development and transport. This aims to make developments acceptable if they maintain and improve the transportation infrastructure in Powys or enable access by public transport or for pedestrians and cyclists.

The Scheme is addressed under Chapter 8.5 of the plan which relates to highway improvement schemes. The plan's detailed policy for Highway Improvement Schemes states that:

'the Council will protect programmed routes that would obstruct the undertaking of the planned improvement scheme, as shown on the inset maps. Support will be given to other improvement schemes that comply with the policies and proposals in the plan and bring the following listed benefits:

1. *The safety of all road users, especially pedestrians and cyclists;*
2. *Public transport operation;*
3. *The local environment;*
4. *Maintaining or increasing employment opportunities'.*

Policy T6 relates to walking and cycling and states:

'Proposals for the improvement of facilities and conditions for pedestrians and cyclists in terms of both the existing transport network and in relation to new development will be improved'.

It also states that the Council places great emphasis on a convenient system of pedestrian routes and bridleways through the County and has a statutory duty to ensure that footpaths, bridleways and other public rights of way stay open for public usage.

Under the Recreation and Leisure chapter, Policy RL 6 states:

*'Proposals that improve access to and enjoyment of the countryside by the public, including persons with limited mobility will be encouraged. In particular support will be given to (*amongst others*):*

1. *Development of the existing rights of way network through sensitively located circular routes, local walks, links and other trails, particularly those related to recreational sites, car parks, picnic areas, etc.*
2. *Continued maintenance and enhancement of existing rights of way, including sign posting and waymarking*
3. *Creation of new rights of way within proposed developments with links to the existing network'*

Powys County Council Deposit LDP (July 2014)

Section 2 of the LDP Written Statement (LDP Context) addresses Access and Transport. This states that Powys has over 9,166 km of Public Rights of Way, 88,000 hectares of access land and more than 6,000 km of road (430km of which are trunk roads). The LDP Policy T1 relates to transport infrastructure and states that:

Transport infrastructure and traffic management improvements will be permitted where they:

1. *Improve safety of transport users.*
2. *Reduce traffic congestion and/or improve the local environment.*
3. *Reduce demand for travel by private transport*
4. *Proved, promote and improve sustainable forms of travel*

12.2. Methodology

'Effects on all Travellers' was a new topic chapter in the DMRB Volume 11, Section 3 (Environmental Assessment Techniques) and introduced under IAN 125/09[12.1]. At present the Environmental Assessment Techniques section of the DMRB Volume 11 is being revised and there is no specific methodology developed for Effects on all Travellers. The IAN therefore advises that existing methodologies in relation to Pedestrians, Cyclists, Equestrians[12.2] and Vehicle Travellers[12.3] are used.

In relation to the non-motorised user assessment, the study area is dictated by the residential areas and areas of significant community facilities north and south of the Scheme. These determine the origin and destination of Non-motorised Users (NMU) trips. Community facilities are shown in Volume 2, Figure 12.1 a – e. In relation to vehicle travellers, the study area is the Scheme itself.

12.2.1. Non-motorised users

In relation to impacts on NMUs, the DMRB Volume 11, Section 3, Part 8 (June 1993)[12.2] recommends that the following methods be employed:

- *Refine the information on facilities and their catchment areas by asking for information from owners and managers of community facilities about number and home area of the customers or users. In cases where pedestrians' and others' travel patterns are complex and a scheme could have a major impact, origin/ destination surveys should be considered. Where relevant, it is important to estimate separately the numbers of people in vulnerable groups who will be particularly affected. This will usually be done either by including these groups as separate categories if pedestrian counts are made*

or by obtaining estimates of the number of users or residents of vulnerable facilities (for example, a primary school, community centre or old people's home).

- *Verify the earlier assessment of changes in journey length and amenity and community severance, allowing for any subsequent modifications (for example, to traffic forecasts, or the route alignment or mitigation on which the earlier assessment was based).*
- *Where cyclists will be significantly affected, obtain the views of the Cycle Touring Club (CTC) and local cycling groups and the local highway authority officer responsible for cycling provision on the implications on the preferred route. The views of the Overseeing Department's Regional Cycling Officer should then be obtained through the overseeing Department's Project Manager.*
- *The results of the assessment at Stage 3, to be described in the Environmental Statement should comprise a report assessing the number and location of pedestrians and others and their community facilities affected by the preferred route, taking proposed mitigation into account. The report should also describe any benefits to pedestrians and others from reductions in traffic along the existing route network. A map should be included which shows the community facilities, their catchment areas and routes used by pedestrians and others which are affected by the Scheme.*

The above methodology is over 20 years old (published in 1993) and some aspects may not be as relevant to the assessment of road schemes today. It is for this reason that the guidance is currently being revised. Some slight changes to this method are therefore proposed to make it more relevant to the existing situation. However the underlying principles of the method, which relate to the assessment of effects on the routes used by NMUs for recreation or to access important facilities within their community, will not alter.

In order to assess impacts on NMU journey patterns in the area, it is not considered relevant to write to managers etc. of significant community facilities to gain information about number and home areas of the users. Public information exhibitions were held on 9th July 2013 and 8th April 2014 in Newtown where this type of information has been obtained, as well as other relevant information that relates to NMUs. Additionally, desk based research and site surveys have been undertaken during 2013 to establish the locations of significant community facilities within the study area. The level of information currently available is therefore considered more than adequate as the basis for assessment.

Since the publication of the DMRB Assessment guidance in relation to pedestrians and 'others' (shown above), there are further requirement to ensure NMUs are fully considered in the design process of road construction. An NMU Audit has been undertaken in accordance with HD 42/05[12.4]. Background information of relevance to NMUs has been reported in an NMU Context Report (refer to Volume 3, Appendix I.1). The findings of this report contribute to the assessment of impacts on NMUs in this Chapter.

Much of the supporting information required by the DMRB methodology and which has been reported in the NMU Context Report is addressed under the 'Baseline Conditions' section below. Taking this into account the assessment of the NMU aspect of this section will be reported under the following headings:

- Severance of Public Rights of Way and other key NMU routes
- Impacts on cyclists and cycleways
- Relief from existing severance

In order to inform the assessment of relief from existing severance traffic data using an Average Annual Daily Traffic (AADT) core value figure has been used (refer to Volume 2, Figure 2.9). The percentage change in the AADT level from the base year (2013) and the AADT level from the opening year (2017) associated with the Scheme is used to determine the level of relief from severance.

12.2.1.1. Assessment criteria for non-motorised users

The tables below describe the magnitudes of impact for new severance (Table 12.2.1) and relief from existing severance (Table 12.2.2). These are based on the criteria in DMRB Volume 11, Section 3 Part 8 (June 1993)[12.2]. Table 12.2.3 describes the magnitudes of impact for the beneficial effects for the improvements to public rights of way as a result of the Scheme. This is based on the criteria used in a number of WelTAG[12.5] appraisals for transport studied in relation to Physical Fitness.

Table 12.2.4 describes NMU receptor sensitivity, which is also based on the criteria in DMRB Volume 11, Section 3 Part 8 (June 1993)[12.2].

Magnitude of Impact

The definitions of magnitude of impacts are described in Tables 12.2.1 to Table 12.2.3 below.

Table 12.2.1 – Impact magnitude for new severance

Magnitude of Impact	Description
Severe	*People are likely to be deterred from making trips to an extent sufficient to induce a re-organisation of their habits. This would lead to a change in the location of centres of activity or in some cases to a permanent loss to a particular community. Alternatively, considerable hindrance will be caused to people trying to make their existing journeys. Such effects can be brought about by, for example:* • *Pedestrian at-grade crossing of a new road carrying over 16,000 AADT in the opening year,* • *An increased length of journey of over 500m; or* • *Three or more hindrances set out under 'slight' or two or more set out under 'moderate'.*
Moderate	*Some residents, particularly children and elderly people, are likely to be dissuaded from making trips. Other trips will be made longer or less attractive, for example:* • *Two or more hindrances set out under 'Slight' applying to single trips; or* • *Pedestrian at-grade crossing of a new road carrying between 8,000 – 16,000 AADT in the opening year.* • *Journeys will be increased by 250 – 500m*
Slight	*In general the current journey pattern is likely to be maintained, but there will probably be some hindrance to movement for example:* • *Pedestrian at-grade crossing of a new road carrying below 8,000 AADT; or* • *A new bridge will need to be climbed or a subway traversed; or* • *Journeys will be increased by up to 250m.*
Neutral	*No impacts on journey patterns or hindrance of movement.*

Table 12.2.2 – Impact magnitude for relief from existing severance

Magnitude of impact	Description
Substantial	*where traffic AADT levels are predicted to reduce by approximately > 60% from existing levels*
Moderate	*where traffic AADT levels are predicted to reduce by approximately 30 – 60% from existing levels*
Slight	*where traffic AADT levels are predicted to reduce by approximately 30% from existing levels*

Table 12.2.3 – Impact magnitude for beneficial effects from improvements to PRoW

Magnitude of impact	Description
Large Beneficial	*Scheme is expected to substantially increase travel by active modes*
Moderate Beneficial	*Scheme is expected to moderately increase travel by active modes*
Slight Beneficial	*Scheme is expected to slightly increase travel by active modes*

Sensitivity of impact

Sensitivity of impact is outlined in Table 12.2.4 below.

Table 12.2.4 – NMU Receptor sensitivity

Receptor sensitivity	Description
High	*Vulnerable groups (the elderly, wheelchair users and children) who use pedestrian / cyclist routes to reach key community facilities (e.g. schools, doctors surgeries and shops)*
Medium	*Pedestrian, cyclist or equestrian routes that are used as a registered Public Right of Way or as part of popular recreational trail*
Low	*Pedestrian, cyclist or equestrian routes that are used on an infrequent basis, have low amenity value and do not provide connection with significant community facilities*

Significance of impact

Table 12.2.5 below outlines the significance of impacts on new severance and relief from existing severance and is adapted from DMRB Volume 11, Section 3 Part 9 [12.2].

Table 12.2.5 – Pedestrians and others significance of impact

Magnitude	Sensitivity		
	High	**Medium**	**Low**
Severe / substantial / high	Major Adverse / Beneficial	Major - Moderate Adverse / Beneficial	Moderate – Minor Adverse / Beneficial
Moderate / medium	Major – Moderate Adverse / Beneficial	Moderate – Minor Adverse / Beneficial	Minor Adverse / Beneficial
Slight / low	Moderate – Minor Adverse / Beneficial	Minor Adverse / Beneficial	Minor / Negligible
Neutral	Negligible	Negligible	Negligible

Assessment of amenity

Assessing the amenity of a route focuses on the general pleasantness of the journey and considers exposure to traffic, noise, dirt, air quality, and/or visual impact. A measurement of magnitude is inappropriate for the assessment of amenity. Instead the assessment involves a qualitative description, which describes any perceived changes in amenity value of the journey, resulting from the proposed options (as recommended in DMRB Volume 11, Section 3, Part 8, (June 1993) Para. 4.2).

12.2.1.2. NMU Consultation

The AGC Team has worked closely with Powys County Council (PCC) in relation to impacts of the Scheme on NMUs. The PCC Public Rights of Way Officers provided a consultation response to the Environmental Scoping Report (refer to Volume 3, Appendix A.2). Meetings, site walkover and correspondence with the Rights of Way officers and the AGC Team have taken place to achieve the optimal solution for the stopping up and diversion of Public Rights of Way affected by the Scheme. A record of correspondence with the PCC Public Rights of Way Officer and minutes from the meeting are provided in Volume 3, Appendix I.2.

In preparation of the NMU Context Report the following user groups were consulted:

- Ramblers Cymru,
- Powys Ramblers,
- Walking Newtown,
- Rail Ramblers,
- River Severn Custodians (RSC),
- Maldwyn Harriers,
- Newtown Triathlon,
- Sustrans,

- Cyclists' Touring Club (CTC),
- Severn Velo
- British Horse Society,
- Penhaligon Stud.

Vehicle Travellers

In relation to impacts on Vehicle Travellers, the DMRB Vol. 11, Section 3 Part 9[12.3] recommends that the following methods be used:

- *An assessment of views from the road should be made, taking account of landscape assessments and any modifications to the preferred route.*
- *An assessment of driver stress should be carried out taking account (for example) of finalised junction arrangements for the preferred route.*

Chapter 2 of DMRB Volume 11, Section 3, Part 9[12.3] gives further detail on assessing views from the road and defines 'view from the road' as the '*extent to which travellers, including drivers, are exposed to the different types of scenery through which a route passes'*. 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,*
- *Features of particular interest or prominence in the view.*

Chapter 4 of DMRB Vol. 11, Section 3, Part 9[12.3] gives details on assessing driver stress and identifies three main components of driver stress as follows:

- *Frustration,*
- *Fear of potential accidents, and*
- *Uncertainty relating to the route being followed.*

The guidance states that "*frustration is caused by a driver's inability to drive at a speed consistent with their own wishes in relation to the general standard of the road. Congestion, road works or difficulty overtaking slow moving vehicles are all causes of driver frustration. The main factors leading to fear are the presence of other vehicles, inadequate sight distances and the likelihood of pedestrians, particularly children, stepping into the road. Route uncertainty is caused primarily by signing that is inadequate for individual's purposes*."

12.2.1.3. Assessment Criteria for Vehicle Travellers

Views from the road

There are four categories which should be used in assessing travellers' ability to see the surrounding landscape (as set out in DMRB Vol. 11, Section 3, Part 9, Chapter 2[12.3]). These being:

- *<u>No View</u> – road deep in cutting or contained by false cuttings, environmental barriers or adjacent structures.*
- *<u>Restricted view</u> – frequent cuttings or structures blocking view.*
- *<u>Intermittent view</u> – road generally at ground level but with shallow cuttings or barriers at intervals.*
- *<u>Open view</u> – view extending over many miles, or only restricted by existing landscape features.*

For the purpose of this study the Scheme has been sub divided into sections of similar characteristics. The assessment has been based on the current landscape proposals as shown in Volume 2, Figures 7.12 a – m.

The driver's ability to view the surrounding landscape has been assessed at design year 15, unless otherwise stated when the plants would have reached sufficient maturity to meet their environmental function. It has been assumed that by design year (year 15) the trees would have be effective in visual mitigation. The ability to see the surrounding landscape has been based

on a driver's eye level of 1.2m unless otherwise stated. For the purpose of this assessment it is assumed that lighting would be confined to junction roundabouts. As part of the assessment reference has been made to seasonal variation within the planting. This would influence the ability to see the surrounding landscape throughout the year in addition to the duration for which views would be visible. Where embankments and cuttings are present approximate height difference above the existing ground level have been indicated. For the purpose of this assessment shallow cuttings means those less than 3m as views of the surrounding landscape would be obtained from high sided vehicles.

Driver stress

The DMRB guidance states that on account of available research evidence, the use of finely graded assessments of driver stress is not appropriate and a three point descriptive scale should be used:

- *Low,*
- *Moderate,*
- *High.*

The DMRB guidance in relation to Vehicle Travellers (Volume 11, Section 3, Part 9, Chapter 4)[12.3] states that there have been no reliable correlations established between physical factors and driver stress. However guidance is given on the appropriate category of stress for use in environmental assessments, providing the speeds and flows exist during peak hour flows for at least one kilometre of route (refer to Table 12.2.6 and 12.2.7 below). The guidance states that the assessment should be made for the worst year in the first fifteen after opening.

Table 12.2.6 Dual Carriageway Roads

Average peak hourly flow per lane, in flow Units / 1 hour	Average Journey Speed km/hr		
	Under 60	60 - 80	Over 80
Under 1200	High *	Moderate	Low
1200 - 1600	High	Moderate	Moderate
Over 1600	High	High	High

* 'Moderate' in urban areas.

Table 12.2.7 Single Carriageway Roads

Average peak hourly flow per lane, in flow Units / 1 hour	Average Journey Speed km/hr		
	Under 50	50 - 70	Over 70
Under 600	High *	Moderate	Low
600 – 800	High	Moderate	Moderate
Over 800	High	High	High

* 'Moderate' in urban areas.

12.2.2. Limitations and assumptions

As described in Section 12.2.1 the methodology for non-motorised users was published over 20 years ago and so some aspects may not be as relevant for the assessment of road schemes today, which constitutes a limitation. However, the methodology has been slightly modified (as described in Section 12.2.1) to make it more relevant to the existing situation.

The assessment of NMU route amenity relies on qualitative descriptions by the assessor which is subjective. There is also a degree of subjectivity in the assessment of views from the road although guidance is given regarding the openness of views (refer to Section 12.2.1.3).

12.3. Baseline Conditions

12.3.1. Non-motorised users

12.3.1.1. Trip generators / significant community facilities

The NMU Context Report has identified a number of 'trip generators'. These include places of employment, education, retail, recreation or community facilities that the public might travel to on foot or by bicycle. They are located within the centre of Newtown and throughout the

surrounding residential and industrial estates. Significant trip generators identified are listed below and are shown in Volume 2, Figure 12.1 (a – f).

Residential Areas

- Barnfields
- Garth Owen
- Glandulas Holiday Home Park
- Maesyrhandir
- Mochdre
- Stepaside Village
- Treowen
- Trehafren
- Vaynor
- Middle and Upper Dolfor Road
- Other residential

Leisure and Recreational Facilities

- Maldwyn leisure centre
- Newtown FC
- Golf, tennis, rugby and cricket clubs on Pool Road
- Strike

Commercial / Retail

- Town centre
- Retail units on Pool Road
- Various supermarkets
- Theatre Hafren
- Potters Recycling

Education

- Cedewain School
- Coleg Powys
- Fronlas Farm (Coleg Powys)
- Hafren Junior School
- Ladywell Green Nursery and Infant School
- Maesyrhandir Primary School
- Newtown High School
- Penygloddfa CP School
- Treowen Primary School
- Ysgol Dafydd Llwyd

Employment

- Dyffryn Enterprise Park
- Mochdre Industrial Estate
- St Giles Business Park
- Vastre Industrial Estate

Community facilities

- Montgomery County Infirmary
- Newtown Medical Centre
- Park Street clinic
- Various places of worship
- Bethshan Nursing Home
- Newtown Library
- Post Office
- Treowen Community Hall
- Newtown Cemetery

12.3.1.2. Desire lines

Desire lines are routes that people travelling on foot or by bicycle are likely to take in order to access areas of work, employment or community and leisure facilities (i.e. trip generators).There are many desire lines throughout Newtown, but relatively few that cross the Scheme.

The NMU Context Report has identified the following desire lines which are shown in Volume 2, Figure 12.1 (a – f):

- Glandulas Holiday Home Park towards Newtown via Mochdre Lane
- Stepaside village towards Newtown via Mochdre Lane
- Fronlas Farm (Coleg Powys) towards Newtown via Heol Ashley
- Mochdre Industrial Estate towards Newtown via Garth Owen / Plantation Lane
- Upper and Middle Dolfor Road towards Newtown

12.3.1.3. Public Rights of Way and Cycleways

Existing Public Rights of Way are shown in Volume 2, Figure 12.1 (a – f). The NMU Context Report (Volume 3, Appendix I.1) provides a description of the public rights of way and their general use and condition. Volume 2, Figure 12.2 (a – d) and 12.3 (a – d) show impacts and mitigation on rights of way during the construction and operational phases respectively.

The National Cycle Network (NCN) Route 81, which is part of the 'Lon Cambria' route through mid-Wales passes southwest to northeast through Newtown and is crossed by the Scheme at Mochdre Lane. There are also a number of cycle routes along the existing highways through Newtown.

Public rights of way, cycleways and permissive paths affected by the Scheme are listed in Table 12.3.1.

There is no public access over privately owned land adjacent to the Scheme through land allocated as 'open access land' under the Countryside Rights of Way (CRoW) Act 2000.

Table 12.3.1 – Public Rights of Way and Cycleways affected by the Scheme (west to east)

Right of way type	Number	Location	Summary of effect
Bridleway	BW251/ 16	West of Glandulas Holiday Home Park	165m stopped up between existing A489 Llanidloes Road to its connection with FP 251/8.
Footpath	FP251/8	West of Glandulas Holiday Home Park	No direct impact. Stopping up of 300m length and replaced with realigned PRoW upgraded to Bridleway
Footpath	FP251/9	Glandulas Holiday Home Park	Stopped up for a distance of 160m. Mitigated by upgrading to a Bridleway.
Footpath	FP251/7	Glandulas Holiday Home Park	Severance of footpath. Footpath to be stopped up for 275m from connection with A489 Llanidloes Road. Central sections upgraded to Bridleway to link to proposed Bridleway links to the south, east (via Gladulas Overbridge) and west.
Bridleway	BW251/ 5	South-east of Glandulas Holiday Home Park	Severance of Bridleway, Bridleway to be stopped up for a distance of 240m.
Footpath	FP251/4	West of Mochdre Lane	Footpath stopped up for 170m and replaced with realigned Bridleway.
Footpath	FP251/3	North of Mochdre Lane	Severance of footpath. Footpath stopped up for 140m and replaced with realigned Bridleway to the east

Right of way type	Number	Location	Summary of effect
Bridleway	BW251/ 2	Driveway of Glandulas Holiday Park	Short 18m section stopped up to accommodate the realigned existing A489. No significant effects as it would remain connected to the re-aligned road. New bridleway provided to the west and over Glandulas Overbridge.
Cycleway	NCN 81	Mochdre Lane	No impact. No temporary stopping up required during construction
Bridleway	BW253/ N6	Castell-y-Dail	Severance at start point at Castell-y-Dail. Stopping up of the 270m eastern section. Replacement provided to the north that would link to retained sections of the PRoW to the south via the Bridleway Underpass.
Bridleway	BW253/ N5	Castell-y-Dail	Severance at start point at Castell-y-Dail. Stopping up of the 445m eastern section. Replacement provided to the north that would link to retained sections of the PRoW to the south via the Bridleway Underpass
Footpath	FP253/ N4	Fronlas Farm to Castell-y-Dail	No direct impact. Stopped up for 745m and realigned along the toe of the embankment along the northern side of the Scheme.
Permissive path	N/A	Fronlas Farm to Castell-y-Dail	No direct impact.
Permissive path	N/A	South of Fronlas Farm	Severance of path's northern end for 145m. Path diverted along southern boundary of the Scheme and then via the Bridleway Underpass during operation.
Footpath	FP253/ N3	Mochdre Industrial Estate to A483	Footpath to be stopped up for 350m. No replacement provided as not currently used and no safe verge available to walk along A483.
Bridleway	BW253/ N30(A)	Upper Dolfor to Middle Dolfor Road	Bridleway not affected
Footpath	FP253/ N14	South from Brimmon Lane	Temporary stopped up for 200m during construction and temporary diversion provided to allow construction of Brimmon Farm underpass. Accommodated via Brimmon Farm underpass during operation. Used for organised walks by the Rail Ramblers and Walking Newtown
Bridleway	BW253/ N15	Heol Treowen / Kerry Road to Great Brimmon Farm	Severance of southern section. Stopped up for 170m. Diversion to the west and through Brimmon Lane underpass during operation.
Footpath	FP253/ N22	East of Kerry Road / West of Wern Ddu Lane	Short 8m section stopped up immediately east of Kerry Road and an 8m section immediately west of Wern Ddu Lane to accommodate the realigned A489 Kerry Road and Wern Ddu Lane. No significant effects as it would remain connected to the re-aligned roads

12.3.1.4. NMU Flows

As reported in the NMU Context Report (refer to Volume 3, Appendix I.1) NMU surveys were undertaken from 14th to 17th January 2014, from 0830 to 1630, to establish the movements of pedestrians, cyclists and equestrians within the proposed bypass corridor. Flows on all routes were less than 5 users per day and many of the Public Rights of Way were obstructed.

It is considered that use would increase if the routes were improved or opened up, and local consultation has identified groups of volunteers with a desire to do so. During the consultation exercise it was found that some rights of way are used for organised walks (e.g. FP14, south of Brimmon Lane – refer to Table 12.3.1).

In general the NMU Context Report concluded that existing footpaths and bridleways are used sporadically, usually by organised groups during periods of fine weather and at weekends.

12.3.1.5. Traffic Data

Table 12.3.2 below shows baseline traffic figures (AADT 2013) compared with predicted traffic figures for the opening year (AADT 2017) (refer also to Volume 2, Figure 2.9). This information is used when assessing impacts in relation to community severance.

Table 12.3.2 – Baseline traffic data compared with predicted opening year traffic data

	2013 AADT	2017 AADT	% Increase / Decrease
Llanidloes Road (East)	15,080	5,593	- 63%
New Road (West)	18,703	10,721	- 43%
New Road (East)	14,548	5,999	- 59%
Pool Road (West)	11,281	3,221	- 71%
Plantation Lane	2,676	1,328	- 50%
A483 Dolfor Road (North)	6,999	7,553	+ 8%
Heol Treowen	3,094	1,905	- 38%
A489 Kerry Road (North)	5,257	5,666	+ 8%
Bypass (West)	x	8,739	x
Bypass (Central)	x	11,115	x
Bypass (East)	x	12,480	x

12.3.2. Outcomes of Consultation

12.3.2.1. Powys County Council

Following a number of meetings, correspondence and discussions with PCC's Public Rights of Way and Definitive Map Officers, an agreement was reached in relation to the stopping up and diversion of Public Rights of Way affected by the Scheme. Having regard for the newly established Active Travel Bill, PCC wished to improve and rationalise the Public Rights of Way network that was affected by the Scheme, particularly in the western end. This involved the stopping up some affected paths that were poorly used and degraded and up-grading other paths to Bridleway status and providing 3m wide aggregate surfacing. The approach would ensure connectivity of the rights of way north and south of the Scheme. Improvements provided would help meet both PCC and WG legislative policy aspirations in relation to active travel.

12.3.2.2. Other user groups

The outcomes of consultation with other user groups are provided in the NMU Context Report (Refer to Volume 3, Appendix I.1). In summary the Scheme complies with the requirements of the other user groups where feasible.

12.4. Predicted Environmental Effects

12.4.1. Construction impacts

12.4.1.1. New severance

During construction the NMU routes listed in Table 12.4.1 would be affected. The magnitude and significance of impacts shown in Table 12.4.1 assume no mitigation is provided.

Table 12.4.1 – Construction impacts on NMU routes prior to mitigation

Receptor	Description of impact	Sensitivity	Magnitude	Significance	Comments / notes
Bridleway BW251/16 (West of Glandulas Holiday Home Park)	Severance and stopping up of first section south of A489	Medium	Severe	Major – Moderate Adverse	
Footpath FP251/8 (West of Glandulas Holiday Home Park)	Stopped up	Low	Severe	Moderate – Minor Adverse	Sensitivity given as low as path is infrequently used and obstructed.
Footpath FP251/7 (Glandulas Holiday Home Park)	Severance of footpath. Footpath stopped up.	Low	Severe	Moderate – Minor Adverse	Sensitivity given as low as path is infrequently used and obstructed.
Bridleway BW251/5 (South-east of Glandulas Holiday Park)	Severance of Bridleway. Bridleway stopped up	Medium	Severe	Major – Moderate Adverse	
Footpath FP251/4 (West of Mochdre Lane)	. Footpath stopped up.	Medium	Severe	Major – Moderate Adverse	
Footpath FP251/3 (North of Mochdre Lane)	Severance of footpath. Footpath stopped up	Medium	Severe	Major – Moderate Adverse	
Bridleway BW251/2 (Driveway of Glandulas Holiday Home Park)	Sothern section stopped up.	Low	Severe	Moderate – Minor Adverse	Sensitivity given as low as route is obstructed with no onward connection.
Cycleway NCN (81 Mochdre Lane)	No direct impact. Minor effect on route amenity.	Medium	Neutral	Negligible	
Bridleway BW253/N6 (Castell-y-Dail)	Severance at start point at Castell-y-Dail. Stopping up of eastern section.	Medium	Severe	Major – Moderate Adverse	
Bridleway BW253/N5 (Castell-y-Dail)	Severance at start point at Castell-y-Dail. Stopping up of eastern section.	Medium	Severe	Major – Moderate Adverse	
Footpath FP253/N4 (Fronlas Farm to Castell-y-Dail)	No direct impact	Medium	Neutral	Negligible	
Permissive path (Fronlas Farm to	No direct impact	Medium	Neutral	Negligible	

Receptor	Description of impact	Sensitivity	Magnitude	Significance	Comments / notes
Castell-y-Dail)					
Permissive path (South of Fronlas Farm)	Severance of path's northern end	Medium	Severe	Major – Moderate Adverse	
Footpath FP253/N3 (Mochdre Industrial Estate to A483)	Footpath stopped up.	Low	Severe	Moderate – Minor Adverse	Sensitivity given as low as route is unpassable. Consultation demonstrates that the route is not widely known.
Footpath FP253/N14 (South from Brimmon Lane)	Footpath stopped up.	Medium	Severe	Major – Moderate Adverse	Used for organised walks by the Rail Ramblers and Walking Newtown
Bridleway BW253/N15 (Heol Treowen / Kerry Road to Great Brimmon Farm)	Severance of southern section. Footpath stopped up.	Low	Severe	Moderate – Minor Adverse	Sensitivity given as low due to obstruction and low amenity due to wet ground conditions in winter.
Footpath FP253/N22 (between Kerry Road and Wern Ddu Lane)	Footpath stopped up at western and eastern ends	Medium	Severe	Major – Moderate Adverse	Used for organised walks by the Rail Ramblers and Walking Newtown

12.4.1.2. Relief from existing severance

There would be no relief from existing severance for NMUs in Newtown during the construction phase as the Scheme would not remove traffic from within the town.

12.4.1.3. Views from the Road

The majority of construction would occur outside the highway boundary and therefore would have a minimal impact on views from the existing roads and for the most part these would remain unchanged.

In sections where the Scheme would tie into the existing A489 (Llanidloes Road Roundabout Ch 00.000) and existing A483 (Dolfor Road and Lower Dolfor Road Roundabout Ch 2100.00 – 2600.00 and A483 Pool Road Roundabout Ch 5600.00 – 5900.00) construction activities would dominate the views from the road.

12.4.1.4. Driver stress

As there would be no traffic on the bypass until Scheme completion, there would be no driver stress associated with construction of the majority of the Scheme.

Where the Scheme ties into the existing A489 (Llanidloes Road Roundabout Ch 00.000) and existing A483 (Dolfor Road and Lower Dolfor Road Roundabout Ch 2100.00 – 2600.00, Kerry Road Roundabout Ch 4350 – 4450 and A483 Pool Road Roundabout Ch 5600.00 – 5900.00) construction impacts would have a significant impact on driver stress.

Assuming no mitigation, the works would cause considerable disruption to drivers and road safety. There would also be an effect of increased route uncertainty. The construction impacts in these sections would be high.

12.4.2. Operational impacts

12.4.2.1. New severance

During the operational phase, without the provision of mitigation measures, such as diversions or crossing points the impacts on NMU routes would be the same as shown in Table 12.4.1 for construction impacts.

12.4.2.2. Relief from existing severance and increases in severance

During operation the Scheme would provide relief from existing severance north and south of the existing A489 / A483 corridor (Llanidloes Road, New Road and Pool Road), along Plantation Way and Heol Treowen. There would also be increased severance west and east of Dolfor Road and Kerry Road.

Table 12.4.2 shows the magnitude and significance of these impacts assuming no mitigation is provided.

Table 12.4.2 – Operational impacts (relief and increase of severance) prior to mitigation.

Receptor	Description of impact	Sensitivity	Magnitude	Significance	Comments / notes
NMU journeys north and south of A489 Llanidloes Road	Relief from existing severance (63% reduction in AADT during opening year)	High	Substantial	Major Beneficial	Relates particularly to residents of Vaynor and Trehafren accessing facilities such as the schools, leisure centre, community centres and Mochdre Industrial Estate to the south. Also residents of Maesydail and Garth Owen accessing facilities to the north. Amenity of journeys improved due to reduced traffic and increased safety.
NMU journeys north and south of A483 New Road (west)	Relief from existing severance (43% reduction in AADT during opening year)	High	Moderate	Major – Moderate Beneficial	Relates particularly to residents of Heol Treowen and New Road accessing facilities in the town centre. Also residents north of A483 accessing facilities south, such as schools and the railway station etc. Amenity of journeys improved due to reduced traffic and increased safety.
NMU journeys north and south of A483 New Road (east)	Relief from existing severance (59% reduction in AADT during opening year)	High	Moderate	Major – Moderate Beneficial	As above
NMU journeys north and south of A483 Pool Road	Relief from existing severance (71% reduction in AADT during opening year)	Medium	Substantial	Major – Moderate Beneficial	Relates particularly to residents of Barnfields and Penygloddfa accessing facilities to the south and east (e.g. super markets and the Vastre and Dyffryn Industrial Estates). Receptor sensitivity given as medium rather than high as shopping and employment facilities are less likely to generate trips for vulnerable users (e.g. the elderly and children). Amenity of journeys improved due to reduced traffic and increased safety.
NMU journeys north and south of Plantation Lane	Relief from existing severance (50% reduction in AADT during opening year)	High	Moderate	Major – Moderate Beneficial	Relates particularly to residents of Garth Owen accessing facilities such as Newtown High School and the Leisure centre to the north). Amenity of journeys improved due to reduced traffic and increased safety.
NMU journeys east and west of Dolfor Road (south)	Increase in existing severance (8% increase in AADT during opening year)	High	Neutral	Negligible	Relates particularly to residents in Garth Owen access facilities in Treowen such as the primary school, church and care home. Also residents in Treowen accessing facilities such as Newtown High School and the Leisure Centre. Little change from existing situation. Amenity of journeys remains the same.

NMU journeys north and south of Heol Treowen	Relief from existing severance (38% reduction in AADT during opening year)	High	Moderate	Major – Moderate Beneficial	Relates particularly to residents in Treowen accessing facilities north of Heol Treowen such as the primary school, church and care home. Amenity of journeys improved due to reduced traffic and increased safety.
NMU journeys east and west of Kerry Road	Increase in existing severance (8% increase in AADT during opening year)	Medium	Neutral	Negligible	Relates particularly to residents of Treowen accessing facilities such as the super markets along Pool Road and within the Vastre and Dyffryn Industrial estates. Receptor sensitivity given as medium rather than high as shopping and employment facilities are less likely to generate trips for vulnerable users (e.g. the elderly and children). Little change from existing situation Amenity of journeys remains the same.

12.4.2.3. Views from the road

The following outlines the assessment of the views from the road with the proposed planting as shown on the Landscape Mitigation Measures Volume 2 Figure 7.12.

Western arm of western A489 tie-in - Llanidloes Road Roundabout (Figure 7.12a)

On approaching the A489 Llanidloes Road Roundabout from the west along the existing A489, the scheme would be approximately 4m above the existing ground level. Proposed woodland to the south of the Scheme would extend the existing Fridd Wood, whilst to the north the proposed woodland planting would extend the section of riverside trees providing filtered views to the hills to the north during early plant establishment and during winter months when the trees are not in leaf. To the south views would be restricted by a belt of existing woodland, rising topography and the proposed woodland planting. A designed landscape treatment to the roundabout would signify a gateway location and as the roundabout itself would be lit this would reinforce the urban influence in this location.

Drivers' views of surrounding landscape: Intermittent View

Eastern arm of western A489 tie-in - Llanidloes Road Roundabout (Figure 12a – b)

On approaching the roundabout travelling south west along the existing A489 from Newtown the road corridor passes through agricultural fields bounded by hedgerows. The Scheme would by pass the existing road with a realignment to the entrance to the Glandulas Holiday Home Park. The scheme would rise to approximately 2m above the existing ground level so there would be views to the River Severn and the formal planting at Glanhafren Hall. To the south views to the Glandulas Holiday Home Park would be restricted in time by the proposed hedgerow planting and scattered groups of tree planting. The section of existing road together with the hedgerows would be retained to provide access to Glanhafren Hall and as a bridleway.

Drivers' views of surrounding landscape: Intermittent View

Chainage Ch. 0 – 220 (Figure 7.12c)

Travelling east from the A489 Llanidloes Road Roundabout the carriageway would be within cutting, approximately 4m deep. This, in combination with the proposed woodland planting, would create an enclosed and clearly defined road corridor with side views out to the wider landscape being obstructed but with long views of the hills to the east. At Ch 150 the Glandulas Overbridge would provide an obvious feature within the view along the Scheme. Directly to the east of the Overbridge, false cuttings and associated woodland and hedge planting would restrict views to the Holiday Home Park to the north and outward views to the south.

Drivers' views of surrounding landscape: Restricted View

Chainage Ch 220 – 480 (Figure 7.12c)

From Ch 220 the cutting would become deeper, up to 15 m in depth, screening all outward views, other than those to the far distant upper valley slopes. Between Ch300-450 exposed rock would be apparent on the lower profile of the cutting slopes, with woodland planting above on the upper slopes. The enclosed nature of this section of the Scheme, in combination with exposed rock, would create a distinct character.

Drivers' views of surrounding landscape: Restricted View

Chainage Ch 480 – 700 (Figure 7.12c)

Continuing east the Scheme would change from cutting to embankment, approximately 12m above ground level as it approaches Mochdre Brook at Ch 550. Woodland planting on both sides of the carriageway would curtail any long views and would reduce the visual impact of the 2m high acoustic barrier. Passing over the bridge there would be wider views of the landscape to the north and south. To the east of Mochdre Bridge the Scheme would pass on embankment with a

2m acoustic barrier which extends to the east of Coleg Powys Underpass. During early plant establishment wider views would be possible but as woodland matures it would provide effective screening in both winter and summer months. However there would still be longer views to distant hills and valley sides along the line of the road.

Drivers' views of surrounding landscape: Restricted View

Chainage Ch 700 – 1150 (Figure 7.12c – d)

This section of the Scheme would traverse the valley side, with predominantly cutting slopes on the southern side, up to 2m high and embankments to the north. The surrounding topography and cutting slopes would limit outward views to the south while to the north the varying profile and depth of mitigation planting would allow filtered winter views. These views would include the adjacent but lower industrial estate, but would more likely be directed to the far valley slopes to the north. At night the lighting in Newtown would also be apparent. Beyond Ch1000 the Scheme is on embankment on both sides, up to 16m high. From the embankment there would be filtered winter views whilst in the summer all views out would be restricted due to leaf cover.

Drivers' views of surrounding landscape: Restricted View

Chainage Ch 1150 – 1480 (Figure 7.12d)

Between Ch1150 and 1320 there would be a 28m deep cutting on the southern side of the Scheme, the bottom sections of which would be exposed rock. Depending on the competency of the rock this could provide geological interest to the driver. Higher up the slopes there would be woodland planting which would further screen any views to the south. To the north views out would be partially obstructed due to the acoustic barrier and woodland mitigation planting however on each side of the barrier intermittent views through the planting would be possible during the winter months when not in leaf. As elsewhere there would be some distant views of the wider landscape context along the line of the road corridor.

Drivers' views of surrounding landscape: Restricted View

Chainage Ch 1480 – 2020 (Figure 7.12d – e)

Through this section the Scheme would continue to cross the relatively steep valley slopes, resulting in the southern side being at grade or on a low embankment, up to approximately 3m, whilst the northern side would be on embankment up to 15m high. The grassed southern slopes would be planted with intermittent trees and bounded by a field hedgerow, allowing drivers outward views, restricted only by sections of hedgerow and trees. To the north the corridor would be more visually enclosed due to woodland planting, with filtered winter views to the industrial Estate, Newtown and the hills beyond. To the north of the Scheme between Ch1600 and 1800 a false cutting around the lay-by would further limit outward views. There would be long long along the carriageway to the wider undulating landscape.

Drivers' views of surrounding landscape: To the north - Restricted View

To the south - Intermittent View

Chainage Ch 2020 – 2500 (Figure 7.12e – g)

This section of the Scheme would include the roundabout junction with the A483 Dolfor Road. Between Ch. 2020 and 2100 the Scheme would be on embankment, up to 15m above existing ground level, with woodland planting on both the northern and southern side slopes. Consequently views would be largely enclosed by Year 15, although there may be some filtered views to the adjacent Mochdre Industrial Estate in winter. There would be highway lighting and singage at the A483 Dolfor Road Roundabout creating a more urban context. This would be reinforced by more formal planting.

The A483 Dolfor Road Roundabout would be in cutting which would continue eastwards through the undulating topography to Dolfor Underbridge and north along the link road to Lower Dolfor Road Roundabout. The lower slopes would be in open grassland with intermittent trees, with woodland on the upper slopes. This area would therefore be visually enclosed, with its character dominated by the highway infrastructure of the roundabout, signage and lighting.

To the east of the A483 Dolfor Road Roundabout the Scheme would enter a cutting up to 23m deep through made up ground. Again the lower slopes would be planted with only intermittent groups of trees, with woodland on the upper cuttings. The scale of this cutting alone would limit drivers' outward views with only distant views to higher valley sides along the line of the road. The views within the road corridor would be dramatic as a consequence of the scale of the earthworks and the high horizon to each side.

Between the A483 Dolfor Road and the southern tie-in the Scheme would be largely in cutting, up to 4m deep, which would obstruct views of the surrounding landscape although there would be longer views along the line of the carriageway. Woodland and hedgerow planting along the top of the slope would increase the visual enclosure within this area, whilst the lower cutting would be in grass with intermittent trees. At the tie-in to the A483 Dolfor Road the Scheme would be at grade allowing drivers views across the adjacent farm and the field pattern beyond.

Drivers' views of surrounding landscape: Restricted View

Lower Dolfor Road Roundabout to Newtown (Figure 7.12g)

This short section of the Scheme would include both the Lower Dolfor Road Roundabout and the link into the Mochdre Industrial Estate to Heol Ashley. This part would be generally at grade or on low embankment. The roundabout would be lit, emphasising the urban context which would be reinforced by the Garth Owen acoustic barrier and the attenuation and treatment pond. Planting to the east of the roundabout would reinforce the existing planting at the bottom of the existing steep slope to Upper Dolfor Road. Views to the west along the Heol Ashley link road would be restricted due to existing topography, housing and industrial units.

Drivers' views of surrounding landscape: Intermittent View

Chainage Ch 2500 – 2630 (Figure 7.12f)

The Dolfor Underbridge would cross the narrow valley known as the Dingle, passing some 16m above Middle Dolfor Road. Other than the existing woodland adjacent to the bridge abutments there would be open long outward views, although the Upper Dolfor Overbridge would form a significant component of the view. Close views would be restricted by the enclosed valley landscape context. The Scheme would pass over the Upper Dolfor Road and would provide a visual focus for east-bound drivers and would clearly restrict views for its short duration.

Drivers' views of surrounding landscape: Open View

Chainage Ch 2630 – 3100 (Figure 7.12f – h)

The Scheme would be within a deep cutting up to 21m high to the north of the Scheme. The northern slope would be open grassland with groups of individual trees, and bounded on its crest by a hedgerow. The southern cutting face would include an area of exposed rock along its lower margins, with woodland planting above. Consequently there would be no views for drivers of the wider landscape. For west-bound drivers the Upper Dolfor Overbridge would provide a visual focus at the end of the cutting.

Drivers' views of surrounding landscape: No View

Chainage Ch 3100 – 3460 (Figure 7.12h – i)

The scheme would be elevated on embankment up to 21m above the adjacent ground level, with the side slopes planted in mitigation woodland. There would be a false cutting on the northern side between Ch. 3080 – Ch. 3420 further restricting views to the north. Consequently outward views would be screened in summer, with filtered views to the wider landscape available during winter months. To the south any views would be towards agricultural fields, farm buildings and the rising land beyond.

Drivers' views of surrounding landscape: Restricted View

Chainage Ch 3460 – 3900

To the east of Brimmon Farm Underpass false cuttings restrict views to the south whilst to the north the embankment provides elevated views. Due to the continued presence of woodland block planting upon the slopes on either side of the carriageway outward views would be screened in summer, with filtered views to the wider landscape available during winter months. Between Ch. 3600 – 3700 to the south of the Scheme where the false cutting is reduced in height views remain obstructed by the acoustic barrier at this location. There are long views along the carriageway to the wider landscape context.

Drivers' views of surrounding landscape: Restricted View

Chainage Ch 3900 – 4300 (Figure 7.12i)

Through this section the Scheme would be largely within cutting, up to 15m deep on the southern side and 10m to the north. The lower slopes would be grass with woodland planting on the upper slopes and hedgerows along the crest. Consequently there would be no views to the wider landscape for drivers, other than along the line of the Scheme.

Drivers' views of surrounding landscape: Restricted View

Chainage 4300 – 4700 and Kerry Road Roundabout (Figure 7.12j)

This section would include Kerry Road Roundabout and the main line largely at grade or on low embankment. Narrow margins of woodland planting and hedgerows would line the road corridor providing a degree of visual enclosure, but there would be a combination of open and filtered outward views, particularly during winter months. There would be views to the rising landscape to the south. The roundabout and its approaches would be lit, introducing an urban character to the drivers' experience especially at night.

South of the Kerry Road Roundabout the Scheme would tie in to the existing road on embankment, but with woodland planting to help screen Lower Brimmon Farm to the east and grassland with hedgerows round the attenuation pond to the west.

Drivers' views of surrounding landscape: Intermittent View

Chainage Ch 4700 – 5200 (Figure 7.12j – k)

This section of the Scheme would be in cutting, up to 10m deep, with the landscape treatment being generally open grass slopes with scattered individual trees, and with the crest of the cutting bounded by hedgerows. The Wern Ddu Overbridge would cross at Ch 4920, and here woodland planting would partially screen the bridge abutments. Through this section the Scheme would be visually enclosed by the cutting form but with an open corridor character due to the generally unplanted slopes. There would be long and narrow views along the road corridor to the distant landscape context.

Drivers' views of surrounding landscape: Restricted View

Chainage Ch 5200– 5400 (Figure 7.12k – l)

This section of the Scheme would cross the prevailing topography such that on its western side it would be close to at-grade but to the east would be in a false cutting. Woodland planting on the eastern slopes would provide a degree of visual enclosure, particularly during summer months, as would hedgerows on both sides. In winter there would be filtered views to the wider landscape but in general planting would define the visual corridor.

Drivers' views of surrounding landscape: Intermittent View

Chainage Ch 5400 – A483 Pool Road Roundabout (Ch 5850) (Figure 7.12l – m)

The Scheme would cross both the railway line and Pool Road with underbridges in this section, and therefore the road would be elevated on embankment up to 13m high. Both faces of the embankment would be planted in mitigation woodland, visually enclosing the highway corridor. At the underbridge positions there would be open views from the road to each side, but at vehicle

speeds the duration of these opportunities would make them negligible. In winter the elevated road position would provide filtered views across the river valley floor.

Drivers' views of surrounding landscape: Restricted View

A483 Pool Road Roundabout (Ch 5850) – eastern tie-in (Figure 7.12m)

Whilst the roundabout would be approximately level with the fields to the north, a false cutting and associated planting would provide visual enclosure of the highway corridor. The highway infrastructure, more formal landscape treatment and lighting would create an urban character around the roundabout. To the east of the junction the Scheme would be on embankment, with the side slopes planted in woodland. Through summer this planting would visually enclose the corridor, but during winter the leaf-fall would allow drivers filtered views to the fields beyond.

Drivers' views of surrounding landscape: Restricted View

A483 Pool Road Roundabout (Ch. 5850) – Pool Road tie-in (Figure 7.12l – m)

From the roundabout the Pool Road link would be within a low cutting before passing under the Scheme at Pool Road Underbridge. This section would have a landscape treatment to create a gateway character, as the eastern approach to Newtown. The topography and planting would prevent views out of the highway corridor, whilst the underbridge would provide a visual focus. Where the Scheme would tie-in to the existing Pool Road there would be an embankment on its northern side. This would be planted in woodland and in combination with proposed hedgerow would provide a degree of visual enclosure from driver eye-level, particularly during summer months. However due to the rising landscape to the south wider views would still be available to drivers.

Drivers' views of surrounding landscape: Intermittent View

12.4.2.4. Driver stress

The predicted levels of traffic for the central and eastern end of the bypass at design year (2032) are 600-800 Flow Units / 1 hour. Based on the DMRB guidance Table 12.2.7 for Single Carriageway Roads, the Scheme is predicted to have a Moderate driver stress levels as the average speeds would be in excess of 70Kph.

The Scheme would reduce driver stress as a result of:

- Reduced frustration, with fewer delays and reduced congestion, due to bypassing the busy town centre,
- Reduced frustration as a result of the 2 + 1 Road layout providing a wider carriageway with 1m clear separation between opposing vehicle flows.
- Reduced frustration as a result of the thin surface course material with reduced spray and noise generation
- Reduced fear due to improved junctions
- Reduced fear brought about by improved sight distances
- Reduced fear due to safer overtaking opportunities with 2 + 1 lane arrangement
- A reduction in route uncertainty as a result of clearer road layouts and better road signing. Signs would be provided with clear text and direction layouts in line with current design standards. Junctions and destination roads would be clearly named and numbered.
- Reduced frustration, with fewer delays on the de-trunked A483/A489 through Newtown.

It is assessed that on balance the Scheme would provide a 'moderate beneficial' effect on drivers' stress levels.

12.5. Proposed Mitigation

12.5.1. Construction mitigation

12.5.1.1. New severance

Public rights of way that are affected by the Scheme to the west of Mochdre Lane (i.e. BW251/16, FP251/8, FP251/9, FP251/7, BW251/5, FP251/4 and BW251/2) would be initially diverted to the south-east and across the Scheme adjacent to Mochdre Lane (refer to Volume 2, Figure 12.2 a – d). This would ensure connectivity of the rights of way network north and south of the Scheme. The Glandulas Overbridge would be completed early in the construction phase (Construction Phase 1.). Once this is complete, the structure would be used to maintain the connectivity of the rights of way network either side of the Scheme.

Footpath FP253/N4 would be upgraded to a bridleway and realigned along the toe of the northern embankment of the Scheme and the eastern section realigned along the route of the permissive path between Fronlas Farm and Castell-y-Dail. Both FP253/N4 and the permissive path between Fronlas Farm and Castell-y-Dail would be accessible throughout the construction phase.

A temporary diversion of BW253/N6, BW253/N5 and the permissive path south of FP253/N4 would be provided across the works area adjacent to the proposed Bridleway Underpass. This would accommodate the rights of way until such time that the Bridleway Underpass was complete at the end of Construction Phase 1. The underpass would then accommodate the permissive path and the Bridleways via a diversion from the east.

No mitigation would be provided in relation to the permanent stopping up of FP253/N3. This route is heavily obstructed and not widely known or used.

FP253/N14 would be stopped up and a temporary diversion provided adjacent to where the Brimmon Farm Underpass would be constructed (Construction Phase 1). Once complete the underpass would accommodate the footpath to maintain the connectivity north and south of the Scheme.

BW253/N15 would be stopped up and a temporary diversion provided adjacent to where the Brimmon Lane Underpass would be constructed. Once complete (following Construction Phase 1) the underpass would accommodate the Bridleway via a diversion from the east.

Short 8m sections at the western and eastern ends of FP253/N22 would be stopped up. Temporary diversions would be provided at these points to allow access along the path east from Kerry Road and west from Wern Ddu Lane during the construction phase.

12.5.1.2. Relief from existing severance

No mitigation is proposed in relation to relief from existing severance during the construction phase as no impacts have been identified.

12.5.1.3. Views from the road

There is no mitigation proposed in relation to drivers' views from the road during the construction phase.

12.5.1.4. Driver Stress

During the construction phase the sections of the Scheme which tie into the existing A489 at the proposed A489 Llanidloes Road Roundabout, the A483 at the A483 Dolfor Road Roundabout, the A489 at Kerry Road Roundabout and the A483 at the A483 Pool Road Roundabout would be subject to construction mitigation in the form of traffic management. Measures would include use of clear signage and lane markings. Two-way traffic would be maintained where feasible, although there would be some lane closures during construction of the tie ins controlled by temporary traffic signals.

A mandatory 40mph (approx.65 kph) speed limit would be imposed where construction occurs in the vicinity of the existing A483 and A489 roads. There is likely to be some increase in congestion and queue lengths when construction works take place directly on the existing A483 and A489 roads.

Traffic management measures would be applied to other minor roads in the area intersected by the Scheme as necessary. These roads include Mochdre Lane, Middle and Upper Dolfor Road, Brimmon Lane and Wern Ddu Lane. Generally two way flows would be maintained along all these routes, but short term temporary closures would be imposed, especially when bridge beams are being lifted into place Diversion routes would be clearly marked and signed during these periods and adequate notices would be given to road users and local residents via press notices and local newsletter distributions.

12.5.2. Operational mitigation

12.5.2.1. New severance

Following completion of construction, the new rights of way network would be fully implemented as shown in Volume 2, Figure 12.3 a – d.

West of the Glandulas Holiday Home Park, BW251/16 would link into a realigned and upgraded section of FP251/8 which would become a bridleway, with a 3m wide grassed surface. Where the path crosses the stream, the slope would be graded out and two culvert pipes would be installed with a minimum width of 750mm. The bridleway would be extended to the east and would cross the Scheme via the Glandulas Overbridge via a 3m wide surfaced access track. This would mitigate the stopping up of FP251/8 and FP251/7. The bridleway would continue northeast and would join with the northern section of BW251/2, along the driveway of Glandualas Holiday Home Park. From the northern section of driveway the bridleway would continue northeast alongside the highway as far as the start point of FP251/1 at the existing A489.

A new section of bridleway would be provided along the de-trunked section, north of A489 Llanidloes Road Roundabout, 3m wide with an aggregate surface. It would provide access north of the A489 from Hafren view and Glanhafren Hall to BW251/2.

A new 3m wide aggregate surface bridleway would also be provided from the southern side of the Glandulas Overbridge along the southern boundary of the Scheme to Mochdre Lane and underneath the Mochdre Bridge. This would mitigate the loss of FP251/7, FP251/4 and a section of FP251/3.

Footpath FP253/N4 would be realigned along the toe of the northern embankment of the Scheme and upgraded to a bridleway that would link to the new bridleway diversion from Castell-y-Dail at the Bridleway Underpass. This new section of bridleway would pass under the Scheme via the underpass and link up to the southern sections of BW253/N5 and BW253/N6 which would be retained. The new bridleway would be 3m wide and have an aggregate surface.

No mitigation would be provided in relation to the permanent stopping up of FP253/N3. This route is heavily obstructed and not widely used.

FP253/N14 would be reopened in its current position and would pass under the Scheme via the Brimmon Farm Underpass.

BW253/N15 would be diverted west along the toe of the Scheme's northern embankment to the Brimmon Lane Underpass, where the bridleway would pass under the Scheme and terminate at Great Brimmon Farm. The diverted section would be 3m wide and have an aggregate surface.

The western and eastern ends of FP253/N22 would be reinstated following the re-alignment of Kerry Road and Wern Ddu Lane.

The Scheme would also provide enhancement through provision of safe pedestrian access along the A489 Kerry Road between Footpath FP253/N22 and the lane that leads to Footpath FP253/N9. Through consultation with Powys Ramblers and Walking Newtown (refer to ES Volume 3, Appendix I.1) it was established that this was a popular recreational route, but there are currently safety concerns due to lack of pedestrian footpaths along the Kerry Road which links these two walks.

The Scheme would provide a pedestrian footway on the western side of the A489 carriageway from the unclassified lane, south of the roundabout, to Kerry Road Roundabout. It would cross onto the eastern side of the A489 carriageway via the two traffic splitter-islands on the southern

and eastern arms of the roundabout. Another pedestrian footway would also be provided along the eastern side of the A489, north of the roundabout, to connect with FP253/N22.

12.5.2.2. Relief from existing severance and increase in severance

No mitigation is proposed in relation to relief from existing severance during the operational phase as impacts are mainly beneficial.

An improved pedestrian crossing facility would be provided on Dolfor Road to mitigate the impact of the minor increased traffic follows along this road and help fulfil the Welsh Government's obligations under the Active Travel (Wales) Bill 2013.

As there are currently pedestrian crossings on Kerry Road, no further measures are proposed to mitigate the increased severance impact along this road.

12.5.2.3. Views from the road

The proposed operational mitigation measures include landscape planting in the form of screen planting, planting for ecological and landscape integration, planting on embankments and cuttings, earth modelling works and the construction of false cuttings and noise barriers adjacent to the Scheme.

The landscape mitigation planting is proposed to provide screening of the road from adjacent residential areas and to help soften engineering embankments and new roundabouts. The planting is proposed to soften the edges of existing woodland areas such as Castell-y-Dail, replace planting removed for the Scheme and provide connectivity with existing planting and hedgerows and reinforce the existing landscape character of the area.

12.5.2.4. Driver Stress

Measures such as road layout, signage, lighting and junction arrangements have been designed to minimise driver stress and therefore there is no additional mitigation proposed.

12.6. Residual Environmental Effects (following mitigation)

12.6.1. Construction impacts

12.6.1.1. New severance

Table 12.6.1 – Construction impacts on NMU routes following mitigation

Receptor	Description of impact	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Significance (following mitigation)	Comments / notes
Bridleway BW251/16 (West of Glandulas Holiday Home Park)	Severance and stopping up of first section south of A489	Severe	Major – Moderate Adverse	Access via bridleways to the east via a temporary crossing adjacent to Mochdre Brook. Access via Glandulas Overbridge, once complete.	Slight	Minor Adverse	Amenity of route reduced because of diversion and construction activity (noise, dust and visual impact).
Footpath FP251/8 (West of Glandulas Holiday Home Park)	Stopped up	Severe	Moderate – Minor Adverse	Provision of upgraded and realigned replacement bridleway. Connectivity over the Scheme provided via temporary crossing adjacent to Mochdre Brook. Connectivity via Glandulas Overbridge, once complete.	Neutral	Negligible	Sensitivity given as low as path is infrequently used and obstructed. There would be some hindrance due to construction diversion but also improvement due to path's realignment. Amenity of route reduced because of construction activity (noise, dust and visual impact). Overall with mitigation significance impact considered Negligible during construction.
Footpath FP251/7 (Glandulas Holiday Home Park)	Severance of footpath. Footpath stopped up.	Severe	Moderate – Minor Adverse	Provision of upgraded bridleway to the south and east. Connectivity over the Scheme provided via temporary crossing adjacent to Mochdre Brook. Connectivity via Glandulas Overbridge, once complete.	Neutral	Negligible	Sensitivity given as low as path is infrequently used and obstructed. There would be some hindrance due to construction diversion but also improvement due to path's realignment. Amenity of route reduced because of construction activity (noise, dust and visual impact). Overall with mitigation significance impact considered Negligible during construction.
Bridleway BW251/5 (South-east of	Severance of bridleway.	Severe	Major – Moderate Adverse	Provision of upgraded bridleway to the northwest. Connectivity over the Scheme provided via	Slight	Minor adverse	There would be some hindrance due to construction diversion but also improvement due to path's realignment.

Receptor	Description of impact	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Significance (following mitigation)	Comments / notes
Glandulas Holiday Home Park)	Bridleway stopped up			temporary crossing adjacent to Mochdre Brook. Connectivity via Glandulas Overbridge, once complete.			Amenity of route reduced because of construction activity (noise, dust and visual impact). Overall with mitigation significance of impact considered Minor Adverse during construction.
Footpath FP251/4 (West of Mochdre Lane)	Footpath stopped up.	Severe	Major – Moderate Adverse	Provision of upgraded bridleway. Connectivity over the Scheme provided via temporary crossing adjacent to Mochdre Brook. Connectivity via Glandulas Overbridge, once complete.	Neutral	Negligible	Path to be upgraded and realigned to the south, which would be beneficial. Amenity of route reduced because of construction activity (noise, dust and visual impact). Overall with mitigation significance impact considered Negligible during construction.
Footpath FP251/3 (North of Mochdre Lane)	Severance of footpath. Footpath stopped up	Severe	Major – Moderate Adverse	Provision of upgraded bridleway. Connectivity over the Scheme provided via temporary crossing adjacent to Mochdre Brook.	Neutral	Negligible	Path to be upgraded and realigned to the southeast, which would be beneficial. Amenity of route reduced because of construction activity (noise, dust and visual impact). Overall with mitigation significance impact considered Negligible during construction.
Bridleway BW251/2 (Driveway of Glandulas) Holiday Home Park)	Southern section stopped up.	Severe	Moderate – Minor Adverse	Provision of upgraded bridleway to the west and south. Connectivity over the Scheme provided via temporary crossing adjacent to Mochdre Brook. Connectivity via Glandulas Overbridge, once complete.	Slight beneficial	Minor beneficial	Sensitivity given as low as route is obstructed with no onward connection. Despite construction diversion and effects on journey amenity from construction activity (noise, dust and visual impact), connectivity to wider bridleway network improved. Overall with mitigation significance of impact considered Minor Beneficial.
Cycleway NCN (81 Mochdre Lane)	No direct impact. Minor effect on route amenity.	Neutral	Negligible	N/A	Neutral	Negligible	No direct impact during the construction phase. Cycleway would pass under the Scheme via the Mochdre Bridge. Amenity of route reduced because of construction activity (noise, dust and visual impact).
Bridleway BW253/N6 (Castell-y-Dail)	Severance at start point at Castell-y-Dail.	Severe	Major – Moderate Adverse	Diversion to the west and temporary crossing provided	Moderate	Moderate – Minor Adverse	With mitigation, journey length would be increased and a temporary crossing negotiated. Amenity of route reduced

Receptor	Description of impact	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Significance (following mitigation)	Comments / notes
	Stopping up of eastern section.			adjacent to proposed Bridleway Underpass			because of construction activity (noise, dust and visual impact).Overall with mitigation significance of impact considered Moderate – Minor Adverse.
Bridleway BW253/N5 (Castell-y-Dail)	Severance at start point at Castell-y-Dail. Stopping up of eastern section.	Severe	Major – Moderate Adverse	Diversion to the west and temporary crossing provided adjacent to proposed Bridleway Underpass	Moderate	Moderate – Minor Adverse	With mitigation, journey length would be increased and a temporary crossing negotiated. Amenity of route reduced because of construction activity (noise, dust and visual impact).Overall with mitigation significance of impact considered Moderate – Minor Adverse.
Footpath FP253/N4 (Fronlas Farm to Castell-y-Dail)	No direct impact. Stopping up, realignment and upgrade to bridleway along northern edge of Scheme.	Neutral	Negligible	Access maintained along northern edge of Scheme during construction. Access along western section improved.	Slight beneficial	Minor beneficial	Accessibility of western end improved as current alignment is obstructed. Amenity of route reduced because of construction activity (noise, dust and visual impact). Overall with mitigation significance of impact considered Minor Beneficial during construction.
Permissive path (Fronlas Farm to Castell-y-Dail)	No direct impact	Neutral	Negligible	Access maintained during construction	Neutral	Negligible	Amenity of route reduced because of construction activity (noise, dust and visual impact). Overall with mitigation significance impact considered Negligible during construction.
Permissive path (South of Fronlas Farm)	Severance of path's northern end	Severe	Major – Moderate Adverse	Temporary crossing provided adjacent to proposed Bridleway Underpass	Slight	Minor Adverse	Hindrance due to negotiating temporary crossing. Amenity of route reduced because of construction activity (noise, dust and visual impact). Overall with mitigation significance impact considered Minor Adverse during construction.
Footpath FP253/N3 (Mochdre Industrial Estate to A483)	Footpath stopped up.	Severe	Moderate – Minor Adverse	No mitigation proposed.	Severe	Moderate – Minor Adverse	Sensitivity given as low as route is unpassable. Consultation demonstrates that the route is not widely known or used. Overall significance of impact considered Moderate – Minor Adverse.

Receptor	Description of impact	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Significance (following mitigation)	Comments / notes
Footpath FP253/N14 (South from Brimmon Lane)	Footpath stopped up.	Severe	Major – Moderate Adverse	Diversion and temporary crossing provided adjacent to the proposed Brimmon Farm Underpass	Slight	Minor Adverse	Used for organised walks by the Rail Ramblers and Walking Newtown. Hindrance due to negotiating temporary crossing. Amenity of route reduced because of construction activity (noise, dust and visual impact). Overall with mitigation significance impact considered Minor Adverse during construction.
Bridleway BW253/N15 (Heol Treowen / Kerry Road to Great Brimmon Farm)	Severance of southern section. Footpath stopped up.	Severe	Moderate – Minor Adverse	Diversion and temporary crossing provided adjacent to the proposed Brimmon Lane Underpass	Slight	Minor Adverse / Negligible	Sensitivity given as low due to obstruction and low amenity due to wet ground conditions in winter. Hindrance due to negotiating short diversion and temporary crossing. Amenity of route reduced because of construction activity (noise, dust and visual impact). Overall with mitigation significance impact considered Minor Adverse / Negligible during construction.
Footpath FP253/N22 (Between Kerry Road and Wern Ddu Lane)	Footpath stopped up at western and eastern ends	Severe	Major – Moderate Adverse	Temporary diversions provided at western (Kerry Road) and eastern (Wern Ddu Lane) ends to allow access along FP253/N22 during the construction phase.	Slight	Minor Adverse	Used for organised walks by the Rail Ramblers and Walking Newtown. Hindrance due to negotiating temporary diversions. Amenity of route reduced because of construction activity (noise, dust and visual impact). Overall with mitigation significance impact considered Minor Adverse during construction.

12.6.1.2. Relief from existing severance

As no construction mitigation is proposed in relation to relief from existing severance the impacts are as described previously in Section 12.4.1.2.

12.6.1.3. Views from the road

As no construction mitigation is proposed in terms of views from the road the impacts are as described previously in Section 12.4.1.3.

12.6.1.4. Driver stress

Construction impacts in relation to driver stress are the same as described previously in Section 12.4.1.4.

12.6.2. Operational impacts

12.6.2.1. New severance

Table 12.6.2 – Operational impacts on NMU routes following mitigation

Receptor	Description of impact	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Significance (following mitigation)	Comments / notes
Bridleway BW251/16 (West of Glandulas Holiday Home Park)	Severance and stopping up of first section south of A489	Severe	Major – Moderate Adverse	Connectivity to bridleways to the east via newly upgraded paths and via Glandulas Overbridge. No access from A489. Provision of new section of bridleway along de-trunked section, north of A489 Llanidloes Road Roundabout.	Slight	Minor Adverse	Amenity of route reduced because of proximity of the new road.
Footpath FP251/8 (West of Glandulas Holiday Home Park)	Stopped up	Severe	Moderate – Minor Adverse	Provision of upgraded and realigned replacement bridleway. Connectivity to wider network via newly upgraded paths and via Glandulas Overbridge	Slight Beneficial	Minor / Negligible Beneficial	Sensitivity given as low as path is infrequently used and obstructed. Amenity of route reduced because of proximity of the new road. Improvements may encourage further use. An overall Minor / Negligible significance of impact following construction due to improvements of path and connectivity.
Footpath FP251/7 (Glandulas	Severance of footpath.	Severe	Moderate – Minor Adverse	Provision of upgraded and realigned replacement bridleway. Connectivity to wider	Slight Beneficial	Minor / Negligible Beneficial	Sensitivity given as low as path is infrequently used and obstructed. Amenity of route reduced because of

Receptor	Description of impact	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Significance (following mitigation)	Comments / notes
Holiday Home Park)	Footpath stopped up.			network via newly upgraded paths and via Glandulas Overbridge			proximity of the new road. Improvements may encourage further use. An overall Minor / Negligible significance of impact following construction due to improvements of path and connectivity.
Bridleway BW251/5 (South-east of Glandulas Holiday Home Park)	Severance of bridleway. Bridleway stopped up	Severe	Major – Moderate Adverse	Provision of upgraded and realigned replacement bridleway to the northwest along Scheme's southern edge. Connectivity to wider network improved and Scheme crossing provided via Glandulas Overbridge.	Slight Beneficial	Minor Beneficial	Amenity of route reduced because of proximity of the new road. Connectivity to wider bridleway network to the north improved, which may encourage further use. Overall significance of impact is considered Minor Beneficial.
Footpath FP251/4 (West of Mochdre Lane)	Footpath stopped up.	Severe	Major – Moderate Adverse	Provision of upgraded and realigned replacement bridleway south of existing path, along the Scheme's southern edge. Connectivity to wider network improved and Scheme crossing provided via Glandulas Overbridge.	Slight Beneficial	Minor Beneficial	Amenity of route reduced because of proximity of the new road. Path upgraded and connectivity to wider bridleway network to the north improved, which may encourage further use. Overall significance of impact is considered Minor Beneficial.
Footpath FP251/3 (North of Mochdre Lane)	Severance of footpath. Footpath stopped up	Severe	Major – Moderate Adverse	Provision of upgraded bridleway. Connectivity over the Scheme provided via crossing adjacent to Mochdre Brook.	Neutral	Negligible	Amenity of route reduced because of proximity of the new road. Path to be upgraded and realigned to the southeast, which would be beneficial. Overall with mitigation significance impact considered Negligible during construction.
Bridleway BW251/2 (Driveway of Glandulas Holiday Home Park)	Southern section stopped up.	Severe	Moderate – Minor Adverse	Provision of new bridleway links northeast and southwest, crossing the Scheme via the Glandulas Overbridge. Improved connectivity to the wider network.	Slight Beneficial	Minor / Negligible Beneficial	Sensitivity given as low as route is obstructed with no onward connection. Amenity of route reduced because of proximity of the new road. Bridleway links to the northeast and southwest which would provide connectivity to wider bridleway network and may encourage further use. Overall significance of impact is considered Minor / Negligible Beneficial.

Receptor	Description of impact	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Significance (following mitigation)	Comments / notes
Cycleway NCN (81 Mochdre Lane)	No impact	Neutral	Negligible	N/A	Neutral	Negligible	No direct impact during the operational phase. Cycleway would pass under the Scheme via the Mochdre Bridge. This might have a slight impact in terms of reducing journey amenity.
Bridleway BW253/N6 (Castell-y-Dail)	Severance at start point at Castell-y-Dail. Stopping up of eastern section.	Severe	Major – Moderate Adverse	Diversion to the west and crossing provided via Bridleway Underpass	Moderate	Moderate – Minor Adverse	With mitigation, journey length would be increased and a new underpass negotiated. Amenity of route reduced because of proximity of new road and route no longer through the woods. Overall with mitigation significance of impact considered Moderate – Minor Adverse.
Bridleway BW253/N5 (Castell-y-Dail)	Severance at start point at Castell-y-Dail. Stopping up of eastern section.	Severe	Major – Moderate Adverse	Diversion to the west and crossing provided via Bridleway Underpass	Moderate	Moderate – Minor Adverse	With mitigation, journey length would be increased and a new underpass negotiated. Amenity of route reduced because of proximity of new road and route no longer through the woods. Overall with mitigation significance of impact considered Moderate – Minor Adverse.
Footpath FP253/N4 (Fronlas Farm to Castell-y-Dail)	No direct impact. Stopping up, realignment and upgrade to bridleway along northern edge of Scheme	Neutral	Negligible	Access maintained along northern edge of Scheme and upgraded to bridleway. Access along western section improved.	Slight beneficial	Minor beneficial	Accessibility of western end improved as current alignment is obstructed. Amenity of route reduced because of proximity of road. Overall with mitigation significance of impact considered Minor Beneficial.
Permissive path (Fronlas Farm to Castell-y-Dail)	No direct impact	Neutral	Negligible	Access maintained	Neutral	Negligible	Amenity of route reduced because of proximity of Scheme. Overall with mitigation significance of impact considered Negligible.
Permissive path (South of Fronlas Farm)	Severance of path's northern end	Severe	Major – Moderate Adverse	Crossing provided via Bridleway Underpass	Slight	Minor Adverse	Hindrance due to negotiating new underpass. Amenity of route reduced because of proximity of Scheme. Overall with mitigation significance impact considered Minor Adverse.

Receptor	Description of impact	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Significance (following mitigation)	Comments / notes
Footpath FP253/N3 (Mochdre Industrial Estate to A483)	Footpath stopped up.	Severe	Moderate – Minor Adverse	No mitigation proposed.	Severe	Moderate – Minor Adverse	Sensitivity given as low as route is unpassable. Consultation demonstrates that the route is not widely known or used. Overall significance of impact considered Moderate – Minor Adverse.
Footpath FP253/N14 (South from Brimmon Lane)	Footpath stopped up.	Severe	Major – Moderate Adverse	New crossing provided via the proposed Brimmon Farm Underpass	Slight	Minor Adverse	Used for organised walks by the Rail Ramblers and Walking Newtown. Hindrance due to negotiating new underpass. Amenity of route reduced because of proximity to the Scheme. Overall with mitigation significance of impact considered Minor Adverse.
Bridleway BW253/N15 (Heol Treowen / Kerry Road to Great Brimmon Farm)	Severance of southern section. Footpath stopped up.	Severe	Moderate – Minor Adverse	Diversion and new crossing provided via the proposed Brimmon Lane Underpass	Slight	Minor Adverse / Negligible	Sensitivity given as low due to obstruction and low amenity due to wet ground conditions in winter. Hindrance due to negotiating short diversion and new crossing. Amenity of route reduced because of proximity to Scheme. Overall with mitigation significance of impact considered Minor Adverse / Negligible.
Footpath FP253/N22 (Between Kerry Road and Wern Ddu Lane)	Footpath stopped up at western and eastern ends	Severe	Major – Moderate Adverse	Western and eastern ends of FP253/N22 would be reinstated following the re-alignment of Kerry Road and Wern Ddu Lane.	Neutral	Negligible	Used for organised walks by the Rail Ramblers and Walking Newtown. Amenity of route reduced because of proximity of Scheme. Overall with mitigation significance of impact considered Negligible.
Recreational route between FP253/N22 and FP253/N9	Enhancement through improved safety for pedestrians along A489 Kerry Road	N/A	N/A	Provision of pedestrian footway and safe crossing points north and south of Kerry Road Roundabout between FP253/N22 and the lane leading to FP253/N9	Slight	Minor Beneficial	Used for organised walks by the Rail Ramblers and Walking Newtown. Sensitivity given as medium. Current situation is dangerous and may prevent usage of this recreational walk. Scheme provides enhancement through provision of safe pedestrian link along the A489 Kerry Road between the two public rights of way.

12.6.2.2. Relief from existing severance and increase in severance

As no operational mitigation is proposed in relation to relief from existing severance the impacts are as described previously in Section 12.4.2.2.

An improved crossing facility is proposed to mitigate impacts in relation to increased severance along Dolfor Road. Prior to mitigation the significance of impact was assessed as being negligible due to only a minor increase in traffic (8%) – refer to Table 12.4.2. The impact flowing mitigation is still considered Negligible. As no mitigation is proposed in relation to the increase in severance along Kerry Road the impacts are also as described previously in Section 12.4.2.2.

12.6.2.3. Views from the road

At opening year the views out would be more extensive than at the design year when the planting would be established.

12.6.2.4. Driver Stress

Overall, once the Scheme is in operation driver stress levels are predicted to be reduced to moderate due to reduced congestion, enhanced surface quality, reduced frustration and fear of accidents. The Scheme would result in a Moderate Beneficial effect on driver stress.

12.7. Summary and Conclusions

The Scheme would affect a number of Public Rights of Way to the south of Newtown. Consultation and surveys have shown that the Public Rights of Way affected are generally poorly used and in many cases obstructed. Some are, however, used as part of organised walks by groups such as the Newtown Ramblers and Walking Newtown.

Through consultation with PCC and a number of other user groups measures have been developed to mitigate the impact on rights of way affected by the Scheme. Temporary diversions and crossing places would be provided during the construction phase. Long-term connectivity over the Scheme would be provided via a number of overbridges and underpasses and there would be some upgrading of Public Footpaths to Public Bridleways which would have 3m wide aggregate surfaces. These upgrades may encourage further use as accessibility would be improved and many of the current obstructions removed.

Once operational, the Scheme would remove traffic along the existing A483 / A489 New Road and Pool Road. This would have a beneficial effect for residents of Newtown by reducing severance caused by road traffic between residential areas and community facilities and places of employment. This reduction in severance would particularly benefit vulnerable users such and school children and may encourage increased travel by active modes within Newtown.

The Scheme would however marginally increase traffic flows along the northern lengths of Dolfor Road and Kerry Road. These minor traffic increases along Dolfor Road are considered more significant due to the close proximity of schools and nurseries that are used by vulnerable groups. To mitigate this, an improved pedestrian crossing would be provided. No mitigation is proposed along Kerry Road as the road already has a signal controlled crossings and less vulnerable user groups are likely to be affected (e.g. adults from Treowen accessing the Vastre and Dyffryn Industrial Estates or supermarkets along Pool Road).

Improvements to the rights of way network and reduced community severance within Newtown support Scheme Planning Objective 4 – *increasing levels of usage for non-car forms of transport.* These improvements also support many of the national, regional and local policies and plans that relate to walking and cycling and travel by active modes. This included policies to promote walking and cycling within the National Transport Plan, National Transport Plan SEA Objectives and the Walking and Cycling Action Plan for Wales. It also supports the regard that Welsh Government highway schemes must have for enhancing the provision for walking and cycling as set out in the Active Travel (Wales) Act 2013.

Improvements for NMUs from the Scheme also support policies relating to sustainable travel and access for all outlined in the TraCC Regional Transport Plan and policies relating to walking and cycling (T6) and improved access to the countryside (RL6) in the Powys Adopted UDP.

With regard to vehicle travellers, in summary the landscape mitigation and Scheme earthworks would result in a generally enclosed road corridor, but with a variety of characteristics along its length. Woodland and hedge planting would primarily be native deciduous species and therefore in places seasonal changes would allow filtered views to the landscape beyond. At night the lit urban areas of Newtown would also be apparent from certain sections.

Throughout several sections of the Scheme there would be long views along the line of the road to elevated, distant landscape, particularly to the upper southern valley slopes.

During the construction phase there would be increased driver stress levels due to congestion caused by localised traffic management, but these would only operate for short durations. The Scheme once operational would result in a reduction in drivers' stress levels due to reduced congestion, enhanced surface quality, reduced frustration and fear of accidents.

Table 12.7.1 – Summary of Impacts in relation to all travellers

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation	Notes / Comments
Construction Impacts					
Bridleway BW251/16 (West of Glandulas Holiday Home Park)	Severance and stopping up of first section south of A489	Severe	Slight	Minor Adverse	Amenity of route reduced because of diversion and construction activity (noise, dust and visual impact).
Footpath FP251/8 (West of Glandulas Holiday Home Park)	Stopped up	Severe	Neutral	Negligible	Sensitivity given as low as path is infrequently used and obstructed. There would be some hindrance due to construction diversion but also improvement due to path's realignment. Amenity of route reduced because of construction activity (noise, dust and visual impact). Overall with mitigation significance impact considered Negligible during construction.
Footpath FP251/7 (Glandulas Holiday Home Park)	Severance of footpath. Footpath stopped up.	Severe	Neutral	Negligible	Sensitivity given as low as path is infrequently used and obstructed. There would be some hindrance due to construction diversion but also improvement due to path's realignment. Amenity of route reduced because of construction activity (noise, dust and visual impact). Overall with mitigation significance impact considered Negligible during construction.
Bridleway BW251/5 (South-east of Glandulas Holiday Home Park)	Severance of bridleway. Bridleway stopped up	Severe	Slight	Minor adverse	There would be some hindrance due to construction diversion but also improvement due to path's realignment. Amenity of route reduced because of construction activity (noise, dust and visual impact). Overall with mitigation significance of impact considered Minor Adverse during construction.
Footpath FP251/4 (West of Mochdre Lane)	. Footpath stopped up.	Severe	Neutral	Negligible	Path to be upgraded and realigned to the south, which would be beneficial. Amenity of route reduced because of construction activity (noise, dust and visual impact). Overall with mitigation significance impact considered Negligible during construction.

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation	Notes / Comments
Footpath FP251/3 (North of Mochdre Lane)	Severance of footpath. Footpath stopped up	Severe	Neutral	Negligible	Path to be upgraded and realigned to the southeast, which would be beneficial. Amenity of route reduced because of construction activity (noise, dust and visual impact). Overall with mitigation significance impact considered Negligible during construction.
Bridleway BW251/2 (Driveway of Glandulas Holiday Home Park)	Sothern section stopped up.	Severe	Slight beneficial	Minor beneficial	Sensitivity given as low as route is obstructed with no onward connection. Despite construction diversion and effects on journey amenity from construction activity (noise, dust and visual impact), connectivity to wider bridleway network improved. Overall with mitigation significance of impact considered Minor Beneficial.
Cycleway NCN (81 Mochdre Lane)	No direct impact. Minor effect on route amenity.	Neutral	Neutral	Negligible	No direct impact during the construction phase. Cycleway would pass under the Scheme via the Mochdre Bridge. Amenity of route reduced because of construction activity (noise, dust and visual impact).
Bridleway BW253/N6 (Castell-y-Dail)	Severance at start point at Castell-y-Dail. Stopping up of eastern section.	Severe	Moderate	Moderate – Minor Adverse	With mitigation, journey length would be increased and a temporary crossing negotiated. Amenity of route reduced because of construction activity (noise, dust and visual impact).Overall with mitigation significance of impact considered Moderate – Minor Adverse.
Bridleway BW253/N5 (Castell-y-Dail)	Severance at start point at Castell-y-Dail. Stopping up of eastern section.	Severe	Moderate	Moderate – Minor Adverse	With mitigation, journey length would be increased and a temporary crossing negotiated. Amenity of route reduced because of construction activity (noise, dust and visual impact).Overall with mitigation significance of impact considered Moderate – Minor Adverse.
Footpath FP253/N4 (Fronlas Farm to Castell-y-Dail)	No direct impact	Neutral	Slight beneficial	Minor beneficial	Accessibility of western end improved as current alignment is obstructed. Amenity of route reduced because of construction activity (noise, dust and visual impact). Overall with mitigation significance of impact considered Minor Beneficial during construction.

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation	Notes / Comments
Permissive path (Fronlas Farm to Castell-y-Dail)	No direct impact	Neutral	Neutral	Negligible	Amenity of route reduced because of construction activity (noise, dust and visual impact). Overall with mitigation significance impact considered Negligible during construction.
Permissive path (South of Fronlas Farm)	Severance of path's northern end	Severe	Slight	Minor Adverse	Hindrance due to negotiating temporary crossing. Amenity of route reduced because of construction activity (noise, dust and visual impact). Overall with mitigation significance impact considered Minor Adverse during construction.
Footpath FP253/N3 (Mochdre Industrial Estate to A483)	Footpath stopped up.	Severe	Severe	Moderate – Minor Adverse	Sensitivity given as low as route is unpassable. Consultation demonstrates that the route is not widely known or used. Overall significance of impact considered Moderate – Minor Adverse.
Footpath FP253/N14 (South from Brimmon Lane)	Footpath stopped up.	Severe	Slight	Minor Adverse	Used for organised walks by the Rail Ramblers and Walking Newtown. Hindrance due to negotiating temporary crossing. Amenity of route reduced because of construction activity (noise, dust and visual impact). Overall with mitigation significance impact considered Minor Adverse during construction.
Bridleway BW253/N15 (Heol Treowen / Kerry Road to Great Brimmon Farm)	Severance of southern section. Footpath stopped up.	Severe	Slight	Minor Adverse / Negligible	Sensitivity given as low due to obstruction and low amenity due to wet ground conditions in winter. Hindrance due to negotiating short diversion and temporary crossing. Amenity of route reduced because of construction activity (noise, dust and visual impact). Overall with mitigation significance impact considered Minor Adverse / Negligible during construction.
Footpath FP253/N22 (Between Kerry Road and Wern Ddu Lane)	Footpath stopped up at western and eastern ends	Severe	Slight	Minor Adverse	Used for organised walks by the Rail Ramblers and Walking Newtown. Hindrance due to negotiating temporary diversions. Amenity of route reduced because of construction activity (noise, dust and visual impact). Overall with mitigation significance impact considered Minor Adverse during construction.

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation	Notes / Comments
Drivers at the existing A489 (Llanidloes Road Roundabout Ch 00.000), existing A483 (Dolfor Road and Lower Dolfor Road Roundabout Ch 2100.00 – 2600.00 , the Kerry Road Roundabout Ch 4350 - 4450 and A483 Pool Road Roundabout Ch 5600.00 – 5900.00)	Views from the road would be dominated by construction activities and construction impacts would have a significant impact on driver stress.	High	Moderate	Minor Adverse	Two way traffic would be maintained whenever possible, but traffic management controlled by temporary traffic signals would be used to construct the tie-ins.
Operational Impacts					
NMU journeys north and south of A489 Llanidloes Road	Relief from existing severance (63% reduction in AADT during opening year)	Substantial	Substantial	Major Beneficial	Relates particularly to residents of Vaynor and Trehafren accessing facilities such as the schools, leisure centre, community centres and Mochdre Industrial Estate to the south. Also residents of Maesydail and Garth Owen accessing facilities to the north. Amenity of journeys improved due to reduced traffic and increased safety.
NMU journeys north and south of A483 New Road (west)	Relief from existing severance (43% reduction in AADT during opening year)	Moderate	Moderate	Major – Moderate Beneficial	Relates particularly to residents of Heol Treowen and New Road accessing facilities in the town centre. Also residents north of A483 accessing facilities south, such as schools and the railway station etc. Amenity of journeys improved due to reduced traffic and increased safety.
NMU journeys north and south of A483 New Road (east)	Relief from existing severance (59% reduction in AADT during opening year)	Moderate	Moderate	Major – Moderate Beneficial	As above
NMU journeys north and south of A483 Pool Road	Relief from existing severance (71% reduction in AADT during opening year)	Substantial	Substantial	Major – Moderate Beneficial	Relates particularly to residents of Barnfields and Penygloddfa accessing facilities to the south and east (e.g. super markets and the Vastre and Dyffryn Industrial Estates). Receptor sensitivity given as medium rather than high as shopping

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation	Notes / Comments
					and employment facilities are less likely to generate trips for vulnerable users (e.g. the elderly and children). Amenity of journeys improved due to reduced traffic and increased safety.
NMU journeys north and south of Plantation Lane	Relief from existing severance (50% reduction in AADT during opening year)	Moderate	Moderate	Major – Moderate Beneficial	Relates particularly to residents of Garth Owen accessing facilities such as Newtown High School and the Leisure centre to the north). Amenity of journeys improved due to reduced traffic and increased safety.
NMU journeys east and west of Dolfor Road (south)	Increase in existing severance (8% increase in AADT during opening year)	Neutral	Neutral	Negligible	Relates particularly to residents in Garth Owen access facilities in Treowen such as the primary school, church and care home. Also residents in Treowen accessing facilities such as Newtown High School and the Leisure Centre. Little change from existing situation. Amenity of journeys remains the same.
NMU journeys north and south of Heol Treowen	Relief from existing severance (38% reduction in AADT during opening year)	Moderate	Moderate	Major – Moderate Beneficial	Relates particularly to residents in Treowen accessing facilities north of Heol Treowen such as the primary school, church and care home. Amenity of journeys improved due to reduced traffic and increased safety.
NMU journeys east and west of Kerry Road	Increase in existing severance (8% increase in AADT during opening year)	Neutral	Neutral	Negligible	Relates particularly to residents of Treowen accessing facilities such as the super markets along Pool Road and within the Vastre and Dyffryn Industrial estates. Receptor sensitivity given as medium rather than high as shopping and employment facilities are less likely to generate trips for vulnerable users (e.g. the elderly and children). Little change from existing situation Amenity of journeys remains the same.
Bridleway BW251/16 (West of Glandulas Holiday Home Park)	Severance and stopping up of first section south of A489	Severe	Slight	Minor Adverse	Amenity of route reduced because of proximity of the new road.
Footpath FP251/8 (West of Glandulas Holiday Home Park)	Stopped up	Severe	Slight Beneficial	Minor / Negligible Beneficial	Sensitivity given as low as path is infrequently used and obstructed. Amenity of route reduced because of proximity of the new road.

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation	Notes / Comments
					Improvements may encourage further use. An overall Minor / Negligible significance of impact following construction due to improvements of path and connectivity.
Footpath FP251/7 (Glandulas Holiday Home Park)	Severance of footpath. Footpath stopped up.	Severe	Slight Beneficial	Minor / Negligible Beneficial	Sensitivity given as low as path is infrequently used and obstructed. Amenity of route reduced because of proximity of the new road. Improvements may encourage further use. An overall Minor / Negligible significance of impact following construction due to improvements of path and connectivity.
Bridleway BW251/5 (South-east of Glandulas Holiday Home Park)	Severance of bridleway. Bridleway stopped up	Severe	Slight Beneficial	Minor Beneficial	Amenity of route reduced because of proximity of the new road. Connectivity to wider bridleway network to the north improved, which may encourage further use. Overall significance of impact is considered Minor Beneficial.
Footpath FP251/4 (West of Mochdre Lane)	Footpath stopped up.	Severe	Slight Beneficial	Minor Beneficial	Amenity of route reduced because of proximity of the new road. Path upgraded and connectivity to wider bridleway network to the north improved, which may encourage further use. Overall significance of impact is considered Minor Beneficial.
Footpath FP251/3 (North of Mochdre Lane)	Severance of footpath. Footpath stopped up	Severe	Neutral	Negligible	Amenity of route reduced because of proximity of the new road. Path to be upgraded and realigned to the southeast, which would be beneficial. Overall with mitigation significance impact considered Negligible during construction.
Bridleway BW251/2 (Driveway of Glandulas Holiday Home Park)	Southern section stopped up.	Severe	Slight Beneficial	Minor / Negligible Beneficial	Sensitivity given as low as route is obstructed with no onward connection. Amenity of route reduced because of proximity of the new road. Bridleway links to the northeast and southwest which would provide connectivity to wider bridleway network and may encourage further use. Overall significance of impact is considered Minor / Negligible Beneficial.
Cycleway NCN (81 Mochdre Lane)	No impact	Neutral	Neutral	Negligible	No direct impact during the operational phase. Cycleway would pass under the Scheme via the

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation	Notes / Comments
					Mochdre Bridge. This might have a slight impact in terms of reducing journey amenity.
Bridleway BW253/N6 (Castell-y-Dail)	Severance at start point at Castell-y-Dail. Stopping up of eastern section.	Severe	Moderate	Moderate – Minor Adverse	With mitigation, journey length would be increased and a new underpass negotiated. Amenity of route reduced because of proximity of new road and route no longer through the woods. Overall with mitigation significance of impact considered Moderate – Minor Adverse.
Bridleway BW253/N5 (Castell-y-Dail)	Severance at start point at Castell-y-Dail. Stopping up of eastern section.	Severe	Moderate	Moderate – Minor Adverse	With mitigation, journey length would be increased and a new underpass negotiated. Amenity of route reduced because of proximity of new road and route no longer through the woods. Overall with mitigation significance of impact considered Moderate – Minor Adverse.
Footpath FP253/N4 (Fronlas Farm to Castell-y-Dail)	No direct impact. Stopping up, realignment and upgrade to bridleway along northern edge of Scheme	Neutral	Slight beneficial	Minor beneficial	Accessibility of western end improved as current alignment is obstructed. Amenity of route reduced because of proximity of road. Overall with mitigation significance of impact considered Minor Beneficial.
Permissive path (Fronlas Farm to Castell-y-Dail)	No direct impact	Neutral	Neutral	Negligible	Amenity of route reduced because of proximity of Scheme. Overall with mitigation significance of impact considered Negligible.
Permissive path (South of Fronlas Farm)	Severance of path's northern end	Severe	Slight	Minor Adverse	Hindrance due to negotiating new underpass. Amenity of route reduced because of proximity of Scheme. Overall with mitigation significance impact considered Minor Adverse.
Footpath FP253/N3 (Mochdre Industrial Estate to A483)	Footpath stopped up.	Severe	Severe	Moderate – Minor Adverse	Sensitivity given as low as route is unpassable. Consultation demonstrates that the route is not widely known or used. Overall significance of impact considered Moderate – Minor Adverse.
Footpath FP253/N14 (South from Brimmon Lane)	Footpath stopped up.	Severe	Slight	Minor Adverse	Used for organised walks by the Rail Ramblers and Walking Newtown. Hindrance due to negotiating new underpass. Amenity of route reduced because of proximity to the Scheme. Overall with mitigation significance of impact considered Minor Adverse.

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation	Notes / Comments
Bridleway BW253/N15 (Heol Treowen / Kerry Road to Great Brimmon Farm)	Severance of southern section. Footpath stopped up.	Severe	Slight	Minor Adverse / Negligible	Sensitivity given as low due to obstruction and low amenity due to wet ground conditions in winter. Hindrance due to negotiating short diversion and new crossing. Amenity of route reduced because of proximity to Scheme. Overall with mitigation significance of impact considered Minor Adverse / Negligible.
Footpath FP253/N22 (Between Kerry Road and Wern Ddu Lane)	Footpath stopped up at western and eastern ends	Severe	Neutral	Negligible	Used for organised walks by the Rail Ramblers and Walking Newtown. Amenity of route reduced because of proximity of Scheme. Overall with mitigation significance of impact considered Negligible.
Recreational route between FP253/N22 and FP253/N9	Enhancement through improved safety for pedestrians along A489 Kerry Road	N/A	Slight	Minor Beneficial	Used for organised walks by the Rail Ramblers and Walking Newtown. Sensitivity given as medium. Current situation is dangerous and may prevent usage of this recreational walk. Scheme provides enhancement through provision of safe pedestrian link along the A489 Kerry Road between the two public rights of way.
Vehicle travellers at western arm of western A489 tie-in - Llanidloes Road Roundabout	Drivers' views of surrounding landscape	Intermittent View			
Vehicle travellers at eastern arm of western A489 tie-in – Llanidloes Road Roundabout	Drivers' views of surrounding landscape	Intermittent View			
Vehicle travellers at Chainage Ch. 0 – 220	Drivers' views of surrounding landscape:	Restricted View			
Vehicle travellers at Chainage Ch 220 – 480	Drivers' views of surrounding landscape:	Restricted View			
Vehicle travellers at Chainage Ch 480 – 700	Drivers' views of surrounding landscape:	Restricted View			

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation	Notes / Comments
Vehicle travellers at Chainage Ch 700 – 1150	Drivers' views of surrounding landscape:	Restricted View			
Vehicle travellers at Chainage Ch 1150 – 1480	Drivers' views of surrounding landscape:	Restricted View			
Vehicle travellers at Chainage Ch 1480 – 2020	Drivers' views of surrounding landscape	To the north – Restricted view To the south – Intermittent view			
Vehicle travellers at Chainage Ch 2020 – 2500	Drivers' views of surrounding landscape:	Restricted View			
Vehicle travellers at Lower Dolfor Road Roundabout to Newtown	Drivers' views of surrounding landscape:	Restricted View			
Vehicle travellers at Chainage Ch 2500 – 2630	Drivers' views of surrounding landscape:	Open View			
Vehicle travellers at Chainage Ch 2630 – 3180	Drivers' views of surrounding landscape:	No View			
Vehicle travellers at Chainage Ch 3180 – 3900	Drivers' views of surrounding landscape:	Restricted View			
Vehicle travellers at Chainage Ch 3900 – 4300	Drivers' views of surrounding landscape:	Restricted View			
Vehicle travellers at Chainage 4300 – 4700 and Kerry Road Roundabout	Drivers' views of surrounding landscape:	Intermittent View			

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation	Notes / Comments
Vehicle travellers at Chainage Ch 4700 - 5200	Drivers' views of surrounding landscape:	Restricted View			
Vehicle travellers at Chainage Ch 5200–5400	Drivers' views of surrounding landscape:	Intermittent View			
Vehicle travellers at Chainage Ch 5400 – A483 Pool Road Roundabout (Ch 5850)	Drivers' views of surrounding landscape:	Restricted View			
Vehicle travellers at A483 Pool Road Roundabout – eastern tie-in	Drivers' views of surrounding landscape:	Restricted View			
Vehicle travellers at eastern A483 Roundabout (Ch. 5850) – Pool Road tie-in	Drivers' views of surrounding landscape:	Intermittent View			
Vehicle travellers across the whole Scheme	Driver stress levels are predicted to be reduced to moderate due to reduced congestion, enhanced surface quality, reduced frustration and fear of accidents.	Moderate	Moderate	Moderate Beneficial	

13. Community and Private Assets

Private property associated land-take, land used by the community and development land

13.1. Introduction

13.1.1. General

This section addresses impacts in relation to Community and Private Assets associated with the Scheme. It follows guidelines outlined in IAN 125/09[13.1].

13.1.2. Policy context

In relation to effects on development land and community land, policies and plans most relevant to the assessment are development planning polices from the Powys County Council Adopted Unitary Development Plan (UDP) and the Deposit Local Development Plan (LDP).

Policies that are of relevance to the land use assessment are listed below:

Adopted UDP Policies

- UDP SP1 – Social, Community and Cultural Sustainability
- UDP SP4 – Economic and Employment Developments
- UDP SP5 – Housing Developments
- UDP SP9 – Local Community Services and Facilities
- Policy ENV1 – Agricultural Land
- Policy ENV19 – Amenity Open Space
- Policy HP1 – Shire Housing Allocations
- Policy HP4 – Settlement Development Boundaries
- Policy EC1 – Business, Industrial and Commercial Developments
- Policy EC3 – Protection of Employment Sites
- Policy RL1 – Protection of Existing Outdoor Playing Space
- Policy RL9 – The Safeguarding of Allotments
- Policy CS1 – Land Safeguarded for Community Facilities
- Policy CS2 – Protecting Existing Community Facilities and Services

Deposit LDP Policies

- Policy E1 – Employment Proposals on Allocated Employment Sites
- Policy E3 – Mixed Use Allocations
- Policy T1 – Transport Infrastructure
- Policy H1 – Housing Provision
- Policy C1 – Community Facilities and Indoor Recreation

13.2. Methodology

'Community and Private Assets' is a new topic chapter in the DMRB Volume 11, Section 3 (Environmental Assessment Techniques) and is introduced under IAN 125/09[13.1]. At present the Environmental Assessment Techniques section of the DMRB Vol. 11 is being revised and there is no specific methodology developed for 'Community and Private Assets'. The IAN therefore advises that existing methodologies in relation to Land Use[13.2] and Community Effects[13.3] are utilised.

The assessment will address the following key issues:

- Demolition of private property and associated land-take;
- Loss of land used by the community and community facilities;
- Effects on development land;

- Effects on agricultural land (addressed separately in second part of this Chapter).

Assessment of Waterway restoration projects as been scoped out.

13.2.1. Demolition of private property and associated land take

Demolition of private property and associated land-take will be assessed as follows using the following method, as described in DMRB Volume 11 Section 3, Part 6[13.2] for a Stage 3 Assessment:

- *The number of properties which would need to be demolished should be estimated for residential, commercial (including farming), industrial and other properties at risk of demolition or land-take (excluding community facilities). Where relevant, the assessment of impact on businesses should be updated.*
- *When reporting the possible effects of a scheme on businesses, it may be necessary to treat sensitive information as 'commercial in confidence'. Such information should not be included in reports which will be publically available.*

13.2.2. Loss of land used by the community

Loss of land used by the community will be assessed using the following method, as described in DMRB Volume 11 Section 3, Part 6[13.2] for a Stage 3 Assessment. Effects on key community facilities in the vicinity of the Scheme are noted in Chapter 12 of this ES.

- *Where land-take would be likely to occur, obtain information about the number of users. In some cases the local planning authority may be able to provide information, but in many cases it will be necessary to visit the site and, depending on its importance, either make an estimate of usage or undertake a formal count. The site visit should take place on one or more 'typical' days (for example, a weekday during the school term or at the weekend);*
- *A desk-top study should also be carried out to determine any cultural associations of the land in question. Information on historical, literary, artistic and other connections can be obtained from local libraries and museums or the local planning authority;*
- *If Public Open Space is to be taken, identify whether there is land in the vicinity which could be offered as exchange land. If so, this should be assessed to ensure that it is no smaller and is equally advantageous to users as that which would be required for the preferred route.*
- *The assessment should set out the scheme's impact on land used by the public, taking account where relevant of exchange land to be provided in mitigation.*

13.2.3. Effects on development land

Effects on development land will be assessed using the following method, as described in DMRB Volume 11 Section 3, Part 6[13.2] for a Stage 3 Assessment:

- *Plot route option on a map of land use planning designations.*
- *Identify the potential land-take of the route option from areas which the local planning authorities have designated for future development.*
- *Assess how route options might affect local planning authority's development designations.*
- *The local planning authority should be asked through the Overseeing Department's Project Manager, to give their views on how the preferred route may affect their development designations.*

13.2.4. Data collection and sources of information used

In terms of land use and ownership, a combination of desk based research, questionnaire surveys and meetings with affected parties have been undertaken. This includes:

- Searches of Land Registry information;
- Issuing of questionnaires to affected parties;
- Meetings held with affected parties.

From this work, a detailed knowledge of land ownership interests affected by the Scheme has been collated.

In relation to assessing impacts on development land, the assessment has considered land allocated for housing and employment within the Powys County Council Adopted UDP and Deposit LDP.

13.2.5. Assessment criteria

Private property, community and development land

The criteria used to assess impacts on private property and associated land take, land used by the community and development land is outlined below:

Table 13.2.1 - Demolition of Private Property, Land used by the Community and Impacts on Development Land Magnitude of Impact Assessment Criteria

Magnitude of impact	Assessment Criteria
Large Adverse	Where houses would be demolished, become uninhabitable and inaccessible or lose more than 50% of their garden land The viability of a business / community facility using the land is threatened due to land-take. The viability of a site designated for development within the Local Authority's current development plan is threatened due to land take. A significant proportion of land used by the community would be threatened due to land take.
Moderate Adverse	Where a property would suffer a permanent negative impact from losing between 10 and 50% of their garden land The viability of a business / community facility using the land is not threatened, however significant changes may be experienced in its day-to-day running and/or its size and scale. A site designated for development within the Local Authority's development plan is still viable, but the developable area is reduced by 25 - 50%. A moderate proportion of land used by the community would be threatened due to land take.
Slight Adverse	Where a house would lose less than 10% of their garden land The viability of a business using the land is not threatened and land-take may involve only the acquisition of redundant or infrequently used land not essential to the running of the business or disused/infrequently used buildings. A site designated for development within the county council's development plan is still viable, but the developable area is reduced by 25% or less. A minor proportion of land used by the community would be threatened due to land take.
Neutral	The Scheme would have no significant impact upon existing land uses.
Beneficial	Additional areas of land which the public can access are made available by the Scheme.

Table 13.2.2 – Demolition of Private Property, Land used by the Community and Impacts on Development Land Receptor Sensitivity

Sensitivity	Examples of Receptors
High	Private properties and associated land which are currently occupied or which house a business or community facility currently in use A site designated for development within the local authority's Development Plan, where planning permission has been granted to develop Land which the public have the right to access and which is frequently used by the community
Moderate	Private properties and associated land which are not permanently in use or occupied by either the person(s) living in that property or by a business / community facility or which is not essential to the day to day running of a business A site designated for development within the Local Authority's Development Plan, but where no proposals to develop have currently been made. Land which the public have the right to access, which is sometimes or infrequently used by the community
Low	Private properties and associated land, which are derelict or not currently in use. A site which is being considered as a candidate site for inclusion within the forthcoming Local Development Plan Land which is infrequently used by the community or is used as an unofficial open space

Table 13.2.3 – Demolition of Private Property, Land used by the Community and Impacts on Development Land Significance of Impact

Magnitude	Sensitivity		
	High	Moderate	Low
Large Adverse	Major Adverse	Major- Moderate Adverse	Moderate – Minor Adverse
Moderate Adverse	Major – Moderate Adverse	Moderate – Minor Adverse	Minor Adverse
Slight Adverse	Moderate – Minor Adverse	Minor Adverse	Minor / Negligible
Neutral	Negligible	Negligible	Negligible

13.2.6. Limitations and assumptions

There is no published guidance on the assigning of magnitude of impact and receptor sensitivity for effects on community and private assets. The criteria on which the assessment is based (as shown in Tables 13.2.1 and 13.2.3) has been provided to try and logically quantify the levels of impact and sensitivity so an assessment can be made.

13.3. Baseline Conditions

13.3.1. Commercial and residential property

Private property within the vicinity of the Scheme mainly consists of residential, commercial and agricultural property. At the western end the closest residential areas are along Mochdre Lane north and south of the Scheme and at Maesydail. In the central section the closest residential areas are at Garth Owen north of the Scheme along Middle and Upper Dolfor Roads north and south of the Scheme and at Treowen north of Scheme. At the eastern end residential properties close to the Scheme are east of Wern Ddu Lane and north of the A483(T) Pool Road. Numerous individual residential properties and farmhouses are also located close to the Scheme along its full length. The residential areas of Vaynor and Trehafren are further north of the Cambrian Railway line and Milford, Penygloddfa, Barnfields and Llanllwchaiarn are north of the River Severn.

The main areas of industrial and commercial properties within the vicinity of the Scheme are the Mochdre Industrial Estate, situated adjacent to the north of the Scheme's western end and south of the A489(T). The Vastre and Dyffryn Industrial Estates are situated to the north of the Scheme's eastern end, and south of the A483(T). The St. Giles Technology Park is situated to the north of the Dyffryn Industrial Estate on the northern side of the A483(T) (refer to Volume 2, Figure 13.1 a – d).

13.3.2. Land used by the community and community facilities

Within this assessment, land used by the community includes land which is designated for Open Space (amenity, public and private) in the PCC Adopted UDP or 'Community Facilities and Indoor Recreation' in the Deposit LDP. It also includes land on which the public have the 'right to roam' under the Countryside Rights of Way Act, although none of this 'open access land' is present in the vicinity of the Scheme. Land which does not have any formal designation, but where there is evidence that it is well used on an informal basis is addressed by this assessment. UDP Open Space designations and Deposit LDP Community Facilities and Indoor Recreation areas are shown in Volume 2, Figure 13.1 a – d).

There are several public rights of way affected by the Scheme, which are used for recreation. The impacts of these affects are addressed in chapter 12 – Effects on all Travellers.

13.3.3. Development land

There are several areas of land in and around Newtown that are designated for Housing, Employment, Commercial and Retail Developments under the current PCC Adopted UDP and for Residential and Economic Development under the Deposit LDP. These sites are shown in ES Volume 2, Figure 13.1 (a – d).

One of the sites allocated for residential developments under the Deposit LDP also has approved outline planning permission. The site is located to the south of Heol Treowen (application refs:

M/2003/1354, M/2007/0470 & P/2009). The cumulative impacts associated with this proposed developments are assessed under chapter 15.

13.4. Predicted Environmental Effects

13.4.1. Construction impacts

13.4.1.1. Private property and associated land take

The Scheme would result in the demolition of two residential properties – Kinsale on Middle Dolfor Road and Gelli on Pool Road (refer to Figure 13.1 b and d). It would also result in the loss of some parts of the gardens of the following properties:

- Ashbrook, Middle Dolfor Road
- Woodside Cottage, Middle Dolfor Road
- Sunridge, Upper Dolfor Road
- Hazeldene, Pool Road

It would also affect approximately 1.0ha of other residential land. However most of this would only constitute the adjacent half road widths of existing highways which would be improved which are presumed to be owned by these properties. In total 2.5ha of land would be required during the construction phase (temporary and permanent land take).

The Scheme would also affect approximately 4.5ha of commercial land during the construction phase (temporary and permanent). The majority of this is in relation to the Glandulas Holiday Home Park (approximately 2ha) and Welsh Government's land in the Mochdre Industrial Estate (approximately 1.8ha). The other commercial land affected would be small areas of individual factories where alternative accesses would be provided and a small area of Network Rail's land to construct the Railway Bridge. Glandulas Holiday Home Park would also lose four permanent static caravan pitches.

The impacts on private property and associated land prior to mitigation, during the construction phase are shown in Table 13.4.1 below. Note that effects on agricultural farm units are addressed in the second part of this chapter.

Table 13.4.1 – Construction impacts on private property and associated land take prior to mitigation

Receptor	Description of impact	Sensitivity	Magnitude	Significance	Comments / notes
Hafren View	Loss of land (including part of field and woodland) and realignment of access	High	Slight Adverse	Moderate-Minor Adverse	
Glandulas Holiday Home Park	Loss of land for Scheme construction, severance of holiday home park and loss of four permanent static caravan pitches	High	Large Adverse	Major Adverse	
Kinsale	Property requires demolition in order to construct the Scheme	High	Large Adverse	Major Adverse	Compulsory purchase of property required.
Asbrook	Loss of some parts of the garden	High	Moderate Adverse	Major – Moderate Adverse	
Woodside Cottage	Loss of some parts of the garden/woodland	High	Moderate Adverse	Major – Moderate Adverse	

Receptor	Description of impact	Sensitivity	Magnitude	Significance	Comments / notes
Gelli	Property requires demolition in order to construct the Scheme	High	Large Adverse	Major Adverse	Compulsory purchase of property required
Hazeldene	Some of garden lost to Scheme	High	Moderate Adverse	Moderate – Minor Adverse	
Other residential land	Loss of approximately 1.2ha of land (mostly half road widths)	Moderate	Slight Adverse	Minor Adverse	
Other commercial land	Loss of approximately 2.5ha of land (mostly Welsh Government's land at Mochdre Industrial Estate, Network Rail and alternative factory accesses)	Moderate	Slight Adverse	Minor Adverse	

13.4.1.2. Land used by the community

No land allocated as 'Open Space' within the PCC Adopted UDP or land allocated for Community Facilities and Indoor Recreation within the Deposit LDP would be affected. Effects on Public Rights of Way used for recreational walking are assessed in Chapter 12 of this ES – Effects on all Travellers. The magnitude of impacts on land used by the community is therefore considered Neutral and the Significance of Impact Negligible.

13.4.1.3. Development land

The land to the south of Heol Treowen which is allocated for residential development within the Deposit LDP and has outline planning for residential development (M/2003/1354, M/2007/0470 & P/2009/0942) would be affected during the construction phase. Approximately 0.2ha of the land holding would be affected by land taken for 'easement' to provide access to the site during construction and for future maintenance requirements for Brimmon Farm Underpass and Pond 3.

As the site has an approved planning permission the sensitivity of the receptor is considered 'high'. The magnitude of impacts is however considered slight adverse as only a strip of the land would be required to access the site. The significance of impact is considered moderate – minor adverse.

No other land allocated for housing, employment or retail development within the PCC Adopted UDP or for Housing or Economic Development within the PCC Deposit LDP would be affected.

13.4.2. Operational impacts

13.4.2.1. Private property and associated land take

Approximately 1.7ha of residential land would be required during the operational phase prior to mitigation (permanent land take). Operational impacts prior to mitigation are considered the same as for construction impacts (refer to Table 13.4.1).

13.4.2.2. Land used by the community

No land allocated as 'Open Space' within the PCC Adopted or land allocated for Community Facilities and Indoor Recreation within the Deposit LDP would be affected. Magnitude and significance of impact are therefore Neutral and Negligible as per the construction phase.

13.4.2.3. Development land

The land to the south of Heol Treowen allocated for residential development within the Deposit LDP (which has outline planning permission) would have approximately 0.2ha affected with the land taken as 'easement' as described in paragraph 13.4.1.3. During the operational phase this would mean that access would need to be provided through the site for maintenance of the

Brimmon Farm Underpass and Pond 3 and this area would still continue to provide access to Upper Brimmon Farm.

The magnitude of this impact is considered slight and the significance moderate – minor adverse (as per the construction phase) as there will only be a requirement to provide access through the site and the developable area is unlikely to be reduced significantly.

13.5. Proposed Mitigation

13.5.1. Construction mitigation

13.5.1.1. Demolition of private property and associated land take

For those commercial premises and land holdings affected by the Scheme appropriate financial compensation would be provided. Where access is affected to private properties and businesses, temporary access would be provided. The Glandulas Overbridge would be completed early in the construction phase and would facilitate access between the severed sections of the Holiday Home Park. Prior to its construction access would be maintained between the severed sections.

Mitigation in the form of financial compensation would be provided to those private property owners where properties are to be demolished or where land is affected by the Scheme.

13.5.1.2. Loss of land used by the community

As the assessment has not identified any impacts on land used by the community, no mitigation is proposed.

13.5.1.3. Effects on development land

No mitigation is proposed as there are no detailed plans for the site at present.

13.5.2. Operational mitigation

13.5.2.1. Demolition of private property and associated land take

New accesses would be provided to those properties affected. An overbridge would be provided to accommodate access between the severed sections of the Glandulas Holiday Home Park.

13.5.2.2. Loss of land used by the community

As the assessment has not identified any impacts on land used by the community, no mitigation is proposed.

13.5.2.3. Effects on development land

No mitigation is proposed as long-term impacts are considered to have a negligible significance.

13.6. Residual Environmental Effects (following mitigation)

13.6.1. Construction impacts

13.6.1.1. Demolition of private property and associate land take

The residual construction impacts are shown in Table 13.6.1 below.

Table 13.6.1 – Construction impacts on private property and associated land take following mitigation

Receptor	Description of impact	Magnitude (prior to mitigation)	Significance (prior to mitigation)	Mitigation	Magnitude (following mitigation)	Significance (following mitigation)
Hafren View	Loss of land (including part of field and woodland) and realignment of access	Slight Adverse	Moderate-Minor Adverse	Appropriate financial compensation and new realignment of access provided	Slight Adverse	Moderate-Minor Adverse
Glandulas Holiday Home Park	Loss of land for Scheme construction, severance of holiday home park and loss of four permanent static caravan pitches	Large Adverse	Major Adverse	Appropriate financial compensation provided. Access maintained across site throughout construction with the Glandulas Overbridge completed early in the construction phase. With provision of mitigation the Holiday Home Park business is considered to be still viable but adversely affected	Moderate Adverse	Major – Moderate Adverse
Kinsale	Property requires demolition in order to construct the Scheme	Large Adverse	Major Adverse	Appropriate financial compensation and new realignment of access provided	Large Adverse	Major Adverse
Asbrook	Loss of some parts of the garden	Moderate Adverse	Major – Moderate Adverse	Appropriate financial compensation and new realignment of access provided	Moderate Adverse	Major – Moderate Adverse
Woodside Cottage	Loss of some parts of the garden/woodland	Moderate Adverse	Major – Moderate Adverse	Appropriate financial compensation and new realignment of access provided	Moderate Adverse	Major – Moderate Adverse
Gelli	Property requires demolition in order to construct the Scheme	Large Adverse	Major Adverse	Appropriate financial compensation and new realignment of access provided	Large Adverse	Major Adverse
Hazeldene	Some of garden lost to Scheme	Moderate Adverse	Moderate – Minor Adverse	Appropriate financial compensation and new realignment of access provided	Moderate Adverse	Moderate – Minor Adverse
Other residential land	Loss of approximately 1.2ha of land (mostly half road widths)	Slight Adverse	Minor Adverse	Appropriate financial compensation and new realignment of access provided	Slight Adverse	Minor Adverse
Other commercial land	Loss of approximately 2.5ha of land (mostly Welsh Government's land at Mochdre Industrial Estate, Network Rail and alternative factory accesses)	Slight Adverse	Minor Adverse	Appropriate financial compensation and new realignment of access provided	Slight Adverse	Minor Adverse

13.6.1.2. Loss of land used by the community

As no impacts or mitigation have been identified in relation to loss of land used by the community, the magnitude and significance of impacts are the same as stated in Section 13.4.1.2.

13.6.1.3. Effects on development land

As no mitigation has been identified in relation to loss of development land the magnitude and significance of impacts are the same as stated in Section 13.4.1.3.

13.6.2. Operational impacts

13.6.2.1. Demolition of private property and associated land take

Operational impacts following mitigation are the same as those shown in Table 13.6.1 above.

13.6.2.2. Loss of land used by the community

As no impacts or mitigation have been identified in relation to loss of land used by the community, the magnitude and significance of impacts are the same as stated in Section 13.4.2.2.

13.6.2.3. Effects on development land

As no mitigation has been identified in relation to development land during the operational phase the magnitude and significance of impacts are as stated in Section 13.4.2.3.

13.7. Summary and Conclusions

The Scheme would affect a number of private properties and associated land. The greatest impacts would result from the demolition of two residential properties; Kinsale on Middle Dolfor Road and Gelli on Pool Road and the severance of land at the Glandulas Holiday Home Park and loss of four permanent static caravan pitches. Other impacts would include the loss private land including gardens and realignment of accesses.

The Scheme would not impact on any land designated at ‘open access’ land under the CRoW Act, or ‘Open Space’ within the Adopted UDP or ‘Community Facilities and Indoor Recreation’ within the Deposit LDP.

No land allocated for housing, employment or retail development under the Powys Adopted UDP or for Housing and Economic Development under the Deposit LDP would be acquired for the Scheme. A strip of land through a Deposit Draft LDP residential designation which has outline planning permission would be taken as ‘easement’ to allow access through the site. However, this is unlikely to affect the developable area significantly.

As the Scheme does not acquire any land designated for development or Open Space within the Powys UDP, it can be concluded that the Scheme conforms to this plan. Aside from the strip of land taken as easement described above, the Scheme does not affect any other Deposit LDP designation and therefore conforms with the plan. There is also no conflict with other policy, legislation or guidance that pertains to private property, land take, land used by the community and development land.

Table 13.7.1 – Summary of Impacts in relation to Private property associated land-take, land used by the community and development land

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation	Notes / Comments
Construction Impacts					
Hafren View	Loss of land (including part of field and woodland) and realignment of access	Slight Adverse	Slight Adverse	Moderate-Minor Adverse	
Glandulas Holiday Home Park	Loss of land for Scheme construction, severance of holiday home park and loss of four permanent static caravan pitches	Large Adverse	Moderate Adverse	Major – Moderate Adverse	
Kinsale	Property requires demolition in order to construct the Scheme	Large Adverse	Large Adverse	Major Adverse	
Asbrook	Loss of some parts of the garden	Moderate Adverse	Moderate Adverse	Major – Moderate Adverse	
Woodside Cottage	Loss of some parts of the garden/woodland	Moderate Adverse	Moderate Adverse	Major – Moderate Adverse	
Gelli	Property requires demolition in order to construct the Scheme	Large Adverse	Large Adverse	Major Adverse	
Hazeldene	Some of garden lost to Scheme	Moderate Adverse	Moderate Adverse	Moderate – Minor Adverse	
Other residential land	Loss of approximately 1.2ha of land (mostly half road widths)	Slight Adverse	Slight Adverse	Minor Adverse	
Other commercial land	Loss of approximately 2.5ha of land (mostly Welsh Government's land at Mochdre Industrial Estate, Network Rail and alternative factory accesses)	Slight Adverse	Slight Adverse	Minor Adverse	
Land used by the community	No impact on land allocated as 'open	Neutral	Neutral	Negligible	

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation	Notes / Comments
	access' land under the CRoW Act, Open Space under the Adopted UDP or Community Facilities and Indoor Recreation under the Deposit LDP.				
Development land – Land South of Heol Treowen	Approximately 0.2ha of the land holding would be affected by land taken for 'easement' to provide access to the site during construction	Slight Adverse	Slight Adverse	Moderate – Minor Adverse	
Operational Impacts					
Operational impacts are the same as construction impacts shown above.					

Effects on agricultural land

13.8. Introduction

13.8.1. General

This section addresses impacts in relation to the effects on agricultural land and businesses associated with the Scheme. It was undertaken in accordance with the methodology within the DMRB Volume 11, section 3, Part 6 and follows guidelines outlined in IAN 125/09(W)[13.1].

13.8.2. Policy context

In relation to agricultural land, national planning policy on the development of land is set out in Planning Policy Wales Edition 7 (PPWE7) (July 2012) and the accompanying Technical Advice Note 6 (TAN 6, 2010).

PPWE7 advises in paragraph 4.10.1 that land of grades 1, 2 and 3a of the DEFRA system of Agricultural Land Classification (ALC) is the 'best and most versatile' (BMV) and should be conserved as a finite resource for the future. In development management decisions considerable weight should be given to protecting such land from development, because of its special importance. Such land should only be developed if there is an overriding need for the development and either lower grade agricultural land is unavailable or has a recognised environmental value that outweighs the agricultural considerations.

TAN 6 advises on factors to consider when assessing the effects of development on agricultural land (section 6.2) including:

- The effects on farm size and structure;
- The effects on the efficient use of buildings, fixed equipment and capital investment; and
- The effects on drainage, both surface water and land drainage systems.

The adopted Powys Unitary Development Plan (UDP) contains policy ENV1 "Agricultural Land". This notes that BMV land will be safeguarded wherever possible. It notes that it may be appropriate to safeguard lower quality land in situations where such land is of particular value to agriculture in the locality.

There are no specific policies that relate to agriculture within the Deposit Local Development Plan (LDP). However, LDP Objective 3 – *'Efficient Use of Land'* state that there is *'a general presumption against unsustainable development in open countryside and development on soils of high value'*. LDP Objective 7 *'Key Economic Sectors'* states there should be maintenance and strengthening of key economic sectors within Powys such as agriculture and the rural economy.

13.9. Methodology

13.9.1. Effects on agricultural land

The assessment has been carried out in accordance with the methodology within the DMRB Volume 11, section 3, Part 6. As per the DMRB and national and local policy, the agricultural assessment covers loss of land and soil resources, the type of land management and farming practices currently operated and the potential impacts on these, and matters such as severance, disturbance and disruption. The assessment covers direct and indirect, secondary, short, medium and long-term, permanent and temporary, beneficial and adverse impacts of the Scheme. The assessment considers the severity of the impact for two different scenarios:

(i) Where no mitigation is provided;

(ii) Where mitigation is provided.

13.9.2. Data collection and sources of information used

In terms of land use and ownership, a combination of desk based research, questionnaire surveys and meetings with affected parties have been undertaken. This includes:

- Searches of Land Registry information;
- Issuing of questionnaires to affected parties;
- Meetings held with affected parties.

From this work, a detailed knowledge of land ownership interests affected by the Scheme has been collated.

In relation to the effects on agricultural land and businesses, the assessment work has included:

(i) A study of the available published soil, geology and climate data, land quality records and topographic information. This includes:

- the 1:250,000 Geology Map of Wales;
- climatological data for Agricultural Land Classification produced by the Meteorological Office;
- sheet 2 of the National Soil Map Series; and
- the Provisional ALC Plan for Wales;

(ii) From this the likely ALC has been estimated;

(iii) Consultation with The Welsh Government Technical Services Department's Regional Planning Adviser over the requirement for a detailed Agricultural Land Classification Survey;

(iv) A study of the engineering layout plans and land referencing information;

(v) Interviews with affected farmers, landowners and occupiers during the period October 2013 to January 2014.

13.9.3. Assessment criteria

Agricultural land and businesses

The process of EIA requires various thresholds to be set to determine the levels of significance of impact. There are no universally recognised definitions of what constitutes "significance"; this will differ according to the perspective of the stakeholder(s). However for the purposes of this technical assessment, and to assist in its interpretation, common assessment criteria and terminology have been developed for the analysis of predicted impacts. The assessment criteria for impacts on agricultural soil resources and business as set out below have been agreed previously with the Regional Planning Advisor from the Technical Services Department of the Welsh Government. The criteria are based on the formulaic approach proposed in the revised DMRB guidance HA 205/08[13.4].

Receptors

Agricultural land resources

Agricultural land, in particular land of the best and most versatile quality (Grades 1, 2 and 3a), is recognised as being a finite resource of national importance. There are no defined thresholds for assessing the magnitude of the impact, so thresholds have been agreed in consultation with the Welsh Government (as set out in the Environmental Scoping Report, 2013).

Therefore, in respect of effects on agricultural land, this is a resource of national importance and the thresholds reflect both the quantum and quality of the agricultural land affected.

Farm businesses

Farm and land-based rural businesses, whether run by owner-occupiers, tenants, licencees or contractors, and whether affected directly or indirectly, are a key receptor. The assessment has considered the physical effects, including land loss, severance, the potential effects on the movement of livestock, field accesses, drainage and the use of farm buildings. It has also considered, taking a long-term view, the potential effects on the medium to long-term ability for the remaining holding to continue in a beneficial agricultural use.

The effect on occupying and neighbouring land-based businesses is a more transient impact to assess. Such businesses vary from year to year, and even from day to day, affected by many external influences such as management wishes and decisions, market prices, illnesses and diseases, the weather and the exchange rate with the Euro.

Whilst the quality and quantity of agricultural land will influence the farming and other land management practices operated over it, because of the transient nature of farm businesses the effect on those businesses is assessed as being of local importance. That distinction is not intended to denigrate the important role of land managers in providing food for the nation and other opportunities and services.

Criteria

The assessment of impact on land resources has been carried out in three stages. First the magnitude, secondly the importance/sensitivity of the receptor, and thirdly the significance of impact has been considered. These have been determined against the criteria set out in Table 13.9.1 below.

Table 13.9.1 Agricultural Magnitude of Impact Assessment Criteria

Impact Magnitude	Definition	
	Impact on Soils	**Impact on Local Agriculture**
Major	The proposed development would directly lead to the loss of over 20 hectares of **"best and most versatile agricultural land"** (Grades 1 / 2 / 3a).	The impact of the development would render a full-time agricultural business non-viable.
Moderate	The proposed development would directly lead to the loss of between 5 and 20 hectares of **"best and most versatile agricultural land"** (Grades 1 / 2 / 3a).	The impact of the development would require significant changes in the day to day management of a full-time agricultural business.
Slight	The proposed development would directly lead to the loss of less than 5 hectares of **"best and most versatile agricultural land"** (Grades 1 / 2 / 3a) or the loss of any quantity of non BMV land (Grades 3b, 4 or 5).	Land take would require only minor changes in the day to day management / structure of a full-time agricultural business or land take would result in the loss or a significant impact on a part-time business.
Negligible	No direct impact upon agricultural land.	Land take would require only negligible changes to an agricultural business.

The methodology for determining the sensitivity of the receptors is set out in Table 13.9.2 below. There are two identified receptors, one of national importance, the loss of which is determined as high, while the second receptor is of local importance and is defined as of low sensitivity.

Table 13.9.2 Agricultural Receptor Sensitivity

Sensitivity	Examples of Receptors
High	Land Resources are matters of potentially national importance. There are no defined criteria against which to set thresholds. The effect on land resources is a combination of the quantum and quality of agricultural land affected, relative to both the national resource and the relative availability of land of that quality locally. Land resources should therefore be classified as being of high environmental value (sensitivity).
Low	Farm businesses are of potentially local importance. The way that farms are operated will vary over time according to ownership and local and international economic factors. Farm businesses are tolerant of some change without detriment to their character.

A combination of the magnitude and sensitivity allows an assessment of the significance of the impact, as defined in Table 13.9.3 below.

Table 13.9.3 Agricultural Significance of Impact

Magnitude	Sensitivity	
	High	Low
Major	Major Adverse / Beneficial	Moderate Adverse / Beneficial
Moderate	Major-Moderate Adverse / Beneficial	Moderate-Minor Adverse/ Beneficial
Slight	Moderate-Minor Adverse / Beneficial	Minor Adverse / Negligible
Negligible	Negligible	Negligible

13.9.4. Limitations and assumptions

Farm management can change in short periods of time, so whilst the data used was correct at the time of survey, this may change with time. It is assumed that the general farming practices assessed would continue.

13.10. Baseline Conditions

In relation to agriculture, baseline conditions can be divided into two categories:

- Inherent conditions such as soils and land quality, which are not influenced to any significant degree by man;
- Land-use conditions, such as farming occupation and management, which are transient.

13.10.1. Inherent conditions

The small-scale geology map covering Wales shows Silurian rocks over the area surrounding the town. These rocks weather to give loamy materials in which the soils are developed.

Soil information is available on Sheet 2 of the National Soil Map (SSEW 1983). This shows soils to the east and south of the town to comprise seasonally waterlogged fine silty and clayey soils (Cegin association) with soils of the Rheidol association to the south-west, which are generally better drained loamy over gravel soils, shallow in places.

The climate for the area (Met Office 1989) shows an average annual rainfall of 900mm with equable temperatures, which imposes no limitation to land quality. The field capacity for the area, being the period when soils are saturated, is in excess of 200 days.

Gradient in part of the area is moderately steep and results in localised limitations to land quality.

Published ALC information is available at a scale of 1:250,000. This indicates that the entire area covered by the route of the Proposed Scheme is classified as Grade 4 poor quality agricultural land (refer to Volume 3, Appendix J.1).

It has been agreed with the Welsh Government during the scoping consultation, that there is unlikely to be any land of Subgrade 3a or higher (i.e. best and most versatile agricultural land) within the Scheme landtake. The land is likely to comprise a mixture of Subgrade 3b and Grade 4 quality.

13.10.2. Farm businesses

The majority of the land along the route of the Scheme is farmed and forms part of privately owned or occupied farm businesses. There is a Holiday Home Park also associated with farmland, at the western edge of Newtown.

Thirteen farm and land-based rural units are directly affected. These comprise a mixture of part-time and full-time farm units and mostly beef and sheep units with little arable land, or blocks of land let to others to farm.

These units are summarised in the following table.

Table 13.10.1 Summary of the Main Farm Units Affected

No.	Farm Unit	Description
1	Hafren View	A residential holding with a small area of pasture land.
2	Glanhafren Hall	A small holding with stables and paddocks to the west of the River Severn and north of the A489 Llanidloes Road.
3	Glandulas Holiday Home Park	A holding extending to 22.7 hectares, containing grassland grazed by sheep. There are two areas used for the parking for permanent static caravans occupied for holiday purposes. The lower site includes 60 caravans and was extended last in 2008. The upper area has planning consent for 20 pitches, of which 16 are currently occupied.
4	Powys County Council	A block of bare land (i.e. no buildings) owned by the County Council but let to Coleg Powys, Unit 4.
5	Coleg Powys	An 8.5ha holding extending to 120 hectares, of which about half is at Fronlas Farm. The farm runs a mixed beef and sheep breeding enterprise, and grows some root crops for fodder. The holding is centred on the buildings at Fronlas Farm, which is also a training college for young people.
6	Ffrydd Vaughan	A 44.5 hectare holding that has been in the same family for over 50 years. Originally a dairy farm, the land is now let to neighbouring farmers for them to graze sheep. The farm buildings have been converted and are let for non-agricultural purposes.
7	Black Hall	This holding forms the remnant of a former farm unit and now comprises a substantial dwelling with a modest amount of pasture land, occupied by tenants.
8	Plas Newydd	An off-lying parcel of land.
9	Bryneira	A 58 ha family-run mixed beef and sheep farm. The holding went out of milking in 2004 and buildings have been adapted to the rearing of calves and the sheep flock. The farm comprises one block of land.
10	Great Brimmon	Great Brimmon Farm is farmed collectively with Upper Brimmon Farm, Cefnaire and a block of bare land north of Newtown. Collectively this totals 111 ha. This family farm runs a mixed beef and sheep enterprise, and utilises three sets of buildings.
11	Lower Brimmon	This 40 ha farm is currently let out for the grazing of sheep but has until recently been a full-time mixed beef and sheep farm. There are buildings at Lower Brimmon Farm. The farm is divided into three blocks by roads.
12	Melstone	A 28.6ha let farming unit.
13	Penyfridd	A small block of grazing land let for sheep grazing.

13.11. Predicted Environmental Effects

13.11.1. Construction impacts

Agriculture

Many agricultural impacts would commence at the start of the construction phase and would continue throughout the operational phase (for example land loss, severance). They are thus described below under construction phase impacts.

Agricultural land resources

The effects on agricultural land resources transcend both construction and operational phases.

The Scheme requires the permanent acquisition of 51 hectares. This comprises land of Subgrade 3b and 4 quality, although the exact proportion of each grade is not known.

Given that there is no special protection for agricultural land of poorer quality (i.e. Subgrade 3b, Grades 4 and 5) the impact is identified as being of slight magnitude. Agricultural land is a receptor of high sensitivity. As a consequence of the slight magnitude but high sensitivity, given the quantum of land involved the impact is assessed as being of moderate significance.

Agricultural land use

Severance During Construction. Short-term severance of accesses may have time-limited implications for the management of agricultural and diversified activities. Permanent severance effects are considered under the operational stage.

Units 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 would all be affected by severance during construction. Without mitigation this has the potential to be of major significance for a number of these holdings, due to the quantum of land that would be inaccessible.

Crop Loss and Timing. The assessment has considered the potential losses which may have a knock on impact for other enterprises. Grassland is affected by the Scheme and for units 8, 9 and 11 in particular the land affected involves grassland cropped for winter food conservation or arable purposes. However, this would not be a major impact.

Loss of Buildings. Two agricultural buildings, one in active farming use, are directly lost as a result of the Scheme. One isolated Dutch barn at Unit 10, Lower Brimmon, is not currently in use. An isolated building with access to Pool Road and forming part of Unit 11 Melstone, would also be lost.

Disease Transmission. There is the potential, without good practice, for plant diseases and weeds to be spread between holdings. There is a limited risk of the spread of animal diseases without mitigation.

Field Drainage. There is some field drainage in the area, but during construction there is the potential for this to be severed or damaged. There is the potential for the existence of old drainage schemes that are not recorded or known in detail. Without mitigation the effect on land and soil conditions could spread wider as a result.

Water Provision, likewise, can be affected during construction. Without mitigation the effects could be more significant, including the loss of utility of grazing land.

Noise and Dust. Without mitigation, there could be impacts from noise (e.g. during construction) or from dust, although no particularly sensitive neighbouring land uses have been identified, with the exception of the Glandulas Holiday Home Park.

13.11.2. Operational impacts

Agriculture

A summary of the operational impacts associated with agricultural land and businesses is provided below, but as these effects started at the construction phase they have already been described and the effect is not therefore repeated:

(i) Land quality and take: this is the impact on the national agricultural resource of the loss of farmland in policy terms. This is of moderate adverse significance.

(ii) Land take and severance by farm: the impact on individual farm holdings due to permanent land take continues. This would be significant for 10 units without mitigation. The effects of land loss and severance may reduce over time, as patterns of land use, enterprise mix, land ownership etc. vary.

(iii) Drainage: long term impacts on land where drainage may be affected would continue, without mitigation, through the operational phase.

(iv) Water supplies: water from natural sources of mains/private farm supplies affected at the construction phase would continue to be an impact at operational phase, unless mitigated.

Operational noise: there may be impacts from operational noise, but purely in respect of the agricultural enterprises no especially noise sensitive land uses have been identified. This may be an issue for the Glandulas Holiday Home Park.

13.12. Proposed Mitigation

13.12.1. Construction mitigation

Agriculture

Agricultural Land Take. The Scheme involves the permanent land take of the minimum amount of land necessary. Wherever possible land required in addition for construction, for example the site compounds or areas identified for re-grading would be returned to an agricultural use.

Severance During Construction. Severance can be mitigated in places by the provision of underbridges or overbridges or new temporary and permanent accesses. These have been incorporated into the Scheme to reduce severance effects on the following units:

- 3, Glandulas Holiday Home Park, which would be provided with an overbridge to access the western area of caravans and the severed farmland;
- 5, Coleg Powys, which would be provided with two new accesses off Mochdre Lane, one access off the A483 Dolfor Road and two underpasses to access their land and land rented from PCC which would be severed from the main holding;
- 10, Great Brimmon, which would be provided with underpasses along the route of both existing main internal farm access tracks. In addition two new road field accesses would be provided at the eastern end of the farm off the A489 Kerry Road, so that larger grassland management machinery used for silage making can access the farm from the highway as it does at present.
- Improved accesses to severed land would be provided for units 6 (Ffrydd Vaughan), 7 (Black Hall), 9 (Bryneira), 11 (Lower Brimmon) and 12 (Melstone).

Crop Loss and Timing impacts can be reduced by giving advance warning to enable farmers to plan ahead for the year. The timing of entry so as to delay entering a few weeks before a field is to be cut for silage and entering straight after harvest, for example, would minimise the localised impacts.

Disease Transmission. Care to avoid spreading soil and materials between different farms when the fencing is being erected at the start of the entry process, would minimise the limited risk of spreading diseases. Once the route has been fenced there should be limited opportunity for contact with animals and accordingly limited risk for disease transmission. Care would need to be taken with any crossing points used by livestock during the construction process.

Field Drainage. Parts of the route have artificial field drainage schemes in place, particularly at unit 9 (Bryneira) and part of unit 8 (Great Brimmon Farm). There may also be areas where historic under-field drainage exists but the detailed layouts are not known by the current occupiers. Care would be taken to identify any drainage schemes and to provide collector or header pipes so that these schemes continue to work efficiently under the surrounding land both during the construction and during the operation phases. The drainage of surrounding land would be monitored and if drainage conditions are noted to have altered, remedial works would be carried out.

Water Provision would be maintained wherever possible. During construction it may be that water supplies to some areas would be severed, and in those circumstances the owners would be compensated to provide either temporary or permanent water supplies.

Noise and Dust would be kept to a minimum and within acceptable working limits, as described in Chapters 5 and 11 of this ES.

13.12.2. Operational mitigation

Agriculture

Land Loss and Severance

Mitigation for land loss is not possible. The area of land that would be permanently acquired is the minimum necessary to construct and operate the Scheme.

Severance impacts have been mitigated, where feasible and possible, within the Scheme. The provision of mitigation by way of underpasses or bridges brings into consideration many factors, not least engineering possibilities. Due to the hilly nature of the route, and the alignment of the Scheme cutting across the hillside in places, the physical possibilities for providing connections for severed land are limited.

Mitigation for severance would be provided for most holdings. This includes, as noted earlier, units at 3 (Glandulas Holiday Home Park), 4 and 5 (Coleg Powys), 10 (Great Brimmon), 11 (Lower Brimmon) and 12 (Melstone).

Alternative access to severed land at unit 9 (Bryneira) already exists, but it is physically constrained. An alternative access, which would be accessible for all farm vehicles would be provided.

Alternative accesses to other severed land at units 6 (Ffrydd Vaughan), 7 (Black Hall), 8 (Plas Newydd) and 13 (Penyfridd) would also be provided off local sideroads.

13.13. Residual Environmental Effects (following mitigation)

13.13.1. Construction impacts

Agriculture

Agricultural Land Resources

Some 51 ha of agricultural land would be required by the Scheme plus a further 25 ha temporarily during construction. This comprises a mixture of Subgrade 3b and Grade 4 agricultural land, defined as moderate to poor quality.

The loss of agricultural land is of national importance and thus of high sensitivity, but given that this is not the best and most versatile agricultural land the significance of the loss of 51 ha (to be included in Final ES) of poorer quality land is identified as an effect of moderate adverse significance.

Farm and Land-based Businesses

This assessment considers the cumulative impact of the construction phase impacts, as set out above, on the farm businesses affected. It assesses the impact after the mitigation embedded into the Scheme, including physical works (e.g. underpasses) and good management practices described above.

The magnitude of the post-mitigation impacts is assessed in the table below, and is ascribed a magnitude against the criteria in Table 13.9.1 above.

Table 13.13.1 Agricultural Magnitude of Post-mitigation Impacts

No.	Farm Unit	Magnitude of impact (post mitigation)
1	Hafren View	There would be a proportionately modest land take from the northern edge of this small, residential holding. This would have a proportionate effect on the stocking potential of the holding, which is part-time/hobby in scale. There would be no severance impacts, nor should drainage or water supplies be affected. Overall this would be an impact of negligible magnitude, leading to an overall impact of negligible significance.
2	Glanhafren Hall	1ha would be temporarily required and its levels lowered for the construction of a flood compensation area. This would be returned to agriculture once constructed, so there would be no permanent landtake. The overall impact would be of negligible magnitude and significance.
3	Glandulas Holiday Home Park	There are two principal parts to the Holiday Home Park, although they are closely linked. The Scheme would result in both land loss and severance. Four permanent static caravan pitches would be directly affected and would need to be relocated. There would be a direct loss of the bowling green and five touring pitches. The Park would be severed, although Glandulas Overbridge would be provided to link the two parcels of land. There is likely to be an adverse effect on the attractiveness of the site to holiday makers, which would affect economic success. Some reorganisation in the future, subject to planning permission, may provide a more attractive alternative layout. The agricultural land is let out and the effect on that would be limited. Overall approximately 22% of the holding would be lost. Overall the effect would be of moderate adverse magnitude (i.e. requiring significant changes to the day-to-day management), which leads to an overall significance, due to the low sensitivity of farm business, of moderate-minor adverse.
4	Powys County Council	This block of let grazing land would be severed, but two alternative accesses would be provided off Mochdre Lane. The business effects are considered under unit 5, which occupies the land. A slight adverse effect of negligible significance on its own.
5	Coleg Powys	Fronlas Farm is run by Coleg Powys and has a dual role: commercial farm and educational centre. The Scheme would run close by the farm buildings, which would not of itself have a significant effect on agricultural enterprises. Land loss would result in a reduction of land available and a proportionate decrease in the livestock enterprises that can be run on the holding. Severance, however, would be significant. Two underpasses, Coleg Powys Underpass and Bridleway Underpass, would be provided, together with parallel track, to enable access to the severed land for all vehicles, although additional travelling time would inevitably be involved. The Coleg trains young people to farm, including the driving of tractors. The mitigation should enable that training to continue. There would be a reduction in available land (about 5%) for growing of fodder crops (e.g. fodder beet) and the farm's ability to inject slurry would be curtailed. Overall the effect would be of moderate adverse magnitude (i.e. requiring significant changes), which coupled with the low sensitivity of the receptor results in an impact of moderate-minor adverse significance.
6	Ffrydd Vaughan	Ffrydd Vaughan now comprises a part-time holding, with the land let out for grazing. The Scheme would result in the loss of some 22.5% of the farmland, along the northern edges of the holding. The Scheme would cause severance of two of the northern-most fields, which would result in a significant alternative route being necessary to reach these areas. Water would need to be provided to the severed land. Access to all severed land would be provided. Overall this is an adverse impact of slight magnitude, leading to an overall effect of minor adverse significance.

7	Black Hall	The Scheme would cause severance of parts of two fields below the dwelling. This land forms only a part-time/hobby business and the effect would be of slight magnitude leading to an overall impact of minor adverse significance.
8	Plas Newydd	The Scheme would significantly curtail any future agricultural use of this small, off-lying parcel of land. Due to its off-lying location and limited size the effect would be of slight magnitude leading to negligible, albeit adverse impact.
9	Bryneira	This family farm operates a substantial mixed livestock farm, affording full-time work. Whilst the operators supplement their income with full-time work off the farm it is nevertheless a substantial holding. It would be significantly affected, necessitating significant changes to daily management. Stocking would need to be reduced due to the land loss, which represents about 7% of the holding. Additionally the Scheme would affect the fields used for production of silage, which would result in a disproportionately large impact. Severance compounds this impact. An alternative access to the severed land would be provided, accessible for all farm machinery. Holding pens may be needed to aid the movement of sheep and cattle. There would be impacts on field underdrainage and water supplies, both of which would be mitigated and made good. Overall, a farm business would be able to continue, but it would do so with significant changes to day-to-day management. Therefore the impact is of moderate adverse magnitude, leading to an overall impact of moderate-minor adverse significance.
10	Great Brimmon	This is a substantial, full-time stock farm. The Scheme would create a significant severance effect, severing about a third of the holding from the southern two thirds. The land loss of the farm is considerable, being 11.7ha or 10.5%. The land loss of itself would necessitate a proportionate reduction in stocking rates or increased importation of fodder. Land loss of itself would not result in the cessation of the business, however the Scheme would cause significant severance. Two underpasses, Brimmon Farm Underpass and Brimmon Lane Underpass, would be provided, as this would enable vehicular access to be retained to both Great and Upper Brimmon Farm holdings/buildings. The consequence would be that single-handed movement of livestock between Great or Upper Brimmon Farms, and Cefnaire, should be capable of continuing. This significantly mitigates the effect. There would be effects on field water supplies and possibly on under-field drainage, but these can be mitigated via compensation. Additionally increased concentration of livestock movement may increase field damage in gateways. Large silage-making farm machinery can currently only access the farm via a field gateway off the A489 Kerry Road, and two alternative field gateways would be provided off the A489 Kerry Road to enable that seasonal access to continue. Overall the farm would experience a significant effect, necessitating significant changes to the day-to-day management, as a consequence of both land loss and the increased workings involved with the severance. However the farm business would be able to continue, albeit with a significant and consequential impact on the overall economics. The effect is one of moderate magnitude, leading to an overall adverse effect of moderate-minor significance.
11	Lower Brimmon	This currently part-time livestock farm would be severed into two broadly-equal halves by the Scheme. This would have a significant impact on day-to-day management. Presently sheep can be run across from field to field and straight across the lightly-trafficked Wern Ddu Lane to the eastern fields. To mitigate the impact, holding pens would need to be provided at entrances either side of the farm, allowing livestock to be corralled prior to moving then along the Wern Ddu Lane. Relocated field gateways would also assist. Overall there would be a significant impact, primarily as a consequence of the combination of land loss (about 9.5%) and severance. One building of limited utility would be lost. Impacts on field drainage and water supplies would be mitigated during construction. The farm would be capable of continued beneficial agricultural use. The effect is considered to be of moderate magnitude which leads to an overall adverse impact of moderate-minor significance.

12	Melstone	The affected land comprises a block of farmland detached from the main unit. That block would be severed, but road access would be provided to the severed parcels, albeit limited by height restrictions on Wern Ddu Lane. The use of the parcel of land would be affected by severance, and there would be land loss. Additionally there would be land loss from the edge of the field north of the existing A483 Pool Road. An agricultural building off Pool Road, and detached from the farmyard, would be lost. This would reduce the storage available on the holding. Any impacts on underfield drains and water supplies would be mitigated. The overall impact is of slight magnitude, leading to an adverse impact of minor significance.
13	Penyfridd	This offlying block of grazing land is of only moderate utility, forming two long and narrow strips either side of the railway. Part of the northern field would be lost to the Scheme. Access to the southern parcel is currently both under and over the railway. These accesses would be maintained. The overall impact would be of slight magnitude leading to an impact of minor significance.

13.13.2. Operational impacts

Agriculture

No agricultural enterprises would be significantly affected by operational impacts that have not been described above.

13.14. Summary and Conclusions

Much of the land affected by the Scheme is in agricultural use and therefore there are impacts on a number of agricultural units. The entire area covered by the route of the Scheme is classified as Grade 4 poor quality agricultural land on the published provisional ALC plans, and none is expected to be better than Subgrade 3b. Mitigation in the form of underpasses and over bridges to accommodate farm machinery is proposed for Glandulas Holiday Home Park, Coleg Powys, and Great Brimmon Farm. Alternative new accesses would be provided for all other agricultural land severed by the Scheme. 51ha of agricultural land would be permanently acquired and the 25ha of land temporarily required for construction would be returned to agricultural use following completion of the Scheme.

As the Scheme is not affecting any of the best and most versatile agricultural land, it also meets with national planning policy (i.e. Planning Policy Wales Edition 7). The assessment has also taken account of national planning policy guidance (Technical Advice Note 6) by considering effects on farm size and structure; effects on the efficient use of buildings, fixed equipment and capital investment; and effects on drainage, both surface water and land drainage systems. There are impacts but these are mostly of moderate-minor significance, resulting in significant changes to the day-to-day running of a number of farms but not preventing beneficial agricultural use from continuing.

Table 13.14.1 – Summary of Impacts in relation to agriculture

Receptor	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation	Notes / Comments
Construction Impacts					
Agricultural land	Loss of land resource	Slight	Slight	Moderate-minor adverse	
Farm businesses	Effect of severance and land loss	10 units of major-moderate adverse	5 units moderate adverse, 6 slight, 2 negligible	5 moderate-minor, 3 minor, 5 negligible	
Operational Impacts					
Glandulas Holiday Home Park	Disturbance, loss of attractiveness to users	Moderate	Moderate	Moderate	

14. Road Drainage and the Water Environment

14.1. Introduction

This chapter provides an assessment of the water environment related to the Scheme. The assessment methodology followed is in accordance with the guidance provided in the Design Manual for Roads and Bridges (DMRB) HD45/09[14.1].

This chapter considers the existing water environment conditions for the Scheme and the legislative context. It investigates the likely effects of the Scheme on the quality of surface water, groundwater and flood risk. Generic and specific effects on the water environment during the construction phase and the operational phase are identified and assessed. Implications relating to abstraction and existing discharge of water have also been assessed.

The main environmental features referred to in this chapter are shown in Volume 2, Figure 14.1-14.3.

Reference is also made to a Flood Consequences Assessment (FCA) a Water Framework Directive (WFD) report a Drainage Strategy report and water quality tests undertaken using the Highway Agency Water Risk Assessment Tool (HAWRAT). These are reported in Volume 3 Appendix K.1 - K.4 respectively. Full HAWRAT data can be obtained from the Welsh Government on request.

14.1.1. Policy context

The protection of specific water resources, water quality and related policy relevant to the Scheme is set out in the following relevant European legislation:

- The Water Framework Directive (2000/60/EC)
- The Urban Waste Water Treatment Directive (91/271/EEC)
- The Habitats Directive (92/43/EEC)

The aim of water policy in Wales is to protect both public health and the environment by maintaining and improving the quality of natural waters. These include surface water bodies (e.g. rivers, streams, lakes, ponds) and groundwater.

European legislation is implemented in the UK through specific sets of Regulations. The Welsh Government is responsible for all aspects of water policy in Wales. Management and enforcement of water policy is the responsibility of Natural Resources Wales (NRW).The following national legislation is relevant:

- Environmental Protection Act (1990)
- Water Industry Act (1991)
- Environment Act (1995)
- Water Act (2003)
- Water Environment (Water Framework Directive) (England and Wales) Regulations 2003
- Environmental Damage (Prevention and Remediation) Regulations (2009)
- Flood risk regulations (2009)
- Water Resources Act (1991) (Amendment) (England and Wales) Regulations (2009)
- Environmental Permitting Regulations (England and Wales) 2010
- Flood and Water Management Act (2010)

National Planning Policy – Technical Advice Notes (TAN)

The context for planning policy in Wales is set out within the Planning Policy Wales document referencing European and National legislation and supplemented by a series of Technical Advice Notes (TAN) and Policy Clarification Letters.

TANs provide local authorities with guidance when considering the effects of new developments. The TANs identified below can be useful to refer to when assessing road developments.

- TAN 5: Nature Conservation and Planning gives advice as to the consideration of impacts on designated sites in relation to the water environment.
- TAN 15: Development and Flood Risk (2004), provides technical guidance which supplements the policy set out in Planning Policy Wales in relation to development and flooding.

Powys County Council Unitary and Local Development Plans

The route of the Scheme is situated within the county of Powys and as such reference has been made to the Unitary Development Plan (UDP) adopted by Powys County Council (PCC) in March 2010[14.2]. It will guide development during the plan period and supersedes all development plans that were previously in place. In July 2014, PCC published their Deposit Local Development Plan (LDP). Once fully adopted (programmed December 2015) this will replace the current UDP. As such, reference has also been made to this draft plan considering the policies relevant to the water environment[14.3]

The UDP provides a policy framework for positive forward planning, proposals and allocations for future developments and the basis on which consistent development control decisions can be made.

Policy DC13 refers to surface water drainage, outlining development proposals that will be permitted, subject to the following:

- That they make adequate provision for land drainage and surface water disposal;
- That they would not adversely affect flood management or maintenance schemes.
- That they would not give rise to unacceptable on or off site flooding
- If mitigation measures are required to permit a development to proceed, a condition will be attached to any planning permission, or a planning obligation by agreement sought, to ensure that the necessary works are completed prior to the commencement of the development.
- Where proposals include satisfactory alleviation measures to overcome any problem of drainage these will only be acceptable where they will not result in:
    - the loss of wetland habitats;
    - unacceptable adverse impacts on surface or ground waters; and
    - the loss or impediment of access to watercourses and public rights of way

The UDP also highlights the use of Sustainable Urban Drainage Systems (SUDS) and states where the use of SUDS is not feasible, developers should connect to existing (or new) surface water drainage systems where these are available and have adequate capacity. Where systems are not available or capacity has been reached, development will only be acceptable where a satisfactory alternative means of disposal can be found. This may involve some form of flow balancing to control discharges, but could also require the provision of on and off site improvements.

When considering proposals as part of larger developments, PCC highlights that new surface water sewers/drains which discharge directly into local watercourses may provide a practical but less favourable solution.

The Deposit Draft LDP [14.3] echoes that of the UDP, highlighting the importance of water and flood alleviation, recognising the LDP must manage development to carefully protect these resources and prevent pollution. For instance, the LDP should support the protection of quality of the water environment in line with the WFD.

Policy DM1 refers to Strategic Planning Matters, specifically outlining that all proposals for development must not compromise, or unacceptably adversely affect, either on their own or in combination with existing or approved development on:

- The achievement of water quality standards in line with the WFD
- Increasing flood risk elsewhere, and shall where possible allow floodplains to provide water storage to reduce flooding in the catchment

Policy DM2 refers to proposals near a watercourse or within an area of floodplain which must comply with the following (but not limited to):

- In areas identified at risk of flooding (fluvial, surface water) or where a watercourse has insufficient channel capacity, opportunities to improve existing flood risk by using SUDS, wetlands or other agreed and appropriate measures are investigated and implemented wherever possible
- Satisfactory provision shall be made for land drainage and SUDS
- The effective use of permeable surfaces, soakaways and water storage areas should be incorporated in development where technically possible
- SUDS are included for all new development; space should be specifically set aside for SUDS and used to inform the overall site layout. If SUDS cannot be implemented, a full written justification should be submitted explaining why this is the case
- Actions are taken to de-culvert wherever possible. Where this is not possible, an assessment of the structural integrity of the culvert, with any required remedial work, should be carried out prior to the development. A maintenance schedule should be developed for all culverts to ensure regular clearance

Further, Policy TD3 specifically highlights proposals for development that would adversely affect the role of the Montgomery Canal or prejudice its restoration will be opposed.

Wales National Transport Plan (NTP)

The National Transport Plan (NTP) 2010 sets out how the Welsh Assembly Government will deliver the plan (Wales National Transport One Wales: Connecting the Nation), over the next five years. During the development of the NTP a Strategic Environmental Assessment (SEA) was undertaken to ensure the integration of the environment was taken into consideration within the planning and decision making process. The main output from the SEA was an Environmental Report published in July 2009, with an addendum to this in March 2010[14.4]. For the water environment section of this report reference has been made to the following NTP SEA objective and sub-objectives:

Objective 8 - Minimise transport related effects on water quality, flood plains and areas of flood risk.

Sub-objectives

- 8.4 Minimise transport impacts on flood plains and areas of flood risk
- 8.5 Encourage use of sustainable drainage systems/permeable surfaces

14.2. Methodology

The water environment assessment includes consideration of water quality, flood risk and the WFD. Separate reports for FCA and the WFD compliance assessment are included within Volume 3, Appendix K1 and K.2. A summary of their methodologies is provided within this section.

The water quality assessment is presented within this section and has been based on the methodology detailed in the DMRB, HD45/09[14.1]. This deals with road drainage and the water environment and is described below.

The significance of potential effects on the water environment has been determined by assessing:

1. Importance of the water receptors;
2. Magnitude of the impacts of the Scheme; and
3. Influence of mitigation measures.

Data sources

Ongoing correspondence and consultation with the WG, NRW and PCC have been a key part of defining the scope of work for investigating water quality, drainage and hydrology, as well as guiding the production of the FCA. Data sources are detailed in Table 14.2.1.

Table 14.2.1 Datasets used within assessment

Source	Dataset/information	Date on dataset	Description
Environment Agency	Severn River Basin Management Plan[14.5]	December 2009	Annex B: Severn River Basin District
NRW	Data request for the Scheme (reference XJ220003) [14.6]	October 2013	Data request for items including but not limited to: abstractions, discharges, environmental permits, location of any routine water quality monitoring points within 1km of the Scheme
	River Severn catchment flood model TAN 15 Development Advice Maps Flood maps Flood maps for surface water	December 2007	
PCC	Abstraction data	January 2014	Local abstraction data
	Information on known flood history Hard copy plans of culverts on the Dolfor Brook	October 2013	
North and Mid Wales Trunk Road Agency	Information on known flood history	February 2014	No flood risk areas identified
Flood Estimation Handbook (FEH) CD ROM version 3.0	Reference to Figure 11.6 – 1 hour rainfall (in mm) for return period of 100 years[14.7]	1999	Rainfall data obtained for Method C Tests in HD45/09
Countryside Council for Wales (now NRW)	Interactive maps for statutory rural designations [14.8]	October 2013	Allows search for statutory protected sites in the study area that may be sensitive to water environment changes
Metoffice.gov	Wales: climate[14.9]	December 2013	Overview of annual rainfall volume in Newtown (Powys)
Low Flows version 2.0[14.10]	Flow at low flow conditions has been used in the assessment The low flow conditions are expressed in terms of the 95th percentile flow (Q95), which is defined as the flow exceeded in a watercourse for 95% of the time	October 2013	Low Flows enables river flows to be estimated for ungauged catchments in the United Kingdom

Prediction and evaluation of effects

Prediction and evaluation of the effects of the Scheme follows the requirements and detailed assessment methods as set out in HD45/09[14.1]. The methods are outlined in Table 14.2.2. The results of the FCA, outlined under the assessment criteria, have been taken account when determining the significance of effects.

The DMRB methodology, firstly identifies the importance of the environmental attributes within the Scheme area. The magnitude of impact of the Scheme on the attribute is then determined using historical records, calculations and tests from the DMRB, taking into consideration the influence of mitigation measures. The combination of the importance of an attribute and the magnitude of impact on that attribute gives a significance of potential effect on the water environment.

The assessment of the importance of attributes, the magnitude of impacts and the significance of effects are outlined below. Potential impacts of both construction and operation have been investigated in accordance with HD45/09[14.1].

Table 14.2.2 Methods used within the water environment assessment

Method	Description
Method A	This method focuses on the dilution of routine runoff and pollutants. The method is a simple assessment and includes the use of HAWRAT considering dilution of indicator metals (dissolved zinc and dissolved copper). The HAWRAT tool is designed to make an assessment of the short-term risks related to the intermittent nature of road run-off as well as the long-term risks. All discharges have been tested using HAWRAT. The methodology for routine runoff involves tests to predict future concentrations of zinc and copper in receiving watercourses with addition of discharge from the Scheme. This is based on Annual Average Daily Traffic (AADT) flows, catchment size for the road, dilution flows (Q95) and current water quality (hardness) for each receiving watercourse
Method B	In the event that, following the assessment using method A, application of mitigation still fails against Environmental Quality Standards (EQS), method B should be applied. This is a rare occurrence. Method B assesses the bioavailability of the soluble fraction of pollutants (dissolved zinc and dissolved copper
Method C	This method focuses on groundwater effects. This is the standard method for assessing the impact of a scheme on groundwater quality. Typically this considers the risk of pollution to groundwater of discharges from a scheme
Method D	This method focuses on the probability of a serious spillage risk occurring that would affect the water environment. The method provides the return period of a serious accident based on road length, road characteristics (e.g. presence of junctions, roundabouts, and crossroads) AADT, percentage of Heavy Good Vehicles (HGVs), spillage risk factors and emergency services response time (based on site environment – e.g. urban/rural). An assessment has been undertaken for each outfall to test whether the probability of an accidental spillage causing a pollution incident represents an unacceptable risk
Method E	Hydrological Assessment of Design Floods. This gives generic guidance to estimation of flood events for catchments
Method F	Hydraulic Assessment - This gives direction as to what is required in a FCA and the process of hydraulic modelling to determine flood risk

The specific requirements or thresholds to protect the surface water environment are shown in Table 14.2.3. For method A, the thresholds are Environmental Quality Standards (EQS) which are outlined in legislation and must not be exceeded. Run-off Specific Thresholds (RST's) also provide an assessment of the short term impacts of the Scheme for a range of pollutants, including soluble metals. For method D, the threshold is expressed as the minimum return period of an accident or spillage occurring and is set as a standard within HD45/09[14.1].

Table 14.2.3 Water quality thresholds

Method	Test	Limit
Method A RST	Range of pollutants include metals	Range of thresholds (pass/fail)
Method A EQS	Downstream dissolved zinc concentrations	7.8 µg/l
Method A EQS	Downstream dissolved copper concentrations *	1 µg/l for <50 mg/l $CaCO_3$ 6 µg/l for >50 - 100 mg/l$CaCO_3$ 10 µg/l for 100 – 250 mg$CaCO_3$ 28 µg/l for >250mg/l $CaCO_3$
Method D	Risk of serious spillage	<200 years

Key: EQS = Environmental Quality Standards; RST= Run-off Specific Threshold; * the maximum limit for dissolved copper is dependent on hardness of the receiving water.
Source: HD45/09[14.1].Table A1.

An FCA has been prepared in accordance with TAN15 and following consultation with NRW. This can be found in full in Volume 3, Appendix K.1. A summary is provided within this chapter.

Sources of flood risk which are considered in the FCA are:

- Fluvial
- Pluvial (direct surface water runoff)
- Increased Surface Water Runoff from the new road and
- Groundwater

The following stakeholders were consulted in relation to flood risk:

- NRW - to gather flood-related background information

- PCC - as lead local flood authority
- NMWTRA - to identify any known flood risk issues associated with the existing trunk road links and access roads that could potentially be affected by the Scheme

The watercourses which were considered as part of the FCA are:

- River Severn
- Mochdre Brook
- Green Brook
- Dolfor Brook
- Seventeen minor streams and ditches

The approach for the FCA was developed in accordance with methodology set out in HD45/09 Annex I method E. The parameters used were agreed in principle with NRW and liaison will continue as the Scheme progresses. These are as follows:

- Hydrological modelling was undertaken to assess the flood frequency relationships for the catchments of the River Severn, Mochdre Brook, Dolfor Brook, Green Brook and tributary streams along the proposed Scheme route. The tributaries assessed are those that either cross the Scheme or may otherwise pose a flood risk to the Scheme or the associated side roads as agreed with PCC and NRW
- The level of hydraulic assessment has been undertaken in proportion to the perceived level of flood risk in the area. Assessments have been undertaken of the hydraulic capacity of the existing river network including river channels, culverts and structures
- A catchment hydraulic model of the River Severn was made available by NRW.
- On other catchments hydraulic models have been developed where a potential flood risk has been identified. These have been developed with reference to the HD45/09 Annex I (Method F)
- The assessment and modelling of the catchments was undertaken to determine baseline conditions
- The FCA has been prepared in line with the guidance in DMRB HD45/09[14.1], which complements TAN15. Any existing records of surface water flooding have been gathered by consultation with relevant stakeholders, including NRW, NMWTRA and PCC

In agreement with NRW, a supplementary WFD compliance assessment has been undertaken. The assessment is based on the methodology on Environment Agency draft guidance[14.10] as agreeds with NRW. This assessment considers whether the Scheme could potentially impact on water bodies within the locality of the Scheme or downstream.

Assessment criteria

The assessment criteria used for this Scheme follows those set out in HD45/09[14.1]. Tables adapted from those in HD45/09 are shown in Tables 14.2.4 to 14.2.7. Examples for evaluating the importance of water attributes are shown in Table 14.2.4. Examples for assessing the magnitude of impacts are shown in Table 14.2.5. A matrix for determining significance of effects is shown in Table 14.2.6 and examples of the potential significance of effects are shown in Table 14.2.7.

Table 14.2.4 Evaluating the importance of water environment attributes

Value	Criteria	Typical examples
Very high	Attribute has a high quality and rarity on regional or national scale	*Surface water* • European Community (EC) Designated Salmonid / Cyprinid fishery • WFD Class High • Site protected/designated under EC or UK wildlife legislation (SAC, SPA, SSSI, WPZ, Ramsar Site, salmonid water)/ species protected by EC legislation *Groundwater* • Principal aquifer providing a regionally important resource or supporting site protected under EC and UK Habitat legislation • SPZ 1 *Flood risk* • Floodplain or defence protecting more than 100 residential properties from flooding • Existing likelihood of fluvial flooding affecting property*

Value	Criteria	Typical examples
		• Existing likelihood of pluvial flooding affecting properties based on topography
High	Attribute has a high quality and rarity on a local scale	*Surface water* • WFD Class Good • Major Cyprinid Fishery. Species protected under EU or UK habitat legislation *Groundwater* • Principal aquifer providing locally important resource or supporting river ecosystem • SPZ 2 *Flood risk* • Floodplain or defence protecting between 1 and 100 residential properties or industrial premises from flooding • Flooding of key infrastructure during a 1 in 30 year event
Medium	Attribute has a medium quality and rarity on a local scale	*Surface water* • WFD Class Moderate *Groundwater* • Aquifer providing water for agricultural or industrial use with limited connection to surface water • SPZ 3 *Flood risk* • Floodplain or defence protecting 10 or fewer industrial properties from flooding • Likelihood of pluvial flooding of infrastructure based on topography
Low	Attribute has a low quality and rarity on a local scale	*Surface water* • WFD Class Poor *Groundwater*: • Unproductive strata *Flood risk* • Floodplain with limited constraints and a low probability of flooding of residential and industrial properties

Key: SAC = Special Area Conservation; SPA = Special Protection Area; SPZ = Source Protection Zone=SPZ; SSSI = Site of Special Scientific Interest; WPZ = Water Protection Zone; * = Scheme specific example
Source: Adapted from DMRB HD45/09 [14.1] Table A4.3

Table 14.2.5 Assessing the magnitude of impact on water environment attributes

Magnitude	Criteria	Typical example
Major adverse	Results in loss of attribute and/or quality and integrity of the attribute	*Surface water* Failure of both soluble and sediment-bound pollutants in HAWRAT (method A) and compliance failure with EQS values (method B). Calculated risk of pollution from an accidental spillage > 2% annually (method D) Loss or extensive change to a fishery Loss or extensive change to a designated nature conservation site *Groundwater* Loss of or extensive change to an aquifer Risk score >250 (method C) Calculated risk from spillages > 2% annually (method D) Loss or extensive change to groundwater designated wetland. *Flood risk* Increase in peak flood level of (1% annual probability)>100mm (methods E and F).
Moderate adverse	Results in effect on integrity of attribute or loss of part of attribute	*Surface water* • Failure of both soluble and sediment-bound pollutants in HAWRAT (method A) but compliance with EQS values (method B) • Calculated risk of pollution from accidental spillages > 1 % annually and <2% annually (method D) • Partial loss in productivity of a fishery *Groundwater* • Partial loss or change to aquifer • Risk score 150-250 (method C) • Spillage risk >1% annually and <2% annually • Partial loss in integrity of groundwater supported designated wetland *Flood risk* • Increase in peak flood level of (1% annual probability)>50mm

Magnitude	Criteria	Typical example
Minor adverse	Results in some measurable change in attributes quality or vulnerability	*Surface water* • Failure of either soluble or sediment-bound pollutants in HAWRAT • Calculated risk of pollution from accidental spillages > 0.5% annually and <1% annually (method D) *Groundwater:* • Risk score <150 (method C) • Calculated risk of pollution from accidental spillages > 0.5% annually and <1% annually (method D) • Minor effects on groundwater supported wetlands *Flood risk* • Increase in peak flood level (1% annual probability)>10mm
Negligible	Results in effect on attribute but of insufficient magnitude to affect the use or integrity	The Scheme is unlikely to affect the integrity of the water environment. *Surface water* • No risk identified by HAWRAT and risk of pollution from accidental spillages <0.5% *Groundwater* • No measurable impact upon an aquifer and risk of pollution from accidental spillages <0.5% *Flood risk* • Change in flood peak (1% annual probability) <+/- 10mm
Minor beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring	*Surface water* • HAWRAT assessment of either soluble or sediment bound pollutants becomes Pass from existing site where the baseline was a Fail condition • Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is <1% annually) (method D) *Groundwater* • Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is <1% annually) (method D) *Flood risk* • Reduction in peak flood level (1% annual probability) >10mm.
Moderate beneficial	Results in moderate improvement in attribute quality	*Surface water* • HAWRAT assessment of both soluble and sediment-bound pollutants becomes Pass from an existing site where the baseline was a Fail condition • Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk > 1% annually) (method D) *Groundwater* • Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is > 1% annually) *Flood risk* • Reduction in peak flood levels(1% annual probability) >50mm
Major Beneficial	Results in major improvement of attribute quality	*Surface water* • Removal of existing polluting discharge, or removing the likelihood of polluting discharges occurring to a watercourse *Groundwater* • Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring • Recharge of an aquifer *Flood risk* • Reduction in peak flood levels (1% annual probability)>100mm

Adapted from Source: Adapted from HD45/09[14.1] Table A4.4

Table 14.2.6 Determining the significance of effect on water environment attributes

Importance of attribute	Magnitude of impact			
	Negligible	Minor	Moderate	Major
Very High	Neutral	Moderate/large	Large/very large	Very large
High	Neutral	Slight/moderate	Moderate/large	Large/very large
Medium	Neutral	Slight	Moderate	Large
Low	Neutral	Neutral	Slight	Slight /moderate

Source: HD45/09[14.1] Table A4.5

Table 14.2.7 Examples of overall significance of effect

Effect	Description
Very large adverse	Where the proposal would result in degradation of the water environment, because it results in predicted very significant adverse impacts on at least one water attribute. More than one attribute may be affected by a single project and each should be assessed and reported separately. For example: *Surface water* • Potential failure of both soluble or sediment bound pollutants in a High or Good watercourse OR in an EC Designated Salmonid fishery for both short term and long term assessments (methods A and B) • Loss or extensive change to a site/habitat protected under EC or UK legislation (SAC, SPA, Ramsar site, SSSI, WPZ, salmonid waters) • Calculated risk of pollution from spillages is >2% when discharging into a Good watercourse, > 1% for a High watercourse* *Groundwater* • Potential high risk (risk score > 250) of pollution in Method C (Annex I) to a principal aquifer providing a regionally important resource or supporting a site protected under habitat legislation OR a medium to high risk (score>150) to an SPZ1 • Calculated risk of pollution from an accidental spillage is >1% when discharging into an SPZ 1 or principle aquifer • Potential loss or extensive change to a site/habitat protected under EC or UK legislation (SAC, SPA , Ramsar site, SSSI, WPZ, salmonid water) through interception of groundwater flow or significant change to groundwater level. *Flood risk* • An increase in peak flood levels (1% annual probability) > 100mm increasing the risk of flooding to > 100 residential properties

Effect	Description
Large adverse	Where the proposal would result in a degradation of the water environment, because it results in predicted highly significant adverse impacts on a water attribute. More than one attribute may be affected by a single project and each should be assessed and reported separately. For example: *Surface water* • Potential short-term (HAWRAT) failure of both soluble and sediment-bound pollutants in a High or Good watercourse OR in an EC Designated Salmonid fishery • Calculated risk of pollution from spillages is > 1% for a Good watercourse (or one of lower ecological class) and >0.5% for a High watercourse • Loss or extensive change to a cyprinid fishery • Loss or extensive change to a Local Nature Reserve *Groundwater* • Potential high risk (risk score >250) of pollution to a secondary aquifer providing water for a small number of dwellings, agricultural or industrial use and/or supporting Local Nature Reserves aquifer OR medium risk (Score 150-250) of pollution of a principal aquifer providing a locally important resource or supporting or supporting a site protected under habitat legislation, OR medium to high risk (score>150) to a SPZ2, OR potential low risk (score <150) to a SPZ1 • Calculated risk of pollution from spillages is >0.5% when discharging to a principal aquifer or SPZ 1 • Loss or extensive change to a Local Nature Reserve through interception of groundwater flow or change to groundwater level. *Flood risk* • An increase in peak flood levels (1% annual probability) > 50mm increasing the risk of flooding to > 100 residential properties OR an increase of >100mm increasing the risk of flooding to 1-100 residential properties
Moderate adverse	Where the proposal may result in the degradation of the water environment because it results in predicted moderate adverse impacts on at least one attribute. More than one attribute may be affected by a single project and each should be assessed and reported separately. For example: *Surface water* • Potential short-term (HAWRAT) failure of either soluble or sediment-bound pollutants in a High or Good watercourse • Calculated risk of pollution from spillages is > 0.5% for a Good watercourse OR >1% for a Moderate or Poor watercourse • Partial loss or change to a fishery • Effect on the integrity of the existing flora and fauna *Groundwater* • Potential medium risk (risk score 150-250) to a secondary aquifer providing water for a small number of dwellings, agricultural or industrial use and/or supporting Local Nature Reserves OR potential low risk (risk score < 150) of pollution to a principal aquifer providing a regionally important resource or supporting a river ecosystem OR medium to high risk score (>150) to a SPZ3 , OR potential low risk (score<150) to a SPZ2, OR high risk (>250) for a discharge to unproductive strata • Calculated risk of pollution from spillages is > 1% for an aquifer or SPZ3 • Effect on the integrity of the existing flora and fauna through interception of groundwater flow or change to groundwater level *Flood risk* • An increase in peak flood level (1% annual probability) > 10mm resulting in an increased risk of flooding to > 100 residential properties OR an increase of > 50mm resulting in an increased risk of flooding to 1-100 residential properties

Effect	Description
Slight adverse	Where the proposal may result in a degradation of the water environment because it results in a predicted slight impact on one or more attributes. More than one attribute may be affected by a single project and each should be assessed and reported separately. For example: *Surface water* • Potential short-term (HAWRAT) failure of either soluble or sediment-bound pollutants in a Moderate or Poor watercourse • Calculated risk of pollution from spillages is > 0.5% for an Moderate or Poor watercourse • Temporary loss to, or loss in productivity of a fishery *Groundwater* • Potential low risk of pollution (risk score < 150) to a secondary aquifer with limited agricultural use and connectivity to surface waters and local ecology OR low to medium risk (risk score <250) for a discharge to unproductive strata, OR low risk (score<150) to a SPZ3 • Calculated risk of pollution from spillages is > 0.5% for an aquifer or SPZ3 *Flood risk* • An increase in peak flood level (1% annual probability) > 10mm resulting in an increased risk of flooding to a fewer than 10 industrial properties
Neutral	Where the net impact of the proposals is neutral, because it results in no appreciable effect, either positive or negative, on the identified attributes. More than one attribute may be affected by a single project and each should be assessed and reported separately. For example: *Surface water* • No risk identified by method A or method B assessment (Pass both soluble and sediment-bound pollutants • Calculated risk of pollution from accidental spillages < 0.5% annually *Groundwater* • No predicted change in quality of any type of aquifer and/or its use as a resource • Calculated risk of pollution from accidental spillages < 0.5% annually *Flood risk* • Negligible change in peak flood (1% annual probability) < +/- 10mm
Slight beneficial	All other situations where the proposal provides an opportunity to enhance the water environment or provide an improved level of protection to an attribute. More than one attribute may be affected by a single project and each should be assessed and reported separately. For example: *Surface water* • Method A assessment of either soluble or sediment-bound pollutants becomes a pass from previous Fail conditions for existing discharges; • Reduction by 50% or more in existing pollution risk from accidental spillages into High to Poor watercourses (when existing spillage risk is < 1%) *Groundwater* • Reduction by 50% or more in existing pollution risk from spillages into an aquifer (when existing spillage risk is <1%) *Flood risk* • A reduction in peak flood level (1% annual probability) > 10mm resulting in a reduced risk of flooding to 1-100 residential properties

Effect	Description
Moderate beneficial	Where the proposal provides an opportunity to enhance the water environment, because it results in a moderate improvement for an attribute. More than one attribute may be affected by a single project and each should be assessed and reported separately. For example: *Surface water* • Method A assessment of both soluble and sediment-bound pollutants becomes Pass from previous Fail condition for existing discharges • Reduction by 50% or more in likelihood of pollution to watercourses from spillages from existing discharges through retrofitting of pollution control to outfalls into a High to Poor watercourse* (existing risk > 1%) • Recharge of aquifer through provision of treated discharges to ground resulting in measurable improvements to a connected site/habitat of local nature conservation value i.e. Local Nature Reserve *Groundwater* • Reduction by 50% or more in existing likelihood of pollution arising from a spillage to an aquifer through retrofitting of pollution control (existing risk > 1%) *Flood risk* • A reduction in peak flood level (1% annual probability) > 10mm resulting in a reduced risk of flooding to > 100 residential properties OR a reduction of > 50mm resulting in a reduced risk of flooding to 1-100 residential properties
Large beneficial	It is extremely unlikely that any proposal incorporating the construction of a new or improved trunk road would fit into this category. However, proposals could have a large positive impact if it is predicted that it would result in a 'very' or 'highly' significant improvement to a water attribute(s), with insignificant adverse impacts on other water attributes. More than one attribute may be affected by a single project and each should be assessed and reported separately. For example: *Surface water* • Removal of an existing polluting discharge through provision of pollution prevention measures, or any other measure, affecting a site/habitat protected under EC or UK legislation (SAC, SPA, Ramsar site, SSS, WPZ, Salmonid waters) • Reduction by 50% or more in the existing likelihood of pollution arising from a spillage affecting a site/habitat protected under EC or UK legislation (SAC, SPA, Ramsar site, SSSI, WPZ, Salmonid water) where existing risk > 1% *Groundwater* • Removal of an existing polluting discharge within Zone 1 and 2 of a SPZ and/or a principal aquifer • Reduction by 50% or more in the existing likelihood of pollution arising from a spillage at discharge points within Zone 1 or 2 of a SPZ, principal aquifer and/or a site supporting a habitat protected under habitat legislation (existing risk > 1%) • Recharge of aquifer through provision of treated discharges to ground resulting in measurable improvements to a connected site/habitat protected under EC or UK legislation (SAC, SPA, Ramsar site, SSSI, WPZ, Salmonid water) *Flood risk* • A reduction in peak flood levels (1% annual probability) >50mm reducing the risk of flooding to >100 residential properties OR a reduction of > 100mm resulting in a reduced risk of flooding to 1-100 residential properties

Source: Adapted from DMRB HD45/09[14.1] Table A4.6

Water Framework Directive (WFD) compliance assessment

The WFD compliance assessment considers hydromorphological, biological (aquatic ecological) and groundwater quantity impacts. The environmental objectives used to assess WFD compliance are based on internal Environment Agency guidance [14.11]. These are as follows:

1. The Scheme would not cause deterioration in any element of water body classification
2. The Scheme would not prevent the WFD status objectives from being reached within the water body or other downstream water bodies
3. The Scheme would not negatively impact critical or sensitive habitats within the water body[3].
4. The Scheme would contribute to the delivery of the Severn River Basin Management Plan (RBMP) where required by the RBMP (i.e. if an affected water body is at less than Good ecological status / potential, and examination of whether pre-determined mitigation measures could be incorporated into the Scheme should be considered).

The WFD compliance assessment can be found in full in Volume 3, Appendix K.2.

14.2.1. Limitations and assumptions

The WFD compliance assessment is based on the Scheme as shown within the ES. Changes to the design at the detailed design stage may require an updated WFD detailed compliance assessment to be produced.

14.3. Baseline conditions

Surface water

Watercourses within the study area fall within the Severn River Basin District (RBD) as set out within the Severn River Basin Management Plan)RBMP) [14.12].

Watercourses crossed by the Scheme are shown in Table 14.3.1 and also within Volume 2, Figure 14.1. The assessment of the importance of these watercourses has been determined using the criteria in the HD45/09 (Table A4.3) and is included in Table 14.3.1. Consideration of hydromorphological and aquatic ecological effects of the Scheme are not defined within the DMRB but are considered within the WFD compliance assessment in Volume 3, Appendix K.2.

The Scheme would affect 20 watercourses. Some of the watercourses are crossed more than once. In total, there are 27 watercourse crossings. These are shown in Table 14.3.1. Seven of 19 watercourse affected are tributaries of the River Severn.

The current ecological status of the River Severn (GB109054049310) is Moderate. The WFD status objective is Good ecological potential by 2027. The River Severn is classified as an Artificial/Heavily Modified Water Body (A/HMWB) due to the following reasons as set out in the RBMP.

- Drinking water;
- Water Regulation (impoundment release); and
- Water Storage - non-specific.

As such, the River Severn may be prevented from reaching Good status due to the modifications necessary to maintain its functions. It is, however, required to achieve Good potential through the implementation of a series of mitigation measures outlined in the Severn RBMP.

Mochdre Brook (GB109054044730) has a current status of Moderate and an objective of Good ecological status by 2015.

Although the current status of all watercourses and associated tributaries shown in 14.3.1 below is Good, the requirement of the WFD is for all watercourses to meet Good status or potential by 2027. Subsequently, for the purposes of the baseline for this Scheme, these watercourses have

[3] Objective 3 is driven by the Environment Agency's wider responsibility for the protection of the UK's environmental assets rather than a specific requirement of the WFD legislation.

been assigned ‘high’ importance so as not to impact on their 2027 status objectives. Table 14.3.1 provides a summary of the relevant watercourses/water bodies and their importance with regards to the water quality assessment. Proposed structure references are also provided in Table 14.3.1 to assist in the interpretation of Scheme proposals.

The water features are shown in ES Volume 2, Figure 14.1.

Table 14.3.1 Summary of watercourses and their importance

Watercourse reference	Name	Crossing reference	Structure/culvert reference	Scheme Chainage (m west to east)	WFD water body ID	Current ecological potential/status [14.3]	Status objective (by 2027), unless stated otherwise [14.3]	Importance
WC1	Tributary 1 of River Severn	1	C1	375 west of 0	River Severn GB109054049310	Moderate	Good	High
WC2	Tributary 2 of River Severn	2	C2a	300mwest of 0	River Severn GB109054049310	Moderate	Good	High
		3	n/a (existing culvert – no works required)	150	River Severn GB109054049310	Moderate	Good	High
WC3	Mochdre Brook	4	S2	500	Mochdre Brook GB109054044730	Moderate	Good (by 2015)	High
WC4	Tributary 1 of Mochdre Brook – south of College Coleg Powys Fronlas Farm	5	C3a	1000	Mochdre Brook GB109054044730	Moderate	Good (by 2015)	High
WC5	Un named Stream at Castell-y-Dail (Tributary 2 of Mochdre Brook)	6	C3b	1100	Mochdre Brook GB109054044730	Moderate	Good (by 2015)	High
		7	C4	1300	Mochdre Brook GB109054044730	Moderate	Good (by 2015)	High
WC6	Unknown	8	n/a (no culvert required at this location)	1350	Mochdre Brook GB109054044730	Moderate	Good (by 2015)	High
WC7	Tributary 3 of River Severn – course culverted north under Mochdre Industrial Park	9	C5	1395	River Severn GB109054049310	Moderate	Good	High
WC8	Tributary 4 of River Severn	10	C6	1400	River Severn GB109054049310	Moderate	Good	High
WC9	Tributary 5 of River Severn	11	C7	1500	River Severn GB109054049310	Moderate	Good	High
WC10	Ditch 10	12	n/a (no culvert required at this location) – flow diverted to C8	1800	River Severn GB109054049310	Moderate	Good	High
WC11	Ditch 11	13	n/a (no culvert required at this location – flow diverted to C8)	1900	River Severn GB109054049310	Moderate	Good	High
WC12	Green Brook/ Black Hall Brook	14	C8	2000	River Severn GB109054049310	Moderate	Good	High

Watercourse reference	Name	Crossing reference	Structure/culvert reference	Scheme Chainage (m west to east)	WFD water body ID	Current ecological potential/status [14.3]	Status objective (by 2027), unless stated otherwise [14.3]	Importance
		15	S4 (Originally proposed as a bridge but later changed to a culvert)	Mochdre Industrial Estate	River Severn GB109054049310	Moderate	Good	High
WC13	Dolfor Brook 1	16	S5	2500	River Severn GB109054049310	Moderate	Good	High
		17	C9	Middle Dolfor Road	River Severn GB109054049310	Moderate	Good	High
		18	C10	Middle Dolfor Road	River Severn GB109054049310	Moderate	Good	High
WC14	Tributary 6 of River Severn	19	C11	3350	River Severn GB109054049310	Moderate	Good	High
WC15	Tributary 7 of River Severn	20	n/a (New culvert not required because it is already culverted)	3375	River Severn GB109054049310	Moderate	Good	High
WC16	Tributary 8 of River Severn	21	C12	75 south east of 4450 Lower Brimmon	River Severn GB109054049310	Moderate	Good	High
WC17	Tributary 9 of River Severn	22	n/a (new culvert not required because it is already culverted)	145 south east of 4450 Lower Brimmon	River Severn GB109054049310	Moderate	Good	High
WC18	Surface water feature 18	23	n/a (C13 has been removed from the Scheme – no culvert is required)	4600	River Severn GB109054049310	Moderate	Good	High
WC19	Ditch 19	24	C14	4850	River Severn GB109054049310	Moderate	Good	High
WC20	Tributary 10 of River Severn	25	n/a (no culvert required because the stream's source is at this location and it is not impeded by the Scheme)	5200	River Severn GB109054049310	Moderate	Good	High
		26	C15	5600	River Severn GB109054049310	Moderate	Good	High

As part of the GI[14.13] undertaken in September 2013, water samples were obtained from four surface water features along the Scheme. The location of these sample points are shown in Volume 2, Figure 14.1. The water quality data used as part of this assessment are shown in Table 14.3.2. These data are single spot sample results and include hardness, which is used to determine the EQS for copper.

Table 14.3.2 Water quality monitoring

No.	Sample reference	Chainage (m)	Water body	Hardness (mgCaCO3/l)	Copper (dissolved) µg/l	Zinc (dissolved) µg/l
1	SW01	0	River Severn	28.1	5.1	6.7
2	SW02	500	Mochdre Brook	124	8.1	2.6
3	SW04	2500	Tributary of River Severn	192	3.3	1.1
4	SW05	3400	Tributary of River Severn	219	3.9	1.3

Groundwater

There are no SPZs within 1 km of the Scheme and there are no NRW monitoring boreholes for groundwater levels within 1 km of the Scheme [14.6].

The superficial aquifers underlying the route range from unproductive strata those which have a low permeability and are unlikely to provide for water supply or river base flow through to Secondary A which are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. The bedrock geology underlying the route is classified as an aquifer of Secondary B type. These are predominantly low permeability layers which may store and yield a limited amount of groundwater due to localised features such as fissures, thin permeable horizons and weathered zones.

A summary of the importance of groundwater quality is shown in Table 14.3.3. This importance is related to the most sensitive aquifer type for the water body which is shown in Table 14.3.4. Superficial and bedrock deposits underlying the Scheme have been sourced from the Preliminary Sources Study Report [14.14].

Groundwater levels were monitored as part of the GI. Preliminary results from the first round of monitoring November, 2013 show that groundwater levels are typically 1–2 metres below ground level across the Scheme in the superficial deposits. A notable exception to this is around Dolfor Brook, where the groundwater level is deeper at around 10 metres below ground level.

Groundwater is likely to be in continuity with the surface water system, with groundwater discharging as base-flow to the main river and brooks at times when the groundwater level is high.

Areas of the route with identified aquifers and their importance are shown in Table 14.3.3 and 14.3.4. There is only groundwater identified for the Chainages shown in Table 14.3.5.

Table 14.3.3 WFD ground water bodies underlying the Scheme [14.15]

Water body ID	Water body	Aquifer type	Quantitative quality		Chemical quality		Importance
			Current	2015 predicted	Current	2015 predicted	
GB40902G203400	Severn Uplands - Secondary Combined	Secondary A	Good	Good	Poor	Poor	Medium

Table 14.3.4 Aquifers underlying the Scheme [14.14]

Chainage (m)		Aquifer designation	Importance
From	To		
0	650	No data available	Medium
1900	1950	Secondary A aquifers	Medium
3200	3500	Mixture of Secondary A and Undifferentiated Secondary aquifers	Medium
5450	5495	Undifferentiated Secondary aquifers	Medium

In some areas of the Scheme landslides are known to occur and are considered further in Volume 1, Chapter 9 Geology and Soils.

Flood risk

The existing flood risk is described in Section 3 of the FCA in Volume 3 Appendix K.1 and is summarised below. Flood risk has been considered and assessed from:

- Rivers - Fluvial
- Direct surface runoff from rainfall - Pluvial
- Groundwater

Fluvial flood risk

River Severn

Newtown has a history of flooding. After two events in the 1960s, a flood defence Scheme was constructed. The Scheme follows a route south of Newtown, away from the main flood risk area of the River Severn. There is no recorded flooding to the existing roads at the western and eastern tie-ins to the Scheme.

Two areas of the Scheme are potentially at risk of fluvial flooding from the River Severn. These are shown on the Development Advice Maps in the FCA, Volume 3 Appendix K.1 and these are:

1. Western end of the Scheme (Ch. 0) at the proposed link in to the existing A489 west of the A489 Llanidloes Road Roundabout, approximately 200 m of road embankment is indicated to lie within Flood Zone 2
2. Eastern end of the Scheme (Ch. 5600); the sections east and west of the A483 roundabout lie in close proximity although not within Flood Zone 2

There is also anecdotal evidence of flooding on the Mochdre Brook, Mochdre Industrial Estate, Dolfor Brook and Green Brook.

Mochdre Brook

A house upstream and adjacent to the existing Mochdre Lane bridge crossing of the Mochdre Brook is understood to have been subject to flooding from Mochdre Brook.

Mochdre Industrial Estate

Mochdre Industrial Estate has been subject to flooding from overland flows from an unnamed stream from Castell-y-Dail Wood. Information received from PCC highlighted a number of existing sources of flood risk along A483 Dolfor Road, Middle Dolfor Road and Lower Dolfor Road.

Dolfor Brook

A culvert on Middle Dolfor Road has been reported to be prone to blockage. This has resulted in an overland flow path developing north along the road towards the location of the Lower Dolfor Road roundabout. Another culvert under the existing A483 west of the junction with Middle Dolfor Road is suspected by PCC to be prone to blockage, although no specific documented instances of such are available to confirm.

Overtopping from an open channel section of Dolfor Brook has caused overland flow paths to develop along Dolfor Road north into Newtown. This has resulted from blockage of the trash

screens on the open channel section and culvert. This is approximately 280 m north (downstream) of the Scheme.

Green Brook
Green Brook is reported to overtop onto the existing A483 Dolfor Road at Black Hall Farm, with the resulting overland flow directed north. This flood risk area is upslope from the location of the proposed Lower Dolfor Road Roundabout.

It is considered that there is a medium importance associated with existing fluvial flood risk.

Pluvial flood risk
Based on Environment Agency Surface Water Flood Maps and site observations of local topography, two areas have been identified as susceptible to pluvial flooding, these are:

1. Existing A483 Dolfor Road at Black Hall Farm down slope (north).
2. A489 Kerry Road at Lower Brimmon Farm

There is also anecdotal evidence of surface water flow paths down Mochdre Lane flooding part of Glandulas Drive.

It is considered that there is a medium importance associated with existing pluvial flood risk.

Groundwater flood risk
There is no evidence of an existing significant groundwater flood risk. Due to the topography of the area this is unlikely to be a risk to the trunk road network.

It is considered that the importance of groundwater flood risk is low.

Abstractions
There are 16 abstractions within 1 km of the Scheme. These have been sourced from the GI information[14.13] and PCC [14.16]. A summary of these is shown in Table 14.3.5 and the locations are shown in Volume 2, Figure 14.1. With the exception of one all are un-licensed and would typically use < 20m^3 water per day.

Table 14.3.5 Abstractions within 1 km of the Scheme [14.16]

Reference	Chainage (m) from west to east of Scheme	Distance and direction from Chainage	Abstraction class	Abstraction type	Property and Location	Importance
A1	0	260 NW	Not given	Well	Glanhafren Hall	High
A2	2300	800 S	Shared supply	Well	Caeheylin Farm, Upper Dolfor Road	
A3	2400	760 S	Shared supply	Well	Caeheylin Bungalow, Upper Dolfor Road	
A4	2400	220 S	Shared supply	Well	Dingle Hall, Dolfor Road	
A5	2400	210 S	Shared supply	Well	Dingle Hall Cottage, Dolfor Road	
A6	2400	200 S	Shared supply	Well	Minafon, Dolfor Road	
A7	2900	100 S	Single supply	Well	Bryneira, Old Dolfor Road	

Reference	Chainage (m) from west to east of Scheme	Distance and direction from Chainage	Abstraction class	Abstraction type	Property and Location	Importance
A8	3400	220 S	Shared supply	Well	Magic Cottage aka Upper Brimmon, Brimmon Lane	
A9	3600	120 S	Shared supply	Well	Great Brimmon Farm, Brimmon Lane	
A10	3600	60 S	Shared supply	Spring	New House, Brimmon Lane	
A11	3700	500 S	Single supply	Spring	Shwrwd, Vastre	
A12	4300	400 S	Single supply	Well	The Birches, Kerry	
A13	4500	80 S	Single supply	Spring	Lower Brimmon, Kerry Road	
A14	4500	80 S	Single supply	Spring	Lower Brimmon, Kerry Road	
A15	5000	560 SE	Single supply	Well	Four Acres , Vastre	
A16	6200	420 NW	Single supply and mains	Well	Penarth , Pool Road	

Discharges

There are 20 active discharges within 1 km of the Scheme. A summary of these is shown in Table 14.3.6. The locations are shown in Volume 2, Figure 14.1.

Table 14.3.6 Active discharges within 1 km of the Scheme [14.6]

Reference	Chainage (m) from west to east of Scheme	Distance and direction from Chainage	Discharge type	Permit No.	Receiving water body	Receiving water environment	Importance
D1	0	960 SW	Domestic Property (Single)	S/01/5 5549/S	Llyfnant Brook	Freshwater river	High
D2	0	710 NW	Sewage disposal works - other	S/01/1 1426/S	River Severn	Freshwater river	
D3	0	190 N	Other Tourist/Short Stay Accommodation	EPRH P3221 XR	Mochdre Brook	Freshwater river	
D4	0	640 N	Domestic Property (Single)	NPSW QD003 880	River Severn	Freshwater river	

Reference	Chainage (m) from west to east of Scheme	Distance and direction from Chainage	Discharge type	Permit No.	Receiving water body	Receiving water environment	Importance
D5	0	120 N	Undefined or Other	***248	Mochdre Brook	Freshwater river	
D6	2300	1130 N	Domestic Property (Single)	S/02/04294/S	River Severn (Non Tidal)	Freshwater river	
D7	2400	200 S	Sewage disposal works - other	S/01/22670/S	Green Brook	Freshwater river	
D8	2500	70 S	Sewage disposal works - other	S/01/50012/S	Green Brook	Freshwater river	
D9	2600	50 N	Domestic Property (Multiple)	S/01/55494/S	Green Brook	Freshwater river	
D10	3100	420 N	Domestic Property (Single)	WQ/72/2964	Underground Strata	Soakaway	
D11	3300	310 N	Domestic Property (Single)	DS/4647	Not Defined	Freshwater river	
D12	3500	670 N	Sewerage Network - Sewers - water company	S/01/04428/O	River Severn (Non Tidal)	Freshwater river	
D13	3500	670 N	Sewerage Network - Sewers - water company	S/01/04428/O	River Severn (Non Tidal)	Freshwater river	
D14	3500	670 N	Sewerage Network - Sewers - water company	S/01/04428/O	River Severn (Non Tidal)	Freshwater river	
D15	3800	720 N	Sewerage Network - Pumping Station - water company	S/01/05873/O	River Severn (Non Tidal)	Freshwater river	
D16	3800	600 N	Sewerage Network - Sewers - water company	S/01/50128/O	River Severn	Freshwater river	
D17	3900	880 N	Sewerage Network - Sewers - water company	S/01/05871/O	River Severn (Non Tidal)	Freshwater river	

Reference	Chainage (m) from west to east of Scheme	Distance and direction from Chainage	Discharge type	Permit No.	Receiving water body	Receiving water environment	Importance
D18	5900	310 N	Sewerage Network - Pumping Station - water company	S/01/5 5021/O	River Severn	Freshwater river	
D19	6200	650 NE	Sewage Disposal Works - water company	S/01/5 5360/R	River Severn	Freshwater river	
D20	6200	650 NE	Sewage Disposal Works - water company	S/01/5 5360/R	River Severn	Freshwater river	

Lakes and other water features

There are no WFD lakes within 1 km of the Scheme.

Montgomery Canal (GB70910253) is approximately 840 m east of the eastern tie-in of the Scheme. This watercourse is thought to be in hydraulic connectivity to the River Severn from a feeder stream at Penarth Weir. This watercourse is also designated as a Special Area Conservation (SAC) and a Site of Special Scientific Interest (SSSI). Floating water-plantain (*Luronium natans)* is the primary reason for the site designation [14.17]. This site supports the largest and most extensive population of floating water-plantain in lowland Britain. Details of this water body are provided in Table 14.3.7. For this assessment it has a very high importance.

A total of 14 other natural ponds were identified within a 500 m buffer around the Scheme. Details of the one pond affected by the Scheme are addressed in Chapter 8 Nature Conservation.

Table 14.3.7 Lakes and other water features

Water body	Location	WFD water body ID
Montgomery Canal	840 m east of Chainage 6200	GB70910253

Watercourse hydromorphology and aquatic ecology

Hydromorphology and aquatic ecology of the watercourses is considered in the WFD Assessment within Volume 3, Appendix K.2. A brief summary of the baseline is provided in Table 14.3.8. A survey was undertaken by hydromorphological and aquatic ecologists in November 2013 to inform the assessment. In addition, a walkover survey was undertaken at selected locations by specialists from the NRW team. The NRW team baseline descriptions were largely in line with those presented below. Further details on the NRW survey findings are within Volume 3, Appendix K.2 WFD Detailed Assessment.

Table 14.3.8 Hydromorphology and aquatic ecology baseline

Element	Baseline description
Hydromorphology	The watercourses at 20 crossing locations were categorised dependent on their hydromorphology into four categories: 1. Ditch with flow (perennial) (4 watercourse locations) - These channels are primarily drainage ditches and although they are filled with water most of the time they offer limited ecological potential with no real channel features or substrate diversity. They are often dredged or modified and generally have limited biological connectivity to the River Severn 2. Ditch without flow (ephemeral) (5 watercourse locations) - Minor ditches or surface run-off depressions used for land drainage; these channels are dry more frequently than wet. As a result they have no channel features and limited or no associated riverine habitat recorded. Most have limited biological connectivity to the Severn with culverts at their downstream extent. Substrate is generally grass or silt 3. Open watercourse in poor condition (7 watercourse locations) - These channels are generally culverted within the vicinity or downstream of the proposed works which therefore limits biological connectivity to main rivers downstream. In general most of the channels in this category have uniform cross sections, limited flow and habitat diversity. Japanese knotweed is widespread along one or two reaches 4. Open watercourse in reasonable/good condition (4 watercourse locations) - Four channels were considered to be good enough to fall into this category demonstrating a variety of habitats and flow types including pools, riffles and glides, i.e. a variety of habitats for fish. In addition, all of the channels offered, to some extent, associated features of bank side roots, overhanging bows or woody debris offering potential cover for fish species
Macroinvertebrates	• The latest 2013 RBMP classification provided from NRW for the relevant water bodies shows the River Severn to be high for Macroinvertebrates, the Mochdre Brook is not classified • A water quality assessment undertaken on behalf of the Scheme using biological metrics in 2012 showed water quality to be high throughout the proposed route; it was particularly good on the Mochdre Brook. • Data from 1998 provided by NRW indicates the water quality in the Mochdre Brook is good. • No data were available covering the various drainage channels feeding into the River Severn
Macrophytes/ Phytoplankton	• The River Severn is classified as moderate for phytoplankton • No other NRW data were available covering macrophytes and diatoms pertinent to the development area

Designated sites

All internationally designated sites for nature conservation within 30 km of the Scheme are shown in Volume 2, Figure 8.1. The only internationally designated site within the zone of influence for the Scheme, is the Montgomery Canal SAC, which is located approximately 840 m to the north-east of the Scheme at its closest point. This is also designated as a SSSI. A Statement to Inform an Appropriate Assessment (SIAA) in relation to the Montgomery Canal SAC is provided in ES Volume 3, Appendix E.2.

There is also one SSSI within 1 km of the Scheme.

A summary of these sites is shown in Table 14.3.9. There are no other international or national designated sites within 1 km of the Scheme.

Table 14.3.9 Designated sites [14.8]

No.	Site name	Location	Designation
1	Mochdre Dingles	1 km south west of Chainage 500	SSSI
2	Montgomery Canal	840m north east of Chainage 6200	SAC; SSSI

Land contamination

There are no known active landfill sites within 1 km of the Scheme. There are two historic landfill sites within 1 km of the Scheme. A summary of these is shown in Table 14.3.10. No further assessment related directly to land contamination is undertaken in this chapter**.** Further details are provided in Volume 1, Chapter 9 Geology and Soils.

Table 14.3.10 Landfill sites within 1 km of the Scheme [14.18]

No	Site name	Location	Easting	Northing	Status
1	Plantation Lane, Newtown	580 m north of Chainage 2100	310112	290591	Historic
2	Pool Road, Newtown	580 m north of Chainage 3900	311633	291902	Historic

Existing drainage infrastructure

For sections of the Scheme within the town it has been considered there would be no change to existing drainage infrastructure. The remainder of the Scheme is new build and is being built on Greenfield land, therefore no existing drainage infrastructure is in place.

14.4. Predicted Environmental Effects

This section considers the proposed drainage of the Scheme and the potential impacts and effects of the Scheme on the water environment during both construction and operation. The potential effects set out in this section do not take into account proposed mitigation.

14.4.1. Construction impacts

Proposed construction works for the Scheme are identified in the Construction chapter and movement of materials is considered in the Materials chapter. The proposed construction works for the Scheme have the potential to impact water quality in any of the receiving surface or groundwater receptors. This may be due to excavation, the deposition of soils, sediment, or other construction materials, spillage of fuels or other contaminating liquids, the mobilisation of contamination following disturbance of contaminated ground or groundwater, or through uncontrolled site runoff.

Surface water

Surface water receptors that could be affected by construction works are listed in Table 14.4.1 with details of the potential impacts from construction of the Scheme.

Groundwater

Any seepage from cuttings would remove groundwater from the associated aquifer that may have otherwise flowed into connected watercourses as base-flow. There is a potential moderate magnitude of impact if this causes a loss of local abstractions.

If seepage from the ground in cuttings is then discharged into a watercourse then there could be a potential moderate adverse impact if the existing land is contaminated. Groundwater receptors that could be affected by construction works are listed in Table 14.3.3.

Flood risk

Fluvial flood risk

If work is undertaken within the floodplain and materials are stored in the floodplain this could increase flood risk. There is potentially a minor adverse magnitude of impact.

Pluvial flood risk

Additional impermeable areas from site compounds or access roads has the potential to have a temporary, short term minor adverse impact locally downstream from these areas by increasing surface water runoff.

Groundwater flood risk

During construction, discharge of collected groundwater could lead to a minor adverse impact on fluvial flood risk if discharged to watercourses without attenuation. Without permitted dewatering there is potential for a minor adverse magnitude of impact to some sections of the Scheme during construction.

Abstractions

Any dewatering or water abstracted for construction activities could provide a minor adverse impact on local abstractions through drawdown of the local water table.

Lakes and other water bodies

The Montgomery canal is approximately 840 m north east of the eastern tie-in of the Scheme. There is potential to be a moderate adverse impact during construction without mitigation due to silt or pollutant loading providing poor conditions for flora and fauna.

It is not considered that there would be any connectivity with the other natural ponds identified in the baseline and no further assessment of impact will be undertaken in this chapter.

Table 14.4.1 Water receptors at risk of water pollution from schedule of works

Catchment	Water Feature	ID	Chainage (m)	Potential impact	Importance	Potential magnitude of impact
Construction of new bridge						
1A West	Mochdre Brook	S2	500 – 600	Increase in silt Spillage to watercourse	High	Moderate
2A	Dolfor Brook	S5	2500 - 2600			
Culvert extensions and /or replacements						
1A West	Tributaries to the River Severn	C1	0	Increase in silt Spillage to watercourse Reduction in biodiversity Erosion of river bed	High	Minor
1A West		C2a	0			
4		C12	4400			
6		C15	5600			
New culverts						
1A West	n.a – flood relief culvert	C2c	300			
1A East	Tributary of Mochdre Brook	C3	1000	Increase in silt Spillage to watercourse Reduction in biodiversity Erosion of river bed	High	Minor
1A East	Tributary of Mochdre Brook	C4	1200			
1A East	Tributaries of River Severn	C5	1300			
1A East		C6	1600			
1A East		C7	1600			
2A		C8	2000			
2A		S4	2100			
2A		C9	2600			

Catchment	Water Feature	ID	Chainage (m)	Potential impact	Importance	Potential magnitude of impact
2A		C10	2600			
3		C11	3300			
5		C14	4800			
6	n.a – flood relief culvert	C16	5700			
Realignments or de - culverting						
1A East	Tributary of Mochdre Brook	C3	1000	Loss of channel Increase in silt Spillages to watercourse	High	Moderate
2A	Tributary of Dolfor Brook	C9	2500			
2A		C9a	2500			
2A		C10	2500			
4	Tributary of River Severn	C12	4400			
Compounds construction						
1A West	Surface water or groundwater	-	0 - 200	Increased flood risk Spillages	High	Minor
			500 - 600			
1A East			600 - 800			
			1000 - 1200			
			1500 - 1670			
2A			1670 - 1800			
			2500 - 2600			
2B			2600 - 2800			
3			3500 - 3650			
5			4800 - 5000			
			5400 - 5500			
6			5500 - 5700			
Cuttings up to 24m						
2A	Secondary Uplands – Secondary Combined – Groundwater body (GB40902G203400) and surface watercourse	-	2300	Discharge of polluted groundwater to surface water Loss of perched water table Loss of local abstraction	High	Moderate
2A and 2B			2600			

14.4.2. Operational impacts

During operation road drainage can impact the water environment through discharge of sediments, pollutants and volume of water. The impact of road drainage on the water environment is partly determined by the way in which water is discharged from the Scheme to the water environment. Ideally the pathway of water from the Scheme to the environment should reflect natural hydrological processes. The DMRB refers to this process as a preferred drainage hierarchy. The DMRB suggests that the preferred drainage hierarchy typically should consider discharge of road drainage by infiltration to ground before discharge to a surface water course or then sewer.

Based on ground investigations reported in the Geotechnical Report (Volume 3 Appendix F), it is considered that:

- Generally along the route of the Scheme, impermeable rock lies approximately 1 m below ground level, and
- Where more permeable gravels or made ground underlies the Scheme, these correspond with areas of instability and areas at risk of land slip.

Therefore, it has been considered full infiltration drainage is not a viable option for the Scheme. Further investigation has considered that all outfalls would discharge to watercourses. Details of these proposed outfalls are provided in Table 14.4.2. Further consideration of drainage design for each of these outfalls can be found in the FCA and the Drainage Strategy, within Volume 3 Appendices K.1 and K.3 respectively.

The route of the Scheme has been assessed in terms of eight drainage catchments based on the vertical alignment of the proposed Scheme. All outfalls are proposed to discharge to watercourses.

Details of the catchments and outfall locations are shown in Table 14.4.2 and in Volume 2 Figure 14.2.

Table 14.4.2 Catchment summary

Catchment reference	Catchment name	Chainage (m)		Outfall Chainage (m)	Receiving water feature	Importance of attribute
		Start (west)	End (east)			
1A West	Mochdre West	0	600	50	Tributary of the River Severn	High
1A East	Mochdre East	600	1670	600	Mochdre Brook	High
2A	Dolfor	1670	2600	2500 West of A483 Dolfor Road Roundabout	Tributary of the River Severn	High
2B	Dolfor	2600	2770	2600	Tributary of the River Severn	High
3	Vastre	2770	4100	3650	Tributary of the River Severn	High
4	Kerry Road	4100	4500	4400	Tributary of the River Severn	High
5	Railway	4500	5500	5500	Tributary of the River Severn	High
6	Glan Hafren	5500	5800	6050	Tributary of the River Severn	High

Surface water

Water quality tests (Methods A and D) have been undertaken using variables for the proposed Scheme. Table 14.4.3 provides a descriptive summary of the water quality test results which are shown in more detail in Table 14.4.6.

Table 14.4.3 Water quality test results with no mitigation

Water quality test	Description of result
RSTs	Tests undertaken show that under proposed Scheme conditions, discharge from four catchments (1A West, 2A, 3, and 5) out of the eight assessed would fail the intermittent highway runoff 6 hour and 24 hour ecologically-derived RST for copper
EQS	Discharge from all catchments assessed show that without mitigation, discharge would meet the EQS for both copper and zinc
Suspended Sediment (SS)	Tests show that without mitigation discharge from two catchments (2A and 3) would fail

Water quality test	Description of result
Spillage Risk – Method D	Method D tests undertaken show that all discharges have a lower serious spillage risk than the threshold of 1 in 200 years, as shown by the Method D results in Table 14.4.6

The water quality results shown in Table 14.4.6 show that at outfalls 2A and 3 there would be a potential moderate significance of effect. This is based on a high importance and a moderate magnitude of impact with the outfalls failing RST and SS tests. Outfalls 1A West and 5 would have a slight adverse significance of effects based on a high importance and a minor magnitude of impact with the outfalls failing RST tests.

For assessment of impacts associated with soluble pollutants where outfalls are within 1 km of each other and discharge to the same water receptor these should be aggregated for assessment of operational impact. When assessing the potential impacts associated with sediment-bound pollutants, only outfalls lying within 100 metres of each other should be aggregated for assessment following guidance for the use of HAWRAT in HD45/09 [14.1].

Outfalls 2A and 2B are within 100 m and would discharge to the same water receptor. Subsequently, these outfalls have been aggregated for the assessment of both soluble and sediment-bound pollutants. Table 14.4.4 provides a summary of the effects of aggregated outfalls under proposed Scheme conditions without mitigation. Table 14.4.4 shows the detail of the aggregated outfall assessment.

Table 14.4.4 Water quality test results for aggregated outfalls (with no mitigation)

Water quality test	Description of result
RST	Tests undertaken show that under proposed Scheme conditions, the combined discharge from catchments 2A and 2B would fail the intermittent highway runoff 6 hour and 24 hour ecologically-derived RST for copper
EQS	The combined discharge from catchments 2A and 2B show that without mitigation, discharge would meet the EQS for both copper and zinc
SS	Tests show that without mitigation , the combined discharge from catchments 2A and 2B would fail Tier 1 SS tests

There is also potential for pollution of surface watercourses and groundwater from road run-off from de-icing activities.

Groundwater

As there is no discharge to groundwater proposed from the Scheme it is not considered there would be any direct impact on groundwater quality.

Groundwater collected by drainage at cuttings would be returned to the surface water system and therefore would be at a loss to the local groundwater balance. However, considering the large size of the groundwater body (2358 km^2), the quantity of groundwater lost through the seepage at cuttings is likely to be negligible compared to the overall recharge quantities; therefore it is expected that the Scheme would have no impact on the status of this element at the waterbody scale.

Locally, the drainage at cuttings may result in lowering of the water table. Lowering of the water table has the potential to impact on wells and boreholes used for abstraction by reducing the flow into the borehole and potentially dewatering the pump or borehole. However, the only groundwater abstractions in the vicinity of the Scheme are adjacent to the River Severn and groundwater levels and flows at these locations would be dominated by the relationship with river levels. It is therefore, considered unlikely that the Scheme would have any effect on existing groundwater users.

Flood risk

Fluvial flood risk

The main sources of flood risk associated with the Scheme are:

- River Severn – The Scheme in the Llanidloes Road area is located within the flood plain of the River Severn. Without mitigation, the loss of floodplain storage for events above the 1% (1 in 100) with climate change will result in a slight increase of flow in the River Severn through Newtown.

- Dolfor Brook and Green Brook -The Lower Dolfor Road Roundabout is located within the flood plain of the Dolfor Brook and Green Brook. The loss of flood plain conveyance would result in the diversion of overland flows onto the new road links and north along existing A483 into the town centre.

Without mitigation:

  - The A489 western link road would be overtopped and flood in a 0.1% (1 in 1000) event

  - The Heol Ashley link road to the Mochdre Industrial Estate would also be overtopped in a 0.1% (1 in 1000) event

  - The loss of flood plain conveyance would result in increased flows being diverted along the existing A483 into the town centre

  - The new link road into Newtown from the Scheme would be at risk of flooding

A summary of the operational significance of effect to the water environment relating to flood risk is shown in Table 14.4.7.

Pluvial flood risk

The main pluvial flood risk is associated with overland flow paths onto the new A483 Dolfor Road Roundabout from the existing A483. Without mitigation this would result in flooding of the roundabout.

Increased Surface Water Runoff

Where any increased surface water flow is not attenuated and directed to surface water then this could cause an increase in fluvial flood risk downstream of the Scheme.

Without mitigation through attenuation, the flood risk on the Dolfor Brook would present a moderate magnitude of impact of potentially large significance due to the potential effect on people and property.

The Mochdre Brook discharge has a moderate impact magnitude of impact with a potentially moderate significance of effects. Although there are properties adjacent to this Brook, it is unlikely they would be affected. Any effect on Mochdre Brook would contribute to a general increase in flow rather than any tangible effect on flood risk in the locality

In all other catchments, the additional flow at each of the other outfalls, as listed in Table 14.4.2, of this Scheme is likely to have a minor adverse impact and a slight significance of effect. This is due to the lack of receptors within the other catchments.

Groundwater flood risk

No locations of known groundwater flooding have been identified. Based on the topography of the area, it is considered unlikely to be a significant risk to the Scheme.

Abstractions

It is considered that drawdown in the local superficial deposits would not impact on the local ground water abstractions as noted in the WFD compliance assessment in Volume 3 Appendix K.2.

Lakes and other water bodies

The tests undertaken on proposed discharges from the Scheme show that the Scheme would meet EQS and serious spillage risk thresholds (method D). However, some RSTs and SS thresholds are exceeded. This suggests that without further mitigation there could be potential short term impacts on the Montgomery Canal that has a very high importance. There is potential for a moderate adverse impact and a large significance of effects.

Water Framework Directive compliance assessment

An initial screening assessment as part of the WFD compliance assessment shown in Volume 3, Appendix K.2, was undertaken in November 2013 (and updated in August 2014) using best available data to consider what Scheme elements could impact on the hydro morphological, biological, physic-chemical or groundwater elements of water bodies.

Following an examination of initial general arrangements, concept drawings and discussion with the engineering design team, the elements detailed within Table 14.4.5 were scoped into the WFD compliance detailed assessment. Note, that the numbers denoted in brackets are the Scheme element references as shown in Volume 2, on Figure 14.3.

Table 14.4.5 Scheme elements considered in the WFD compliance assessment

Scheme element	Water body screened into WFD compliance assessment and Scheme element reference number in (brackets)
New clear – span bridges	Mochdre Brook – source to confluence R Severn GB109054044730 (S2) Dolfor Brook part of the R Severn – confluence Afon Dulas to confluence R Camlad GB109054049310 (S5)
Culvert extension or culvert replacement (which extends the length of the existing culvert)	Four tributaries to the River Severn – confluence Afon Dulas to confluence R Camlad GB109054049310 Minimal extension only: (C1) Culvert replacement: (C2, C12, C15)
New culverts	Two tributaries of Mochdre Brook – source to confluence R Severn GB109054044730 (C3, C4) Nine tributaries to the River Severn – confluence Afon Dulas to confluence R Camlad GB109054049310 (C5, C6, C7, C8, C9, C10, C11, C14, S4)
Realignments or de - culverting	One tributary of Mochdre Brook – source to confluence R Severn GB109054044730 (C3) Dolfor Brook part of the R Severn – confluence Afon Dulas to conf R Camlad GB109054049310 (C9, C10) Tributary of the R Severn – confluence Afon Dulas to confluence R Camlad GB109054049310 (C12)
Cutting into the ground	Secondary Uplands – Secondary Combined – Groundwater body GB40902G203400

The Scheme elements outlined in Table 14.4.5 have been assessed for compliance against hydromorphology, biology and hydrogeology elements of the WFD. Of the Scheme elements assessed, new culverts and culvert extensions / replacements are considered to have the largest impact on the water environment as they are likely to lead to localised hydromorphological and aquatic ecological impacts.

Mitigations have been recommended to reduce the localised surface water deterioration in element quality and are shown in Volume 3, Appendix K.2.

Table 14.4.6 Summary of effects of operation on water quality of watercourses with no mitigation

Catchment reference	Receiving watercourse	RST no mitigation		EQS limit (µg/l) no mitigation		SS test (Tier 1) no mitigation	Method D serious spillage risk no mitigation – return period in years (threshold <200)	Importance	Magnitude of impact	Significance of effect
		HAWRAT copper	HAWRAT zinc	HAWRAT copper concentration	HAWRAT zinc concentration					
1A West	Tributary of the River Severn	Fail	Pass	0.98	3.55	Pass	9597	High	Minor adverse	Slight
1B East	Mochdre Brook	Pass	Pass	0.05	0.19	Pass	31360	High	Negligible	Neutral
2A	Tributary of the River Severn	Fail	Pass	0.91	3.29	Fail	5715	High	Moderate adverse	Moderate
2B	Tributary of the River Severn	Pass	Pass	0.14	0.53	Pass	96184	High	Negligible	Neutral
3	Tributary of the River Severn	Fail	Pass	1.08	3.88	Fail	12294	High	Moderate adverse	Moderate
4	Tributary of the River Severn	Pass	Pass	0.69	2.52	Pass	7015	High	Negligible	Neutral
5	Tributary of the River Severn	Fail	Pass	0.91	3.28	Pass	8515	High	Minor adverse	Slight
6	Tributary of the River Severn	Pass	Pass	0.31	1.13	Pass	7344	High	Negligible	Neutral

Table 14.4.7 Summary of potential effects during operation on fluvial flood risk

Watercourse	Chainage	Potential Effects	Importance	Magnitude of impact	Significance of effect
River Severn	0	Loss of floodplain storage	High	Minor adverse	Slight
Dolfor Brook	2500 to 2600 mainline	Increased flood risk downstream due to loss of storage and re-routing of local overland flows in location of proposed Mochdre Industrial Estate link roundabout	High	Moderate adverse	Moderate

Table 14.4.8 Summary of effects of operation on water quality of watercourses from aggregated outfalls with no mitigation

Catchment reference	Receiving watercourse	RST no mitigation		EQS limit (µg/l) no mitigation		SS test (Tier 1) no mitigation	Importance	Magnitude of impact	Significance of effect
		HAWRAT copper	HAWRAT zinc	HAWRAT copper concentration	HAWRAT zinc concentration				
2A + 2B	Tributary of the River Severn	Fail	Pass	0.98	3.51	Fail	High	Moderate adverse*	Moderate/large

Key: *Failure of both soluble RST (copper) and sediment-bound pollutant

14.5. Proposed Mitigation

Proposed mitigation during construction and operation is considered in the following sections.

14.5.1. Construction mitigation

Surface water

Prior to construction a Construction Environmental Management Plan (CEMP) would be compiled to provide targeted guidance throughout the construction period. This would detail both generic and specific instruction to enable construction to be undertaken with minimal impact on the water environment and ensure appropriate consents are obtained prior to works commencing.

In addition to best practice guidance, effects of construction have been assessed for particular construction activities.

The risk of pollution during construction can be reduced by the adoption of good working practices and strict adherence to the Environment Agency Pollution Prevention Guidelines (PPGs). The key guidelines are:

- PPG 1 Understanding your environmental responsibilities – good environmental practice
- PPG 2 Above ground oil storage tanks
- PPG 3 Use and design of oil separators in surface water drainage systems
- PPG 4 Treatment and disposal of sewage where no foul sewer is available
- PPG 5 Works and maintenance in or near water
- PPG 6 Working at Demolition and Construction Sites
- PPG 22 Dealing with spills

Additional good working practice has been collated from DMRB Volume 11 Section 3 Part 10, the Construction Industry Research and Information Association. Generic mitigation measures that would be applied prior to and during construction include the following.

- Provision of adequate temporary storage to contain surface run-off during the construction period, particularly when there are large areas of exposed earthworks or cutting as these lead to substantial increases in surface flows during intense rainstorms and can carry silt through to receiving watercourses
- On-site availability of oil spill clean-up equipment including absorbent material and inflatable booms for use in the event of an oil spill or leak
- Use of drip trays under mobile plant
- Sediment-trapping matting installed downstream of any construction activities adjacent to or over watercourses
- Preparation of incident response plans, prior to construction, and present on site throughout construction to inform sub-contractors of required actions in the event of a pollution incident
- Timing of works close to watercourses so that they do not interfere with spawning fish
- The use of construction materials on site free from contaminated material, so as to avoid any potential contamination of the watercourse
- Ensuring that wet cement does not come into contact with river or groundwater
- Testing of made soils and soils that be reworked to identify any soil contamination

During construction an incident response plan would be in place to deal with any issues as soon as they occur for a particular site and to ensure that works are undertaken with the utmost care where they have potential to lead to contamination of any watercourse. Emergency action planning would include measures to be taken to prevent pollution caused by severe weather.

Water management would be an important part of the earthworks operation. During wet periods, storage of surface runoff would be undertaken to assist in dust suppression during dry periods. Prior to the commencement of any major soil stripping activities, initial water management systems would be installed.

Temporary site drainage would be designed where practicable to retain surface run-off within the site boundary. Where possible the permanent drainage arrangements would be utilised in the

temporary management system. Prior to starting the main earthworks, the permanent cut-off ditches would be constructed at the tops of batters and toes of embankments. These ditches would be used to direct the surface water to the storage lagoons and hence prevent the run-off from entering the earthworks areas. Where required, additional settling areas would be constructed to allow for settling of sediment before discharge or water to watercourses.

Wherever practicable, grey water systems would be used at site compounds to reduce run-off from site, improve water efficiency and lessen the potential for polluting discharges to surface watercourses.

Uses that could generate contaminated water, such as refuelling areas, would themselves be bunded and would drain to lagoons that would have oil interception facilities. The water would be discharged to ditches or streams through balancing ponds that would also have oil retention measures. Any oils or contaminants retained would be pumped into tankers at regular intervals for disposal off site.

Foul water drainage would be piped to an on-site wastewater treatment plant, or contained within the facilities for removal during regular maintenance.

The significance of effects of construction impacts on surface water quality with specific mitigation examples is presented in Table 14.5.1.

Groundwater

No controlled discharges would be made to ground or groundwater during construction without NRW consent and the permission of landowners. Measures to prevent and mitigate accidental pollution of groundwater would be the same as those already described under surface water above.

Where any excavation is to be undertaken below the water table, identified during construction of the cuttings, installation of headwalls or other structures, consultation with the NRW would determine if an abstraction licence for dewatering would be required.

The significance of effects of construction impacts on groundwater quality with specific mitigation examples is presented in Table 14.5.2.

Flood risk

Potential measures to address fluvial, pluvial and groundwater flood risk during construction are shown in Table 14.5.3.

Abstractions and discharges

Any abstractions required for provision of water for dust suppression or site works is required to be consented by the NRW.

All temporary discharges (either directly or via attenuation features) would be reported to and required consent by the NRW and would be to surface waters where practicable. Where discharges are to groundwater they would only be undertaken with the consent of the NRW or the landowner.

It is considered that there would be negligible adverse impact and a neutral significance of effects on abstractions if this guidance is followed.

Lakes and other water features

Mitigation provided for surface water discharges would ensure a negligible adverse impact and a neutral significance of effects on the Montgomery Canal.

If evidence of connectivity from surface water discharge to lakes and other watercourses is found during construction and it is not possible to mitigate potential impacts, alternative discharge pathways and receptors would be identified and used, where other appropriate mitigation cannot be provided.

Table 14.5.1 Potential effects of construction on surface water quality with mitigation

Water feature	Chainage	Importance	Potential effects	Magnitude of impact	Example of proposed mitigation	Significance
Construction of a new culvert						
11 locations on tributaries to the River Severn	Various	High	• Increased suspended sediment affecting surface water bodies • Reduction in channel capacity • Inhibited flow conveyance • Damage to the bed and banks of the watercourse	Minor adverse	• Sediment Erosion Management Plan controls • Use precast units where practicable, to minimise the use of wet cement. • All water upstream of a culvert would be over pumped into a manhole allowing settlement of silt before discharge downstream	Neutral
Culvert extensions and /or replacements						
At four locations on tributaries to the River Severn	Various	High	• Increased suspended sediment affecting surface water bodies • Release of hydrocarbons to surface water • Reduction in channel capacity • Inhibited flow conveyance • Damage to the bed and banks of the watercourse	Minor adverse	• Sediment Erosion Management Plan controls • Use precast units where practicable, to minimise the use of wet cement. • All water upstream of a culvert would be over pumped into a manhole allowing settlement of silt before discharge downstream	Neutral
Construction of a new Bridge						
Mochdre Brook	500 – 600	High	• Increased suspended sediment affecting surface water bodies • Working in stream • Inhibited flow conveyance • Damage to the bed and banks of the watercourse	Moderate adverse	• Sediment Erosion Management Plan control • Use precast units where practicable, to minimise the use of wet cement. • Works to be undertaken outside of stream wherever possible in Dolfor Brook • No work to be undertaken in Mochdre Brook	Neutral
Dolfor Brook	2500 - 2600					
Construction of temporary storage						
All rivers and ditches	All	High	• Increased suspended sediment affecting surface water bodies	Minor adverse	• Sediment Erosion Management Plan controls • Temporary storage would be positioned to intercept runoff and allow settlement, such that there should be no silt-laden water discharged to watercourses during storms. • Hardcore surface and materials storage, including topsoil, aggregates, cement and fuels • Materials storage (topsoil, aggregates)	Neutral

Water feature	Chainage	Importance	Potential effects	Magnitude of impact	Example of proposed mitigation	Significance
Disposal of surface water runoff from compounds						
All rivers and ditches	All	High	• Changes in chemical balance of water quality	Minor adverse	• The principal contractor would provide a method statement of control of contamination and pollutants	Neutral
Dust caused by construction works						
All rivers and ditches	All	High	• Changes in chemical balance of water quality	Minor adverse	• Sediment erosion Management Plan controls • Suppression of dust using water sprinklers, from waters gained from abstraction and bowsers. • Use of permanent storage area for water storage where required.	Neutral
Abstraction from surface water						
All rivers and ditches	All	High	• Reduced base flow • Reduced abstraction water for local abstractions	Minor adverse	• Ensure licensed abstraction only	Neutral

Table 14.5.2 Potential effects of construction on groundwater quality with mitigation

Water Feature	Importance	Magnitude of impact	Mitigation	Significance
Temporary storage of construction material				
Groundwater	Medium/low	Negligible	Areas which may generate contaminated water would be bunded and have water discharged to self-contained units with treatment facilities. There would be no discharge to groundwater	Neutral
Groundwater abstraction				
Groundwater	Medium/low	Negligible	If insufficient water is available to supply requirements at site compounds any abstractions from groundwater would first require licence from the NRW	Neutral
Storage of material from excavations				
Groundwater	Medium/low	Negligible	Tests would be undertaken to ensure contaminated material is identified, isolated and reworked or removed to special landfill to avoid any leachate problems	Neutral
Cutting below groundwater table				
Groundwater near headwall installation or other structures and alongside road cuttings.	Medium/low	Negligible	Consultation with the NRW would determine if an abstraction licence is required for dewatering	Neutral

Table 14.5.3 Potential effects of construction on flood risk with mitigation

Water feature	Chainage	Importance	Potential effects	Magnitude of impact	Example of proposed mitigation	Significance
Increased compound run-off to surface water						
Downstream of all watercourses	Various	High	• Increased run-off downstream of new impermeable area	Minor adverse	• Wherever possible use the proposed operational mitigation to provide attenuation • Capture and restrict additional run-off to Greenfield Run-off Rates.	Neutral
Storage of materials in floodplain						
All Floodplains	Various	High	• Reduction in floodplain storage increases flood risk	Minor adverse	• Minimise locations of storage in floodplains.	Neutral
Work in watercourses						
All watercourses where construction work is to be undertaken	Various	High	• Danger to life • Materials lost • Flood risk	Minor adverse	• Ensure daily weather alerts obtained and retain open liaison with NRW for flood alerts. • Design any temporary works to avoid increasing flood risk. • Obtain temporary Flood Defence Consents for all works in and within 7m of any watercourses and on flood plains.	Neutral
Work near to perched water tables (groundwater flooding).						
All location where perched water tables are present	Various	High	• Temporary flooding from groundwater	Minor adverse	• Monitoring from Ground Investigation to identify locations susceptible to groundwater flooding.	Neutral

14.5.2. Operational mitigation

Surface water

Mitigation measures for drainage and the water environment during operation are required for several reasons:

- To treat contaminants in normal road run-off
- To deal with any accidental spillages occurring on the carriageway
- To attenuate flows from additional impermeable areas of road
- To prevent any increase to flood risk in the area
- To protect and enhance wildlife corridors near watercourses

The preferred approach for the Scheme is to provide mitigation in the form of sustainable drainage.

Water quality tests, detailed in section 14.4.2, have shown that without mitigation under the proposed conditions discharge from four catchments (1A West, 2A, 3, and 5) out of the eight assessed would fail the RST for copper. Discharge from all catchments assessed show that without mitigation, discharge would meet the EQS for both copper and zinc. Tests also show without mitigation discharge from two catchments (2A and 3) would fail Tier 1 SS tests. The required mitigation would provide soluble pollutant treatment and sediment removal as well as some form of capture of routine discharge of hydrocarbons.

For four catchments (1B East, 2B, 4 and 6) it is predicted that there would be no breach of water quality thresholds, meaning that mitigation would not be required for the polluting potential of the discharges. However, mitigation measures have been proposed for flood risk, and these would, in addition provide a degree of water quality treatment for these catchments. Although catchment 2B passes all water quality tests, tests undertaken show that without mitigation, the combined discharge from catchments 2A + 2B would fail both soluble (RST copper) and sediment-bound pollutant thresholds.

With the exception of catchment 2B where a dry detention basin is proposed, wet drainage ponds have been selected as mitigation for all other catchments to control the volume and quality of the run-off from the Scheme. Wet drainage ponds would provide soluble metal removal through plant uptake as well as providing some sediment removal.

Ponds provide surface attenuation of storm water run-off to aid in the control of surface water discharge. Ponds also allow for some water quality treatment, primarily settlement of solids, and uptake of heavy metals through plants. These are proposed for catchments 1A West, 1A East, 2A, 3, 4, 5 and 6, and would meet the water quality and attenuation criteria. In order to intercept hydrocarbons all the drainage ponds with the exception of the detention basin in catchment 2B (due to design constraints) would be hybrid ponds, which feature permanently wet areas. The detention basin in catchment 2B would still allow some removal of hydrocarbons through retention in the detention basin.

In terms of spillage risk, method D tests undertaken show that all discharges have a lower serious spillage risk than the threshold of 1 in 200 years. Separate oil interceptors are not proposed. However, the proposed hybrid ponds would be equipped with skim plates and flow controls (as shown in Figure 2.5, HA 103/06 [14.18]) which would operate on the same principles as oil separators. This approach is subject to agreement with NRW. Emergency shut-off valves and bypasses would be provided upstream of critical discharge locations to enable the ponds to be isolated from receiving watercourses in the event of an accidental spillage.

Winter maintenance

During the operation of the Scheme it is recommended, that the maintenance contractors comply with current Environment Agency guidance and specifications as detailed in PPG10 guidelines for storage of salt. It is also recommended that if any substance other than natural de-icing salt is to be used Natural Resources Wales are notified to ensure no significant adverse impact of supplementary substances on the water environment.

HA 103/06 [14.19] recommends where the use of de-icing salt is likely to be very frequent and the dilution of run-off by receiving waters is low, flow should be diverted to infiltration facilities with

groundwater protection or ponds. The proposed method of discharge for this Scheme would be to surface watercourses and SUDs in the form of a detention basin and drainage ponds. With this mitigation in place the impact would be minor adverse and temporary.

Flood risk

Fluvial flood risk

River Severn

Baseline modelling identified that a portion of the western end of the Scheme lies in the passive floodplain of the River Severn. Compensatory 'level for level' flood storage would be provided to ensure that there is no increase in flood risk downstream.

Mochdre Brook

The main bridge crossing of Mochdre Brook and related embankments have been sited outside the floodplain of the Brook. The soffit of the bridge deck is above the 0.1% (1 in 1000) annual chance flood level.

Dolfor Brook and Green Brook

A combination of mitigation measures are incorporated into the design of the Scheme in the area of the Dolfor Brook and Green Brook confluence. This includes, but not limited to, increasing the size of culverts to compensate for the conveyance lost. A full description can be found in the FCA in Volume 3, Appendix K.1.

All new or amended culverts, together with existing culverts which are to be retained, have been assessed to ensure that each would pass a 1% (1 in 100) chance flow including 20% climate change. Checks have been made to ensure no adverse impact on flood risk up to a 0.1% (1 in 1000) chance event.

Measures to manage the risk of blockages of culverts have been incorporated into the Scheme. These include management of vegetation in the upstream catchments and improved trash screens arrangements including safe access to facilitate regular maintenance and clearing.

Pluvial flood risk

Two locations have been identified as being susceptible to pluvial flood risk. The post Scheme situation at each location is summarised below.

1. **A483 at Black Hall Farm**
   The potential risk to the A483 Dolfor Road Roundabout would be managed by diverting flows into Green Brook. The risk would be reduced at this location with no adverse impact to the side roads.

2. **Kerry Road at Lower Brimmon Farm**
   The Scheme is elevated above the existing flow paths. The surface run-off towards the road would be managed using fenceline drains and the flow paths would be controlled to ensure no adverse impact.

Increased Surface Water Runoff

Attenuation facilities would be provided in the design to ensure that surface water runoff from the highway is restricted to existing green field runoff. Storage would be provided to contain the volume of a 1%(1 in 100) flood event, plus an allowance of 20% for climate change.

Run-off from the highway would be restricted using controls such as hydro-breaks, orifice plates, and attenuation would be provided by ponds. Oversized pipes may be considered for storage in specific situations where space does not facilitate the use of ponds. Suitable access provision would be provided to all attenuation facilities to allow for future maintenance. Further details can be found in the FCA in Volume 3, Appendix K.3.

Groundwater flood risk

Provision would be included within the drainage measures to control groundwater along the line of the new road.

Proposed Water Framework Directive (WFD) compliance mitigation and enhancement measures

Compliance against the WFD has been considered within this Environmental Impact Assessment (EIA). A number of mitigation and enhancement measures have been considered for each Scheme element and are summarised below. Enhancement within WFD compliance assessments can be used as a form of mitigation to offset adverse impacts. Liaison with NRW has been undertaken as part of the Scheme design process, and agreement is required on which measures are essential to include within the Scheme to ensure compliance with the WFD. Further details of the mitigation measures are contained within Volume 3, Appendix K.2.

- At S2 (crossing reference 4), the west abutment and farm access track would be at least 3 m away from the Mochdre Brook bank top
- Where it occurs, Japanese Knotweed should be prevented from spreading during the construction works this is particularly relevant at S5, (crossing reference 16) on the Dolfor Brook
- To prevent fragmentation of local fisheries and other aquatic ecological species, multi-plate arch structures are to be used instead of pipe or box culverts at C3a (crossing reference 5 Tributary 1 of the Mochdre Brook), and C8 (crossing reference 14 on the Green Brook). These are on watercourses considered to be of relatively good quality both hydromophologically and ecologically. These structures include a depressed invert level with a natural like sediment layer on the channel bed
- To lessen the impact to the hydromorphology and aquatic ecology, box culverts instead of pipe culverts are proposed at C4 (crossing reference 7), S4 (crossing reference 15), C9 (crossing reference 17) and C10 (crossing reference 18). Although these would not have a depressed invert level or a natural sediment bed they would maintain the channel width
- At appropriate locations (as specified below) mammal passes would be installed to ensure connectivity. Dry pipes would be installed close to C2a (crossing reference 2), C12 and C15 (crossing reference 26)
- Multi-plate arch bridge structures would incorporate a raised mammal ledge at C3a (crossing reference 5 Tributary 1 of the Mochdre Brook) and C8 (crossing reference 14 on the Green Brook)
- Box culverts would incorporate a raised ledge at C4 (crossing reference 7), S4 (crossing reference 15), C9 (crossing reference 17) and C10 (crossing reference 18).
- At C12 (crossing reference 21) a larger 1200 mm diameter culvert would be installed and a raised mammal ledge would be included
- At C11 (crossing reference 19) there would be an underpass suitable for mammals about 300 m north-east of the C11 culvert. In addition, mammal fencing would be provided at all Scheme locations
- The C4 box culvert (crossing reference 7) would also allow bat movement along the watercourse
- At C3b (crossing reference 6) upstream of the culvert, there would be an approximate 64 m length of channel that would be realigned along a fairly straight alignment next to a track. However, the channel riparian habitat would be slightly improved by tree, shrub and hedgerow planting within the vicinity
- At C9 (crossing reference 17) and C10 (crossing reference 18) there would be a combination of de-culverting and culverting along a similar alignment to the existing channel. The net effect would be de-culverting of approximately 72 m.
- A wetland feature would be recreated near to C2a (crossing reference 2). This would be developed during detailed design
- At C12 (crossing reference 21) a larger capacity culvert would improve the hydromorphology of the reach upstream Downstream of this culvert, the channel is to be realigned for a length of approximately 77 m to the south of farm buildings. The realignment would by-pass a section of existing culverting under the farm buildings
- Nearby C14 (crossing reference 24), a pond that would be impacted by the Scheme crossing at its existing location, is to be recreated as two new ponds to the north and south of the Scheme
- The loss of the watercourses classified as ditches (approximately 252 m) would be indirectly compensated for by the creation of fence line ditches for the full length of the Scheme
- All culverts would have erosion control measures up and downstream of the structures. The exact designs at the transition points between the natural and artificial channels

would need to be managed with respect to WFD throughout the detailed design process of the Scheme

The location of potential mitigation options required to achieve WFD compliance can also be seen in Volume 2 Figure 14.3.

14.6. Residual Environmental Effects (following mitigation)

14.6.1. Construction impacts

Providing adherence to best practice guidance and the adoption of good working practices and strict adherence to the Environment Agency PPGs, the magnitude of impact during construction would be negligible with neutral significance.

Tables 14.5.1 to 14.5.3 provide the magnitude of impact and significance of effect during construction with mitigation for surface water, groundwater and flood risk respectively.

14.6.2. Operational impacts

Water quality tests have been undertaken in accordance with HD45/09 [14.1] for eight catchments with the proposed drainage designs including mitigation. Tests show that all discharges would comply with the EQS for both copper and zinc and would meet and pass the RST for both copper and zinc.

Tests also show that discharge from all catchments following mitigation would pass the Tier 1 SS test.

As highlighted above, for four catchments (1B East, 2B, 4 and 6) it is predicted that there would be no breach of water quality thresholds. Nonetheless, the proposed mitigation measures for flood risk would provide a degree of water quality treatment.

Spillage risk tests undertaken show there would be no serious spillage risk for any catchment.

Following mitigation, tests also show the combined discharge from catchments 2A + 2B would meet and pass the RST for both copper and zinc and would comply with the EQS for both copper and zinc. Tests also show that the combined discharge following mitigation would pass the Tier 1 suspended sediment test.

Table 14.6.1 provides the magnitude of impact and significance of effect under the proposed conditions with mitigation.

The FCA has identified some areas of existing fluvial and pluvial flood risk. Updated modelling and assessment presented in the FCA concludes that there would be no significant risk of flooding from the Scheme following mitigation. Mitigation measures would ensure that the Scheme and new sections of side road links would remain flood free for 1% (1 in 100) annual chance event including an allowance for climate change. The Scheme is considered to remain flood free for more extreme events up to a 0.1% (1 in 1000) annual chance event.

The WFD compliance assessment concludes at a water body scale the impacts are considered unlikely to be significant.

Regarding maintenance of the Scheme, de-icing salt has a low environmental impact when used responsibly and sodium chloride is not classified as dangerous to the environment [14.20].The potential operational impact of salt on water quality would be minor adverse.

Table 14.6.1 Summary of effects of operation on watercourses (water quality) with mitigation

Catchment reference	Receiving watercourse	RST with mitigation		EQS limit (mg/l) with mitigation		SS test (Tier 1) with mitigation	Method D serious spillage risk with mitigation – return period in years(threshold <200)	Importance	Proposed mitigation	Magnitude of impact	Significance of effect
		HAWRAT copper	HAWRAT zinc	HAWRAT copper concentration	HAWRAT zinc concentration						
Individual discharge assessment											
1A West	Tributary of the River Severn	Pass	Pass	0.6	2.21	Pass	38386	High	Wet pond	Negligible	Neutral
1B East	Mochdre Brook	Pass	Pass	0.03	0.12	Pass	125438	High	Wet pond	Negligible	Neutral
2A	Tributary of the River Severn	Pass	Pass	0.56	2.04	Pass	22861	High	Wet pond	Negligible	Neutral
2B	Tributary of the River Severn	Pass	Pass	0.14	0.54	Pass	192367	High	Detention basin	Negligible	Neutral
3	Tributary of the River Severn	Pass	Pass	0.66	2.39	Pass	49177	High	Wet pond	Negligible	Neutral
4	Tributary of the River Severn	Pass	Pass	0.43	1.56	Pass	28058	High	Wet pond	Negligible	Neutral
5	Tributary of the River Severn	Pass	Pass	0.56	2.08	Pass	34060	High	Wet pond	Negligible	Neutral
6	Tributary of the River Severn	Pass	Pass	0.19	0.71	Pass	29357	High	Wet pond	Negligible	Neutral
Combined discharge assessment											
2A + 2B	Tributary of the River Severn	Pass	Pass	0.6	2.18	Pass	n.a	High	Wet pond (2A) + Detention basin (2B)	Negligible	Neutral

14.7. Summary and Conclusions

The Scheme is located in an area that includes surface watercourses and protected sites of a high importance, groundwater bodies and areas of identified flood risk.

In conjunction with the assessment in this chapter, a FCA, a WFD compliance assessment, a Drainage Strategy Report and HAWRAT testing have been completed and been summarised in this chapter. The details of these reports are presented in Volume 3 Appendix K. Full HAWRAT data can be obtained from the Welsh Government on request.

The significance of effect of the Scheme on the water environment based on environmental importance and magnitude of impact both during construction and operation is summarised in Table 14.5.1 to 14.5.3 and 14.6.1.

Water quality tests undertaken show a negligible magnitude of impact and a neutral significance of effects to the water environment under proposed Scheme conditions with mitigation for all catchment assessed.

Mitigation measures have been proposed for all catchments. In four catchments (1B East, 2B, 4 and 6) modelling showed that the mitigation is not needed for water quality. However, the mitigation is required for flood risk and there would be additional benefits for water quality in these catchments.

Scheme impacts on flood risk have also shown a negligible adverse significance of effects.

WFD compliance has been considered as part of this assessment. NRW would need to confirm whether they deem the Scheme to be WFD compliant and whether the nature and scale of the mitigation proposed as part of the Scheme is appropriate.

The Scheme is in accordance with the relevant polices and requirements within the UDP commissioned by PCC in March 2010[14.2] and the LDP Deposit Draft published in July 2014[14.3]. Specifically, water quality tests have shown no breach in water quality standards thereby meeting Policy DM1. The Scheme has considered SUDs, flood risk and WFD implications, and provided justification for the mitigation measures and thereby is in accordance with Policy DM2. Further, the water assessment has also shown with the mitigation provided for surface water discharges, there would be a negligible adverse impact and a neutral significance of effects on the Montgomery Canal thereby in line with Policy TD3.

The Scheme is also in accordance with the NTP SEA[14.4] objective 8 and its sub-objectives: 8.4 to minimise transport impacts on flood plains and areas of flood risk and 8.5 to encourage use of sustainable drainage systems/permeable surfaces.

Table 14.7.1 – Summary of Impacts in relation to the water environment

Receptor/s	Description of effect	Magnitude of impact prior to mitigation	Magnitude of impact following mitigation	Significance of impact following mitigation	Notes / Comments
Construction Impacts					
• Mochdre Brook • Dolfor Brook	**Construction of new bridge** • Increase in silt • Spillage to watercourse	Moderate	Negligible	Neutral	Providing adherence to best practice guidance and the adoption of good working practices and strict adherence to the Environment Agency PPGs, the magnitude of impact during construction would be negligible with neutral significance
• Tributaries to the River Severn	**Culvert extensions and /or replacements** • Increase in silt • Spillage to watercourse • Reduction in biodiversity • Erosion of river bed	Minor	Negligible	Neutral	
• Tributary of Mochdre Brook • Tributaries of River Severn	**New culverts** • Increase in silt • Spillage to watercourse • Reduction in biodiversity • Erosion of river bed	Minor	Negligible	Neutral	
• Tributary of Mochdre Brook • Tributary of Dolfor Brook • Tributaries of River Severn	**Realignments or de-culverting** • Loss of channel • Increase in silt • Spillages to watercourse	Moderate	Negligible	Neutral	
• Surface water or groundwater	**Compounds construction** • Increased flood risk • Spillages	Minor	Negligible	Neutral	
Secondary Uplands – Secondary Combined – Groundwater body (GB40902G203400) and surface watercourse	**Cuttings up to 24m** • Discharge of polluted groundwater to surface water • Loss of perched water table • Loss of local abstraction	Moderate	Negligible	Neutral	

Operational Impacts					
Tributary of the River Severn	• Discharge from catchments 2A and 3 and the combined discharge from catchment 2A and 2B would fail the intermittent highway runoff 6 hour and 24 hour ecologically-derived RST for copper and SS	Moderate	Negligible	Neutral	With the exception of catchment 2B where a dry detention basin is proposed, wet drainage ponds have been selected as mitigation for all other catchments to control the volume and quality of the run-off from the Scheme. Wet drainage ponds would provide soluble metal removal through plant uptake as well as providing some sediment removal
Tributary of the River Severn	• Discharge from catchments 1A West and 5, would fail the intermittent highway runoff 6 hour and 24 hour ecologically-derived RST for copper	Minor	Negligible	Neutral	

15. Assessment of Cumulative Effects

15.1. Legislative and best practice guidance requirements

The approach to assessing cumulative impacts is addressed under DMRB Vol. 11, Section 2, Part 5 (HA 205/08)[15.1]. This draws on guidelines for assessing indirect, cumulative and impact interactions, published by the European Commission[15.2]. HA 205/08 recognises two principle types of cumulative impacts to be addressed in EIAs as follows:

- *Cumulative Impacts from a single project (e.g. combined effects of differing environmental impacts on a single receptor or resource), and*
- *Cumulative impacts from different projects (in combination with the project being assessed).*

The guidance states that in the first type (impacts from a single project) the impacts arise from the *'combined action of a number of environmental topic specific impacts upon a single receptor/resource'.*

For the second cumulative impact assessment type (cumulative impacts from other projects) the guidance states that:

'For the purposes of this guidance, 'reasonably foreseeable' is interpreted to include other projects that are 'committed'. These should include (but not necessarily be limited to):

- *Trunk road and motorway projects which have been confirmed (i.e., gone through the statutory processes),*
- *Development projects with valid planning permissions as granted by the Local Planning Authority, and for which formal EIA is a requirement or for which non-statutory environmental impact assessment has been undertaken'.*

In terms of *'trunk road and motorway projects which have been confirmed'*, there are none within the immediate area which are likely to have a cumulative affect with the Scheme. Planned trunk road projects in Wales are included in the Wales Transport Strategy (2008) and National Transport Plan (2011). Both of these have been subject to SEA and an HRA has been undertaken for the NTP. Consideration has therefore been given to the potential environmental effects of planned transport schemes in Wales, including trunk road schemes, at a strategic level.

Where relevant the environmental topic chapters have referenced how the NTP SEA objectives and sub-objectives are met by the Scheme. Relevant commitments made within the NTP SEA and HRA are included in the draft Register of Commitments (ROC – refer to ES Volume 3, Appendix L.2), which would be addressed as part of the Scheme.

15.2. Cumulative impacts consultation

With regards to '*development projects with valid planning permissions as granted by the Local Planning Authority, and for which formal EIA is a requirement or for which non-statutory environmental impact assessment has been undertaken'* the AGC Team has consulted with PCC and other statutory environmental bodies as recommend in HA 205/08.

The Environmental Scoping Report (Report No. 5105742/ENV/SR/RT203/A1) included a request that statutory environmental bodies suggest other developments to be considered in the assessment of cumulative impacts. Section 1.5 provides details of the statutory environmental bodies consulted on the Environmental Scoping Report.

15.3. Cumulative impacts scope

Following responses to the Scoping Report, consultation with PCC and searches of the PCC Planning website a number of projects and plans have been identified which may have a cumulative effect with the Scheme. These are shown in Table 15.3.1.

The locations of these developments are shown in Volume 2, Figure 15.1.

The three windfarm developments listed below have statutory EIAs which support their planning applications, however none have been granted planning consent and it is unknown if and when planning permission will be granted. An environmental assessment has been carried out in relation to the Strategic Transport Management Plan (STMP) for Mid Wales Wind Farms.

Table 15.3.1 – Other plans and projects considered in the assessment of cumulative impacts

Project / plan	Application Ref:	Planning decision[4]	Draft Programme
Llandinam 132kv grid connection	BERR/2009/0005	No decision	Unknown – awaiting inspector's report following combined wind farm public inquiry
Llandinam Wind Farm Repowering	BERR/2008/0003	No decision	Unknown – awaiting inspector's report following combined wind farm public inquiry
Neuadd Goch Windfarm	P/2012/0040	No decision	Unknown
Residential development and access – Land at Heol Treowen	M/2003/1354, M/2007/0470, P/2009/0942	Outline permission. The latest application seeks an extension to the time period for submission of reserved matters.	Unknown
Hope Community Church	P/2013/0791, SO/2013/0062	Conditional consent	The project start: 16/06/2014 Programmed project completion: 13/07/2015.
Welsh Medium School	P/2013/1138	Conditional consent	Site access work start: 21/07/2014 (anticipated 8 week works contract). Currently no start date for main site
Wind Farm Access Road	P/2010/1028	No decision	Unknown – a public inquiry in relation to the development is programmed for October 2014.
Severnside Yard Residential	P/2013/1185	Conditional consent	Planning conditions expected to be discharged and construction to start soon afterwards.
Mid Wales Wind Farm Strategic Transport Management Plan	N/A	N/A	Unknown
Single turbine developments in the vicinity of Dolfor, Mochdre and Stepaside	P/2013/0524 M/2006/0207 SO/2013/0080 P/2013/0274 SO/2013/0007 P/2010/1221 P/2010/1083 P/2008/1247 M/2007/0304	Conditional consent Conditional consent EIA not required Conditional consent EIA not required Conditional consent Conditional consent Granted subj. S106 Conditional consent	Various

[4] The planning decisions and draft programmes for projects shown in Table 15.3.1 were current as of June 2014

15.4. Approach to assessing cumulative impacts from a single project

The first cumulative impact assessment type as outlined in Section 15.1 (cumulative impacts from a single project) are addressed in Section 15.5 using a matrix style approach, which quantifies the in-combination effects of a number of environmental impacts on a certain receptor (e.g. combined effects of noise and air quality on nearby residents). The in-combination effects would be experienced mostly during the construction phase.

15.5. Approach to assessing cumulative impacts from other projects

As none of the proposed developments considered during the desk study exercise have *'a valid planning permission granted by the local planning authority and for which formal EIA is a requirement or for which non-statutory environmental impact assessment has been undertaken'* the guidance given within the HA 205/08 directs the AGC Team not to consider the cumulative impacts of these projects. However, it is felt that consideration should be given to identify significant environmental effects associated with the combined effects from other projects. This is because of the scale of proposed development within Powys (particularly associated with wind farms) and requests from NRW and PCC to consider potential cumulative effects from other projects.

The potential effects with other projects are considered in Section 15.7.

15.6. In combination effects

Sections 5.0 to 14.0 of this Environmental Statement have addressed impacts of the Scheme in relation to certain environmental topic areas (e.g. air quality, noise, landscape etc.) on certain receptors. These impacts associated with various topics have the potential to interact and combine with one another to have a greater impact on certain receptors. Several impacts that may have been insignificant by themselves may also combine to have an adverse effect.

In terms of the Scheme, effects such as air quality, visual impact, noise and vibration can work together to have a magnified effect on certain receptors. Potential receptors of these cumulative impacts are nearby residents (highest sensitivity), users of the PROW (medium sensitivity) and local workers and road users (low sensitivity). This assessment considers the most sensitive receptors, which are the local residents.

Table 15.6.1 below outlines the in-combination effects of certain environmental effects on sensitive receptors based on the findings of the relevant detailed environmental topic chapters and assuming mitigation is put in place. Due to assessment criteria differing between the individual environmental assessments, the overall cumulative effect is difficult to quantify. The assessment is therefore based on best professional judgement, and comments are provided on how the cumulative impact has been reached. Guidance given in DMRB HA 205/08 has also been taken into account when undertaking the assessment.

Table 15.6.1 – In combination effects

Receptor / Environmental Resource	Significance of noise impact following mitigation	Significance of air quality impact following mitigation	Significance of visual impact following mitigation	Comments and significance of in-combination effect following mitigation
Construction impacts				
Glandulas Holiday Home Park	Significant adverse (caravans and properties within 100m of construction work, although noise issues are not expected to persist for long periods)	Negligible (assuming appropriate measures to prevent and control dust are maintained by the contractor).	Substantial adverse	There would be an in combination effect from noise (caravans and properties within 100m of construction work) and visual impact during the construction phase which is considered likely to have an increased adverse significance of effect on these receptors than the impacts experience in isolation.
Bontdulas Cottages and other properties along Mochdre Lane	Significant adverse (properties within 100m of construction work, although noise issues are not expected to persist for long periods)	Negligible (assuming appropriate measures to prevent and control dust are maintained by the contractor).	Substantial / major adverse	There would be an in combination effect from noise (properties within 100m of construction work) and visual impact during the construction phase which is considered likely to have an increased adverse significance of effect on these receptors than the impacts experience in isolation.
Castell-y-Dail House	Significant adverse (although noise issues are not expected to persist for long periods)	Negligible (assuming appropriate measures to prevent and control dust are maintained by the contractor).	Substantial adverse	There would be an in combination effect from noise and visual impact during the construction phase on this Listed Building which is considered likely to have an increased adverse significance of effect on this receptor than the impacts experience in isolation.
Black Hall Farm	Significant adverse (although noise issues are not expected to persist for long periods)	Negligible (assuming appropriate measures to prevent and control dust are maintained by the contractor).	Substantial adverse	There would be an in combination effect from noise and visual impact during the construction phase which is considered likely to have an increased adverse significance of effect on this receptor than the impacts experience in isolation.
Garth Owen (southern fringe only)	Significant adverse (properties within 100m of construction work, although noise issues are not	Negligible (assuming appropriate measures to prevent and control dust are	Substantial adverse	There would be an in combination effect from noise (properties within 100m of construction work) and visual impact during the construction phase which is considered likely to have an increased adverse significance of effect on these receptors than the impacts experience in isolation.

Receptor / Environmental Resource	Significance of noise impact following mitigation	Significance of air quality impact following mitigation	Significance of visual impact following mitigation	Comments and significance of in-combination effect following mitigation
	expected to persist for long periods)	maintained by the contractor).		
Properties in Dolfor Valley	Significant adverse (properties within 100m of construction work, although noise issues are not expected to persist for long periods)	Negligible (assuming appropriate measures to prevent and control dust are maintained by the contractor).	Substantial adverse	There would be an in combination effect from noise (properties within 100m of construction work) and visual impact during the construction phase which is considered likely to have an increased adverse significance of effect on these receptors than the impacts experience in isolation.
Bryneira	Significant adverse (although noise issues are not expected to persist for long periods)	Negligible (assuming appropriate measures to prevent and control dust are maintained by the contractor).	Moderate adverse	There would be an in combination effect from noise and visual impact during the construction phase which is considered likely to have an increased adverse significance of effect on this receptor than the impacts experience in isolation.
Great Brimmon Farm	Significant adverse (although noise issues are not expected to persist for long periods)	Negligible (assuming appropriate measures to prevent and control dust are maintained by the contractor).	Substantial adverse	There would be an in combination effect from noise and visual impact during the construction phase which is considered likely to have an increased adverse significance of effect on this receptor than the impacts experience in isolation.
Upper Brimmon Farm	Not significant (not within 100m of construction work)	Negligible (assuming appropriate measures to prevent and control dust are maintained by the contractor).	Substantial adverse	There would be a visual impact associated with the construction work on this receptor. However it is unlikely that there would be in-combination effects associated with construction noise and dust.
Lower Brimmon Farm	Significant adverse (although noise issues are not expected to persist for long periods)	Negligible (assuming appropriate measures to prevent and control dust are maintained by the contractor).	Substantial adverse	There would be an in combination effect from noise and visual impact during the construction phase which is considered likely to have an increased adverse significance of effect on this receptor than the impacts experience in isolation.

Receptor / Environmental Resource	Significance of noise impact following mitigation	Significance of air quality impact following mitigation	Significance of visual impact following mitigation	Comments and significance of in-combination effect following mitigation
Properties east of Wern Ddu Lane	Generally not significant although construction of the Wern Ddu Overbridge would come within 100m of Tyn-y-Green which would be a significant adverse effect at some point during the construction phase (although noise issues are not expected to persist for long periods)	Negligible (assuming appropriate measures to prevent and control dust are maintained by the contractor).	Moderate adverse	There would be a visual impact associated with the construction work on this receptor. However it is unlikely that there would be in-combination effects associated with construction noise and dust. There may be an in combination effect from noise and visual impact on Tyn-y-Green when constructing the Wern Ddu Overbridge. This is considered likely to have an increased adverse significance of effect on than the impacts experience in isolation.
Properties along A483 Pool Road Roundabout	Significant adverse (properties within 100m of construction work, although noise issues are not expected to persist for long periods)	Negligible (assuming appropriate measures to prevent and control dust are maintained by the contractor).	Substantial adverse	There would be an in combination effect from noise (properties within 100m of construction work) and visual impact during the construction phase which is considered likely to have an increased adverse significance of effect on these receptors than the impacts experience in isolation.
Operational impacts				
Glandulas Holiday Home Park	Moderate/major adverse	Negligible	Substantial adverse (yr. 1), Moderate adverse (yr. 15 winter and summer)	There would be an in combination effect from noise and visual impact during the operational phase which is considered likely to have an increased adverse significance of effect on these receptors than the impacts experience in isolation.
Bondulas Cottages and other properties along Mochdre Lane	Major adverse	Negligible	Substantial adverse (yr.1, yr. 15 winter and summer)	There would be an in combination effect from noise and visual impact during the operational phase which is considered likely to have an increased adverse significance of effect on these receptors than the impacts experience in isolation.
Castell-y-Dail House	Major adverse	Negligible	Substantial adverse (yr. 1),	There would be an in combination effect from noise and visual impact during the operational phase which is considered likely to

Receptor / Environmental Resource	Significance of noise impact following mitigation	Significance of air quality impact following mitigation	Significance of visual impact following mitigation	Comments and significance of in-combination effect following mitigation
			Moderate adverse (yr. 15 winter and summer)	have an increased adverse significance of effect on this receptor than the impacts experience in isolation.
Black Hall Farm	No significant operational impact	Negligible	Substantial adverse (yr. 1), Slight adverse (yr. 15 winter and summer)	There would be no in combination on this receptor.
Garth Owen (southern fringe only)	Minor/moderate adverse	Negligible	Moderate adverse (yr. 1), Slight adverse (yr. 15 winter and summer)	There would be an in combination effect from noise and visual impact during the operational phase which is considered likely to have an increased adverse significance of effect on these receptors than the impacts experience in isolation.
Properties in Dolfor Valley	Moderate/Major adverse	Negligible	Substantial adverse (yr. 1), Moderate adverse (yr. 15 winter and summer)	There would be an in combination effect from noise and visual impact during the operational phase which is considered likely to have an increased adverse significance of effect on these receptors than the impacts experience in isolation.
Bryneira	Major adverse	Negligible	Slight adverse (yr. 1), No change (yr. 15 winter and summer)	There would be an in combination effect from noise and visual impact during the operational phase which is considered likely to have an increased adverse significance of effect on this receptor than the impacts experience in isolation.
Great Brimmon Farm	Major adverse	Negligible	Substantial adverse (yr. 1), Substantial/ Moderate adverse (yr. 15 winter and summer)	There would be an in combination effect from noise and visual impact during the operational phase which is considered likely to have an increased adverse significance of effect on this receptor than the impacts experience in isolation.
Upper Brimmon Farm	Major adverse	Negligible	Substantial adverse (yr. 1), Moderate	There would be an in combination effect from noise and visual impact during the operational phase which is considered likely to

Receptor / Environmental Resource	Significance of noise impact following mitigation	Significance of air quality impact following mitigation	Significance of visual impact following mitigation	Comments and significance of in-combination effect following mitigation
			adverse (yr. 15 winter and summer)	have an increased adverse significance of effect on these receptors than the impacts experience in isolation.
Lower Brimmon Farm	Minor/Moderate adverse	Negligible	Substantial adverse (yr. 1), Moderate/ Slight adverse (yr. 15 winter and summer)	There would be an in combination effect from noise and visual impact during the operational phase which is considered likely to have an increased adverse significance of effect on these receptors than the impacts experience in isolation.
Properties east of Wern Ddu Lane	Minor/Moderate adverse	Negligible	Moderate adverse (yr. 1), Slight adverse (yr. 15 winter and summer)	There would be an in combination effect from noise and visual impact during the operational phase which is considered likely to have an increased adverse significance of effect on some of these receptors than the impacts experience in isolation.
Properties along A483 Pool Road Roundabout	Moderate adverse	Negligible	Substantial adverse (yr.1, yr. 15 winter and summer)	There would be an in combination effect from noise and visual impact during the operational phase which is considered likely to have an increased adverse significance of effect on these receptors than the impacts experience in isolation.

15.7. Cumulative impacts with other projects

Table 15.7.1 – Assessment of potential cumulative impacts with other projects and plans

Project / plan	Magnitude and significance of potential cumulative impacts with Scheme
Llandinam 132kv grid connection	Planning application not approved. Development programme unknown. If development were to take place the potential cumulative impacts are summarised as follows: • Air Quality – Magnitude of cumulative impact considered neutral and significance negligible due to distance from the Scheme and because development is unlikely to generate traffic growth. • Cultural Heritage – Visual effects were predicted on the setting of several cultural heritage assets, including Offa's Dyke near Forden and Bryn Cwmyrhiwdre Round Barrow near Bryn-picca. Because of their proximity to the development, the significance of

Project / plan	Magnitude and significance of potential cumulative impacts with Scheme
	visual effect is considered moderate and very large respectively (i.e. significant in terms of the requirements of the EIA Regulations). However, due to the distance of these features from the Scheme, there would be no cumulative impact. • Landscape – Magnitude of cumulative impact considered neutral and significance negligible due to distance from the Scheme. • Nature Conservation – Magnitude of cumulative impact considered neutral and significance negligible due to distance from the Scheme. • Geology and Soils – Magnitude of cumulative impact considered neutral and significance negligible due to distance from the Scheme. • Materials – Magnitude of cumulative impact considered neutral and significance negligible due to distance from the Scheme. • Noise and Vibration – Magnitude of cumulative impact considered neutral and significance negligible due to distance from the Scheme. • Effects on all Travellers – Magnitude of cumulative impact considered neutral and significance negligible due to distance from the Scheme. • Community and Private Assets – Magnitude of cumulative impact considered neutral and significance negligible due to distance from the Scheme. • Road Drainage and the Water Environment – Magnitude of cumulative impact considered neutral and significance negligible due to distance from the proposed Scheme. Following guidance in the DMRB (HD45/09) for the assessment of impacts associated with soluble pollutants, only outfalls within 1 km should be aggregated for assessment. When assessing the potential impacts associated with sediment-bound pollutants only outfalls lying within 100 m should be aggregated for assessment. Beyond 100 m the sediment, if it settles at all, is likely to be sufficiently diluted with natural sediment. Based on this, this development has not been assessed and has been scoped out of this assessment. • No impact on flood risk as the Scheme is remote from this site.
Llandinam Wind Farm Repowering	Planning application not approved. Development programme unknown. If development were to take place the potential cumulative impact are summarised as follows: • Air Quality – Magnitude of cumulative impact considered neutral and significance negligible due to distance from the Scheme and because development is unlikely to generate traffic growth. • Cultural Heritage – For features up to 10 km beyond the development site, the predicted indirect impacts are predominantly of minor significance, although an impact of moderate adverse significance is predicted from the indirect visual impact on Caersws Basin and Clywedog Valley Registered Historic Landscapes. However, due to the distance of these features from the Scheme, there would be no cumulative impact. • Landscape – Magnitude of cumulative impact considered neutral and significance negligible due to distance from the Scheme • Nature Conservation – Magnitude of cumulative impact considered neutral and significance negligible due to distance from the Scheme • Geology and Soils – Magnitude of cumulative impact considered neutral and significance negligible due to distance from the Scheme. • Materials – Magnitude of cumulative impact considered neutral and significance negligible due to distance from the Scheme. • Noise and Vibration – Magnitude of cumulative impact considered neutral and significance negligible due to distance from the Scheme.

Project / plan	Magnitude and significance of potential cumulative impacts with Scheme
	• Effects on all Travellers – Magnitude of cumulative impact considered neutral and significance negligible due to distance from the Scheme. • Community and Private Assets – Magnitude of cumulative impact considered neutral and significance negligible due to distance from the Scheme. • Road Drainage and the Water Environment – Magnitude of cumulative impact considered neutral and significance negligible due to distance from proposed Scheme. Following guidance in the DMRB (HD45/09) for the assessment of impacts associated with soluble pollutants, only outfalls within 1 km should be aggregated for assessment. When assessing the potential impacts associated with sediment-bound pollutants only outfalls lying within 100 m should be aggregated for assessment. Beyond 100 m the sediment, if it settles at all, is likely to be sufficiently diluted with natural sediment. Based on this, this development has not been assessed and has been scoped out of this assessment. • No impact on flood risk as the Scheme is remote from this site.
Neuadd Goch Windfarm	Planning application not approved. Development programme unknown. If development were to take place the potential cumulative impact are summarised as follows: • Air Quality – Magnitude of cumulative impact considered neutral and significance negligible due to distance from the Scheme and because development is unlikely to generate traffic growth. • Cultural Heritage – Impacts on the setting of eight individual or groups of prehistoric round barrows and the early Medieval remains of the Cryn Bank Dyke. (Assessed as non-significant in terms of the requirements of the EIA Regulations). However, due to the distance of these features from the Scheme, there would be no cumulative impact. • Landscape – Magnitude of impact neutral and significance negligible due to distance from the Scheme. • Nature Conservation – Magnitude of cumulative impact considered neutral and significance negligible due to distance from the Scheme • Geology and Soils – Magnitude of cumulative impact considered neutral and significance negligible due to distance from the Scheme. • Materials – Magnitude of cumulative impact considered neutral and significance negligible due to distance from the Scheme. • Noise and Vibration – Magnitude of cumulative impact considered neutral and significance negligible due to distance from the Scheme. • Effects on all Travellers – Magnitude of cumulative impact considered neutral and significance negligible due to distance from the Scheme. • Community and Private Assets – Magnitude of cumulative impact considered neutral and significance negligible due to distance from the Scheme. • Road Drainage and the Water Environment – Magnitude of cumulative impact considered neutral and significance negligible due to distance from proposed Scheme. Following guidance in the DMRB (HD45/09) for the assessment of impacts associated with soluble pollutants, only outfalls within 1 km should be aggregated for assessment. When assessing the potential impacts associated with sediment-bound pollutants only outfalls lying within 100 m should be aggregated for assessment. Beyond 100 m the sediment, if it settles at all, is likely to be sufficiently diluted with natural sediment. Based on this, this development has not been assessed and has been scoped out of this assessment. • No impact on flood risk as the Scheme is remote from this site.

Project / plan	Magnitude and significance of potential cumulative impacts with Scheme
Residential development and access – Land at Heol Treowen	Outline planning approved, but due to expire. The latest application seeks an extension to the time period for submission of reserved matters. Development programme unknown. If development were to take place the potential cumulative impact are summarised as follows: • Air Quality – If construction were to take place at the same time as construction of the Scheme, there could be potential cumulative effects from construction dust and site traffic. However provided any independent construction works in the area ensure appropriate emissions prevention and control measure the magnitude of the cumulative effect would be neutral and the significance negligible. • Cultural Heritage – Detailed assessment for cultural heritage has not been undertaken, therefore cumulative impacts are unknown. However there is a potential for the development to affect unknown archaeological assets, therefore this could contribute to a cumulative effect on the overall cultural heritage resource of the region. • Landscape – Magnitude of impact is minor adverse, significance of impact slight adverse on views from the north. • Nature Conservation – These proposals comprise residential development on fields to the north of the Scheme either side of Brimmon Lane and the access track leading to Upper Brimmon. As the proposed development borders the unnamed watercourse which is crossed by the Scheme to the west of this point, it is considered that there is potential for cumulative impacts on the watercourse, and otters using the watercourse. In addition, as the proposed development would affect both sides of Brimmon Lane, there is potential for a cumulative impact on commuting common pipistrelle bats using this feature. However, cumulative impacts on the watercourse and species associated with it, such as otters, are considered unlikely as the detailed applications for housing development on the site would be required to demonstrate that site run-off and other potential pollution events can be avoided. In addition it is highly likely that the layout of housing development on the site would retain a buffer beside the watercourse for flood reasons, even if this were not required for ecological reasons. It is not anticipated that operation of the development would result in significant additional damage to the watercourse or disturbance of species associated with it to a level which would exclude them from using the watercourse. Cumulative impacts on commuting bats may occur if the detailed design of housing development on the site includes removal of the hedges lining Brimmon Lane. If this were to occur, the commuting route along the lane used by common pipistrelle bats would be severed both by the Scheme and by the housing development. Careful design of any detailed development proposals for the Hoel Treowen site would therefore need to ensure that hedgerows or suitable alternative features were retained in such a way that they allowed movement for bats across the housing development site, between mitigation proposed as part of the Scheme, and the existing built-up area to the north. Based on the available information it is not anticipated that there would be any significant cumulative impacts resulting from this projects in combination with the Scheme. • Geology and Soils – It is assumed that appropriate ground investigation work would be carried out prior to construction. Provided work is carried out in accordance with recommendations made in the GI report, the magnitude of the cumulative impact is expected to be neutral, and significance of impact negligible. • Materials – Magnitude of cumulative impact considered neutral and significance negligible. • Noise and Vibration – If construction were to take place at the same time as construction of the Scheme, there could be potential cumulative effects from construction noise and vibration on receptors in Heol Treowen. The magnitude and significance of this impact would depend on the timing of both sets of construction work and the methods used. Impacts would be temporary in nature and could be minimised if appropriate mitigation was provided (e.g. provision of a site hording, noise reducing measures on site equipment, appropriate working hours etc.). • Effects on all Travellers – Both the Scheme and the proposed residential development would have an impact on FP 253/N14, which is used for organised walks by the Rail Ramblers and Walking Newtown. The Scheme would result in some temporary disruption

Project / plan	Magnitude and significance of potential cumulative impacts with Scheme

	and reduced amenity during the construction phase. In conjunction with the residential development the length of the section of path affected and possibly the duration of the disruption would be increased. Without knowing whether the path would be stopped up for the duration of the residential development's construction phase and what the long-term proposals are for the footpath during the operational phase it is not possible to quantify the magnitude and significance of this cumulative effect.
	• Community and Private Assets – The proposed Heol Treowen residential development is on land allocated as a residential commitment under the PCC Deposit Local Development Plan. The Scheme would require a strip of land through this site as 'easement' to access the site during construction and to maintain the Brimmon Farm Underpass and Pond 3 during operation. The magnitude and significance of this impact have been assessed in Section 13 of this ES Volume 1.
	• Road Drainage and the Water Environment - The Heol Treowen residential development is in close proximity (approximately 100m downstream) to the following water body receptors of the Scheme:
	  ○ Crossing 19 – Tributary of the R. Severn
	  ○ Crossing 20 – Tributary of the R. Severn
	  A tributary of the River Severn runs along the southern boundary of the Heol Treowen development site. This watercourse is to be culverted (culvert C11) as part of the Scheme a few hundred metres upstream of the Heol Treowen. The culverting is to be designed such that there is no adverse effect downstream, including the proposed Heol Treowen site.
	  Typically new developments increase impermeable area and run-off. They can potentially cause drainage pathways to be altered and can provide an increased source of pollution. Typically, residential developments would have a low pollution risk and would be required to follow well established best practice guidance to mitigate pollutant loading and flood risk. It is considered likely that the development would have appropriate mitigation in place in order to obtain planning permission and therefore would be unlikely to significantly impact on the channel's form or ecology. Apart from the potential water quality related effects discussed above, no other Water Framework Directive (WFD) related in combination effects are identified. It is considered that there would be a neutral magnitude of impact and negligible significance of effects on the water environment for construction impacts for this residential development.

Hope Community Church	The project programmed to start 16/06/2014 and programmed to be complete by 13/07/2015. • Air Quality – As the construction is programmed to have finished prior to the Scheme's construction start date, there would be no cumulative effects associated with construction dust and traffic. It is not considered likely that the proposal would result in any significant traffic growth, therefore the magnitude of cumulative operational impacts are considered to be neutral and the significance of impact negligible. • Cultural Heritage – Detailed assessment for cultural heritage has not been undertaken, therefore cumulative impacts are unknown. However there is a potential for the development to affect unknown archaeological assets, therefore this could contribute to a cumulative effect on the overall cultural heritage resource of the region. • Landscape – Due to location and scale of proposals, in combination with the Scheme the magnitude of impact is considered neutral and significance negligible. • Nature Conservation – There is a potential cumulative effect on the loss of bat roosts in conjunction with the Scheme. According to the planning inspector's report, it has not been established whether bats are using the building to roost (pending the outcome of activity surveys), although an internal and external inspection of the building to be demolished has been carried out. However, if

Project / plan	Magnitude and significance of potential cumulative impacts with Scheme
	roosting bats were found to be present in the building to be demolished, appropriate mitigation would have to be provided as part of an EPS Licence. In order for a licence to be issued the licencing authority (NRW) would have to be satisfied that three tests set out in the legislation were met. Provided that NRW issue EPS licences for the Scheme and the Hope Community Church development (if one is required) then the magnitude of cumulative impact would be neutral and significance negligible as it would need to be proved that the population of the species concerned would be maintained at a favourable conservation status (FCS). • Geology and Soils – Magnitude of cumulative impact considered neutral and significance negligible. • Materials – Magnitude of cumulative impact considered neutral and significance negligible. • Noise and Vibration – As construction is programmed to have finished prior to the Scheme's construction start date, there would be no cumulative effects associated with construction noise and vibration. • Effects on all Travellers – Magnitude of cumulative impact considered neutral and significance negligible. • Community and Private Assets – Magnitude of cumulative impact considered neutral and significance negligible. • Road Drainage and the Water Environment –The nature of this development would suggest a low polluting potential. This in combination with mitigation proposed for the Scheme to meet Environmental Quality Standards (EQS) would ensure no significant cumulative effect. No operational cumulative impacts that may affect the water environment are anticipated as the development would have a low polluting potential and is required to mitigate pollution and flood risk. Magnitude of cumulative impact considered neutral and significance negligible.
Welsh Medium School	Site access works due to commence on 21/07/2014, anticipated 8 week works contract, but no start date for the main site and building works. The potential cumulative effects are summarised as follows: • Air Quality – If construction were to take place at the same time as construction of the Scheme, there could be potential cumulative effects from construction dust and site traffic. However provided any independent construction works in the area ensure appropriate emissions prevention and control measure the magnitude of the cumulative effect would be neutral and the significance negligible. • Cultural Heritage – Detailed assessment for cultural heritage has not been undertaken, therefore cumulative impacts are unknown. However, there is a potential for the development to affect unknown archaeological assets, therefore this could contribute to a cumulative effect on the overall cultural heritage resource of the region. • Landscape – Due to location and scale of proposals, in combination with the Scheme the magnitude of impact is considered neutral and significance negligible. • Nature Conservation – The proposed development is taking place on existing school playing fields which are of limited ecological value. It is noted that native hedge and tree planting are included in the landscape proposals which will be of benefit. The magnitude of the cumulative impact would be neutral and the significance of impact negligible. • Geology and Soils – Magnitude of cumulative impact considered neutral and significance negligible. • Materials – Magnitude of cumulative impact considered neutral and significance negligible. • Noise and Vibration – If construction were to take place at the same time as construction of the Scheme, there could be potential cumulative effects from construction noise and vibration. The magnitude and significance of this impact would depend on the timing of both sets of construction work and the methods used. Impacts would be temporary in nature and could be minimised if appropriate mitigation was provided (e.g. provision of a site hording, noise reducing measures on site equipment, appropriate working hours etc.). • Effects on all Travellers – Magnitude of cumulative impact considered neutral and significance negligible.

Project / plan	Magnitude and significance of potential cumulative impacts with Scheme
	• Community and Private Assets – Magnitude of cumulative impact considered neutral and significance negligible. • Road Drainage and the Water Environment – The Scheme has the potential to affect flood risk to the school site as it lies in an overland flow path identified by the hydraulic modelling for the Scheme. This risk is being managed through mitigation measures designed as part of the Scheme and identified in the FCA such that the flood risk would be considered neutral. There is a likelihood that pollutant loading from the Scheme could combine with that from this development to worsen water quality. Tests undertaken have shown that water quality parameters would be met by the Scheme and that it is unlikely that EQS would be compromised when considered cumulatively with this development. It is considered that there would be a neutral magnitude of impact and negligible significance of effects on the water environment for construction impacts as they would be required to follow well established best practise guidance. No operational cumulative impacts that may affect the water environment are anticipated. Magnitude of the cumulative impacts is considered neutral and significance negligible (following guidance in the DMRB (HD45/09).
Wind Farm Access Road	Planning application not approved. Public Inquiry programmed for October 2014. Development programme unknown. If it were to take place, the Scheme is likely to negate the need to provide the work proposed to the first corner closest to Newtown and along the A483 Dolfor Road. It may also influence the design of the second corner closest to Newtown along the A483 Dolfor Road (refer to Volume 2, Figure 1.3). The potential cumulative effects are summarised as follows: • Air Quality – If construction were to take place at the same time as construction of the Scheme, there could be potential cumulative effects from construction dust and site traffic. However provided any independent construction works in the area ensure appropriate emissions prevention and control measure the magnitude of the cumulative effect would be neutral and the significance negligible. • Cultural Heritage – Detailed assessment for cultural heritage has not been undertaken, therefore cumulative impacts are unknown. However there is a potential for the development to affect unknown archaeological assets, therefore this could contribute to a cumulative effect on the overall cultural heritage resource of the region. • Landscape – Due to location and scale of proposals, in combination with the Scheme the magnitude of impact is considered neutral and significance negligible. • Nature Conservation – The proposals are located up to 6.5km to the south of the Scheme and so the majority of the work would be outside the zone of influence of the Scheme for most ecological receptors. The proposals would affect a number of sections of hedgerow along the existing A483 south of Newtown, however the Scheme would negate the need for works to the first corner, therefore reducing the impact. Work to hedgerows may have several effects such as habitat loss for nesting birds and affecting connectivity for protected species such as Dormice. However, if dormice were affected, work would need to be carried out under an EPS Licence which would require that the favourable conservation status of this species be maintained. It is not considered that the proposals would have a greater cumulative effect on receptors affected by the Scheme. Therefore the magnitude of cumulative impact is considered neutral and the significance negligible. • Geology and Soils – Magnitude of cumulative impact considered neutral and significance negligible. • Materials – Magnitude of cumulative impact considered neutral and significance negligible. • Noise and Vibration – If construction were to take place at the same time as construction of the Scheme, there could be potential cumulative effects from construction noise and vibration. The magnitude and significance of this impact would depend on the timing of both sets of construction work and the methods used. Impacts would be temporary in nature and could be minimised if appropriate mitigation was provided (e.g. noise reducing measures on site equipment, appropriate working hours etc.). • Effects on all Travellers – In combination with the Scheme the proposals are likely to further improve driving and cycling conditions along the existing A483 to and from Newtown. This is likely to further reduce driver stress and make the road safer for both vehicle

Project / plan	Magnitude and significance of potential cumulative impacts with Scheme
	travellers and cyclists. The magnitude of this cumulative impact is therefore considered minor beneficial and significance slight beneficial. • Community and Private Assets – In combination with the Scheme the proposed wind farm access road would result in further loss of agricultural land from a farm unit affected by the Scheme. As the access road proposals result in only minor land take, alongside the existing A483 it is unlikely to affect the viability of the agricultural business in combination with the Scheme. The magnitude of impact is therefore neutral and significance of impact negligible. • Road Drainage and the Water Environment - The wind farm access road is located near to a number of proposed culvert locations for this Scheme. The wind farm access road may also discharge to Mochdre Brook and a tributary of the River Severn at outfalls 1a east and 2a and 2b that could have a cumulative impact. If construction were to take place at the same time as construction of the Scheme, there could be potential cumulative effects to water quality in any of the receiving surface or groundwater receptors. This may be due to construction of culverts, excavation, the deposition of soils, sediment, or other construction materials, spillage of fuels or other contaminating liquids, the mobilisation of contamination following disturbance of contaminated ground or groundwater, or through uncontrolled site runoff. Any unrestricted dewatering during construction or diversion flows arising from the construction could impact flood risk in these watercourses. The development programme is unknown at the time of reporting. However, providing adherence to best practice guidance and the adoption of good working practices and strict adherence to the Environment Agency Pollution Prevention Guidelines (PPGs), the magnitude of the cumulative effect during construction would be negligible with neutral significance. It is assumed that adherence to best practice in terms of managing the quantity of surface runoff and obtaining necessary consents, the magnitude of the cumulative impact with regard to flood risk would be negligible with neutral significance. Outfalls 1a east, 2a and 2b have been shown to meet required water quality standards and flood risk requirements during operation with mitigation. The temporary use of the wind farm access road through operation is considered unlikely to have a significant adverse impact as the discharge from the access road would be required to meet water quality and flood risk standards.
Severnside Yard Residential	Planning conditions were expected to be discharged by the end of June 2014 and construction to start soon afterwards. The potential cumulative effects are summarised as follows: • Air Quality – If construction were to take place at the same time as construction of the Scheme, there could be potential cumulative effects from construction dust and site traffic. However provided any independent construction works in the area ensure appropriate emissions prevention and control measure the magnitude of the cumulative effect would be neutral and the significance negligible. • Cultural Heritage – Detailed assessment for cultural heritage has not been undertaken, therefore cumulative impacts are unknown. However there is a potential for the development to affect unknown archaeological assets, therefore this could contribute to a cumulative effect on the overall cultural heritage resource of the region. • Landscape – Due to location and scale of proposals, in combination with the Scheme the magnitude of impact is considered neutral and significance negligible. • Nature Conservation – As the site has limited ecological value the magnitude of the cumulative impact is considered neutral and significance of impact negligible. • Geology and Soils – Magnitude of cumulative impact considered neutral and significance negligible. • Materials – Magnitude of cumulative impact considered neutral and significance negligible.

Project / plan	Magnitude and significance of potential cumulative impacts with Scheme
	• Noise and Vibration – If construction were to take place at the same time as construction of the Scheme, due to the distance from the Scheme, there is unlikely to be any potential cumulative effects from construction noise and vibration. The magnitude of this impact would be neutral and significance negligible. • Effects on all Travellers – Magnitude of cumulative impact considered neutral and significance negligible. • Community and Private Assets – Magnitude of cumulative impact considered neutral and significance negligible. • Road Drainage and the Water Environment - The Severnside Yard Residential Development is >1km downstream of the Scheme. In terms of water quality impacts, following guidance in the DMRB (HD45/09) for the assessment of impacts associated with soluble pollutants, only outfalls within 1 km should be aggregated for assessment. When assessing the potential impacts associated with sediment-bound pollutants only outfalls lying within 100 m should be aggregated for assessment. Beyond 100 m the sediment, if it settles at all, is likely to be sufficiently diluted with natural sediment. Based on this, this development has not been assessed and has been scoped out of this assessment.
Mid Wales Wind Farm Strategic Transport Management Plan – Section 4 (Welshpool to Newtown), Section 5 (Newtown to SSA B South) and Section 6 (Newtown to SSA C, via Vastry).	It is unknown if and when the proposals in this plan will take place. If they were to take place the Scheme would negate the need for a section of 'STMP Section 5' through Newtown and possibly a section of 'STMP Section 6' between the A483 at Dolfor and the A489 Kerry Road, south of Newtown. Therefore, in general the cumulative effect would be beneficial as it would negate the need for further development. The majority of the proposals are a sufficient distance from the zone of influence the Scheme has on environmental receptors. Therefore it is not consider there would be any significant cumulative affects with the Scheme.
Single turbine developments in the vicinity of Dolfor and Mochdre	No predicted cumulative affects due to scale of proposed developments and their distance from the Scheme.

16. Environmental Management

16.1. Introduction and purpose

The Environmental Impact Assessment has established the potential significant effects associated with the Scheme and how these can be avoided, reduced or mitigated and how environmental enhancement can be provided. To ensure these measures are properly implemented and to ensure compliance with relevant legislation and the Scheme's Environmental Management System (EMS) it is essential there is effective environmental management throughout the construction, operation and aftercare of the Scheme.

16.2. Environmental Management System (EMS)

The AGC Team will operate a Scheme specific Environmental Management System (EMS) in compliance with BS EN ISO 14001 and ISO 14004, and the requirements of Volume 10 of the DMRB.

16.3. Construction Environmental Management Plan (CEMP)

The Construction Environmental Management Plan (CEMP) would form the basis for environmental management of the Scheme. It would ensure that environmental issues are properly addressed initially through the construction phase and establishes the basis for ensuring environmental issues and commitments are dealt with during operation and aftercare of the Scheme. The draft contents of the Construction Environmental Management Plan (CEMP) is provided in ES Volume 3, Appendix L.1.

The CEMP would be a 'live' document that will be developed further during Key Stage 4 (leading up to public inquiry if one is required) and Key Stage 6 (during construction) in consultation with the Statutory Environmental Bodies (SEBs). Some of the licences, method statements and the draft Register of Commitments (ROC) that would form part of the CEMP have been developed already (e.g. refer to ES Volume 3, Appendix E.6 Badger Ghost Licence and Appendix E.15 – Otter Method Statement).

A draft ROC is provided in ES Volume 3, Appendix L.2. This would be used to keep track of all the relevant Scheme commitments and to ensure they are fulfilled. The draft ROC lists relevant commitments from the National Transport Plan Strategic Environmental Assessment (SEA) and Habitats Regulations Assessment (HRA) and commitments made within this ES (principally taken from the mitigation sections of each topic chapter). It would developed further during Key Stages 4 and 6 and may include further commitments made from:

- The outcomes of consultation with the landowners, SEBs and other stakeholders,
- Findings of additional surveys or supplementary information,
- Commitments made during the public inquiry (should one be required).

The ROC would be implemented through the CEMP and the Environmental Landscape and Ecology Aftercare and Management Plan (ELEAMP).

16.4. Environmental Landscape and Ecology Aftercare and Management Plan

The Environmental Landscape and Ecology Aftercare and Management Plan would be implemented by the Contractor for 5 years following the completion of Environmental Design Works. The plan shall include the following:

- Protection, management and maintenance of existing retained vegetation;
- Protection, management and maintenance of new planting, and seeding;
- Protection, management and maintenance of ecological measures, including habitat and species protection measures;
- Habitat creation areas;

- Details of areas where Japanese Knotweed or other pernicious weeds may be buried for monitoring purposes;
- Summary schedule of activities and monitoring required including timetable;
- Procedure for monitoring compliance;
- Procedures for reporting on completion and establishment of measures during the aftercare period e.g. reporting programme, site inspections, involvement of NMTWRA, reporting on success and establishment.

16.5. Maintenance Environmental Management Plan

A Maintenance Environmental Management Plan (MEMP) setting out a proposed strategy for the future maintenance and management of all Environmental Areas (including landscape and ecological areas) would be prepared for the 10-year period commencing at the issue of the Maintenance Certificate.

The MEMP shall include, but shall not be limited to, the following:

- Strategies for the regular maintenance of all Environmental Areas;
- A timetable for the implementation of each regular maintenance operation during a typical 12 month period, together with an overall 10 year timetable showing any variation to the regular maintenance tasks during the period of the MEMP and with any 20 year objectives;
- A timetable showing the anticipated date at which the Environmental Function attributed to each Environmental Area would be achieved during the 20 year period of the MEMP. (Note: This shall include the date at which any existing Environmental Area has already achieved its Environmental Function during the Contract Period, together with any additional performance criteria over and above that contained within the relevant section of DMRB Volume 10);
- A timetable showing the regular monitoring requirements for each Environmental Area, including those in relation to habitats and species and/or water quality, as agreed with the relevant Statutory and Non-Statutory bodies (e.g. NRW);
- Any supporting information as considered appropriate by the Contractor including agreements made with third parties, (copy correspondence to be included); conclusions of the Environmental Performance Reports.

16.6. Environmental Master Plan

The environmental mitigation measures proposed within this ES are illustrated on the Environmental Masterplan (refer to Volume 2, Figure 16.1) and follow the 'Functions' and 'Elements' methodology as outlined in DMRB Volume 10, Section 0[16.1, 16.2, 16.3].

All mitigation measures have been ascribed the purpose or Environmental 'Function' and the nature or Landscape or Environmental 'Element'. These are described as follows:

Environmental 'Functions'[16.1]: The codes identify the objectives to the various features of the highway estate. This includes the ability, when appropriate, to ascribe highway and structural elements an environmental function that would inform its design and influence maintenance techniques.

Landscape 'Elements'[16.2]: The codes describe the core Elements of the 'soft estate' such as grass, planting, wetland, hedges. It also contains provision for inclusion of 'hard' landscape features, such as decorative railings, feature paving materials, where these are there for specific landscape reasons.

Environmental 'Elements'[16.3]: The codes describe non-landscape features, enabling the description of such 'elements' as Noise Attenuation measures, Water Quality controls, Protected Species, and legislated elements such as Injurious Weeds and Pests. Many of these elements interact closely with landscape functions and elements. In addition to the Environmental Functions and Elements the Environmental Masterplan includes Planning and Policy features which takes account of the relevant planning constraints.

16.7. Roles and Responsibilities

16.7.1. Environmental Co-ordinator

The Contractor's Environmental Co-ordinator shall have a prominent role in the project delivery and co-ordinate the activities of the environmental specialists through the Environmental Assessment process and be responsible for the production and update of:

- The Environmental Statement;
- The Environmental Proposal Plans;
- The Assessments of Implications on European Sites (AIES) (if appropriate);
- Licences and consents (where relevant);
- The Construction Environmental Management Plan (CEMP) including its ongoing review and update throughout the contract period;
- Environmental elements of the Register of Commitments (ROC);
- Environmental elements of the Specification for Highways Works Appendices;
- The Maintenance Environmental Management Plan (MEMP).

The Environmental Coordinator shall:

- Be a full-time member of the *Designer*s site staff. He shall spend at least one full (7.5 hour) day on site every week during Key Stage 6 and shall be supported by the Environmental Clerk of Works (ECOW).
- Have the authority to direct members of the *Contractor*'s site staff on environmental issues.
- Have the authority to halt works that he or the ECOW believes to be detrimental to the environment, not in accordance with commitments made by the Welsh Government or in contravention of any consents and licences granted for the purpose of undertaking works within, adjacent or affecting environmental areas.
- Not be replaced except with the written approval of the Welsh Government.
- Be familiar with the process of highway design, construction, and supervision and have an appropriate level of knowledge of good industry practice.
- Be responsible for the production of the Construction Environmental Management Plan (CEMP) and its continual update and also be responsible for the handover of the Maintenance Environmental Management Plan (MEMP) to the Trunk Road Agent on completion of the aftercare period.
- Be responsible for the production of clear and concise Method Statements required to meet licence conditions and requirements for European Protected Species, UK Protected Species, Discharge Consents and other measures made to comply with statutory provisions.
- Responsible for overseeing and auditing the implementation of the EMS, CEMP, environmental mitigation measures and aftercare.
- Responsible for ensuring that adequate environmental training is provided for the *Contractor*'s staff.
- Assist in the development and delivery of environmental training for site personnel and subcontractors.
- Report on compliance with sustainable construction objectives, targets and records.
- Report on compliance and monitoring of commitments resulting from the statutory procedures, including any from a Public Inquiry (if appropriate).
- Ensure consistency and compliance with legislation, policy and guidance.
- Provide advice and liaise with the construction team to ensure that environmental risks are identified and appropriate controls are developed and included within method statements.
- Provide a schedule and procedures for monitoring and reporting.
- Provide an Environmental Monitoring Report for each year of construction and Environmental Performance Report for each year of the aftercare period.

16.7.2. Environmental Clerk of Works

The Environmental Clerk of Works shall support the Environmental Co-ordinator during construction and after care. He / she is the Environmental Coordinator's representative on site and is responsible for overseeing construction activities to ensure all environmental commitments

are met and compliance with the conditions of all licences and permits. He / she shall be a member of the Designer's site staff, be based on site full time and shall:

- Have the authority to direct members of the Contractor's site staff on environmental issues.
- Not be replaced except with the written approval of the Welsh Government.
- Be familiar with the process of highway design, construction, and supervision.
- Be experienced in environmental site supervision and have an appropriate level of knowledge of good industry practice.
- Undertake site inspections where necessary.
- Be responsible for ensuring all relevant licences, consents and method statements are in place prior to construction activities.
- Be responsible for maintaining and updating the CEMP and the environmental elements of the ROC.
- Shall promote awareness of the SWMP, identifying opportunities to improve waste management on site and monitoring performance.
- Be responsible for overseeing and auditing the implementation of the CEMP and environmental mitigation measures on site during KS6.
- Be responsible for identifying training needs and providing environmental training including inductions, tool box talks etc. for the Contractor's site staff.
- Be able to demonstrate an understanding of the relevant environmental and ecological legislation and requirements for consents and licences and the constraints that they impose upon the operation and timing of works.
- Ensure consistency and compliance with legislation, policy and guidance during the construction period.
- Monitor construction activities to ensure that identified and appropriate control measures are effective and in compliance with the CEMP.
- Manage the environmental monitoring programme and review of the routine reports.
- Provide advice and assistance to site personnel on environmental matters.
- Undertake monitoring when required.
- Ensure correct procedures are followed in the event of an environmental incident.
- Assist the site foreman in maintaining environmental records.
- Dissemination of waste reduction and waste management procedures to all relevant personnel on site.

17. Conclusion

17.1. General

This ES has reported on the EIA undertaken for the Scheme and has been carried out in accordance with current legislation and guidance. It has highlighted adverse and beneficial impacts associated with the Scheme under a number of environmental topic headings and also described how any adverse impacts could be avoided, mitigated or compensated.

Significant environmental effects of the Scheme are summarised at the end of each environmental topic chapter (Chapters 5 to 14) under section 4 (prior to mitigation). Some concluding remarks associated with each environmental topic are highlighted below.

Any difficulties or limitations with the assessment process have been identified within the individual environmental topic chapters.

17.2. Environmental Topics – Concluding Remarks

Air Quality

There are a number of residential properties within 350 m of the Scheme site that could be affected temporarily by dust during construction. The contractor would be required to ensure that effective mitigation is applied to control emissions to avoid any adverse impacts. The impact of construction dust is expected to be negligible, with appropriate mitigation to prevent and control dust emissions. There would be no significant construction phase effects with the Scheme.

The assessment of operational phase air quality impacts indicates that increases and reductions in concentrations of $PM_{2.5}$ and PM_{10} with the Scheme would be imperceptible to small and the overall impact on concentrations being negligible. In addition there is expected to be no significant adverse operational phase effects on concentrations of NO_2 with the Scheme. There is however expected to be 'slight' to 'substantial beneficial' operational phase effects on concentrations of NO_2 at a number of properties within the centre of Newtown. Properties located within the 'Air Quality Management Area' (AQMA) are expected to experience a 'substantial beneficial' effect with concentrations likely to reduce below the Air Quality Strategy (AQS) objective with the Scheme.

Cultural Heritage

The impact of the Scheme on the cultural heritage resource would be limited. It would be confined to a physical impact upon a small number of known archaeological sites, and non-physical impacts upon the setting of Listed Buildings at three locations. Archaeological mitigation for the physical impacts would successfully reduce them to a minor or negligible (i.e. non-significant) magnitude.

The Scheme design already incorporates measures that lessen the potential impacts on residential properties, including the groups of listed buildings that are within its immediate vicinity. Residual moderate (and therefore significant) impacts, arising from the operation of the Scheme, would apply to three of these listed building groups.

Landscape

In assessing the visibility of the proposed Scheme the prevailing topography would assist in integrating it into the landscape, particularly the effect of narrow side valleys and the stepped form of the southern valley slopes. Consequently the Scheme would be screened entirely from parts of the valley floor, with the outer Zone of Visual Influence limited largely by the upper valley edges. It is those landscape character areas which would be physically altered by the Scheme where long-lasting significant impacts would occur. These would result from the introduction of engineered forms into a rural landscape context and the associated changes in landform.

None of the townscape character areas would be directly affected by the Scheme, and many would be largely visually separated from much of it.

The impact on views within the study area would be quite variable; influence by a range of factors. However, there would be significant residual effects on a number of representative views, particularly those that would be in close proximity to elevated bridge structures and those where the affected view is of an unspoilt rural scene.

The affected properties assessment illustrates that the Scheme would have a relatively narrow corridor of influence with the most significantly affected properties being those closest to the proposed route or where elevation would provide more open views to the Scheme. In general the proposed mitigation measures would reduce the visual impact over time, although the assessment illustrates that this would be less effective where visible structures would be provided, such as at Mochdre Bridge or The Dingle, or where roundabout junctions and their infrastructure would be introduced. At Year 15 only a small number of properties with long distance views of the Scheme would suffer any residual visual impact and this would be only Slight.

Nature Conservation

Extensive field and desk based surveys have been undertaken to inform the impact assessment in relation to nature conservation.

The Scheme is not anticipated to have any effects on designated sites. A Statement to Inform an Appropriate Assessment (SIAA) has been undertaken to established impacts of the Scheme in relation to the Montgomery Canal Special Area of Conservation (SAC). This has been concluded at the Screening stage and has established the Scheme would have a neutral effect on the SAC.

The Scheme would directly affect a number of ecological receptors including habitats and protected species. The majority of these are considered to be of medium or low value, and as a result the majority of predicted impacts are slight or moderate, both during construction and operation of the Scheme.

Mitigation measures would ensure that residual impacts on most of these receptors are avoided in the short and medium term, and that residual impacts on all ecological receptors are avoided in the long term.

Protected species licences would be required in relation to badgers, bats and dormice in order to carry out some of the work in relation to the Scheme.

Geology and Soils

Following a preliminary assessment of available information, there is currently considered to be a minimal risk of residual ground instability following completion of construction works. During construction works, temporary measures (such as localised groundwater control, slope reinforcement etc.) and appropriate construction sequences would be implemented to minimise the risk of temporary ground instability.

Overall, the effect of the Scheme with regards to land contamination is anticipated to be neutral providing that the mitigation measures are adhered to. The 2013 Ground Investigation (GI) confirmed that there is little contamination present along the Scheme and only limited Made Ground was encountered.

The materials excavated on site are unlikely to be classified as Hazardous and would therefore be either Non-Hazardous or Inert. A SWMP would be developed for the site by the contractor for the removal, transportation and disposal of all waste materials excavated from the site.

Materials

Materials present on site would be used efficiently taking into account waste prevention, re-use and recycling and disposal to landfill would be minimised. The resultant overall significance of effect associated with the materials requirements during construction, provided that adequate mitigation is considered for the potential impacts identified, is considered to be slight adverse.

The Scheme has been developed to achieve an optimal balance between earthworks activities, minimise waste generated and maximise opportunities to recycle and re-use construction waste as secondary aggregates.

No significant adverse effects are anticipated being associated with the materials usage for the operational phase of the Scheme, and the overall significance of effect is considered to be neutral.

Noise and vibration

During the construction of the Scheme significant noise issues are not expected at distances beyond 100m from the works or from compounds, and for the majority of the planned activities, significant noise issues are not expected at distances beyond 50m from the works or compounds. No properties are predicted to experience sufficient construction noise to qualify for temporary rehousing during the construction phase.

Measures to mitigate the impact of traffic noise along the Scheme would include low noise surfacing, extensive lengths of false cuttings and noise fencing.

The Scheme with mitigation gives rise to more decreases in noise than increases in noise. When the Scheme opens there would be significant decreases in noise at over 900 properties within Newtown as traffic re-routes from existing roads onto the Scheme. Overall, there are decreases in noise at over 3000 properties.

The Scheme would cause increases in noise at over 900 properties close to the Scheme, which would be significant at around 400.

If the Scheme was not constructed then all changes in noise would be negligible.

The Scheme would give rise to a decrease in noise nuisance at approximately 2800 properties compared to approximately 1000 that would receive an increase. The Scheme would give rise to a decrease in airborne vibration nuisance.

No properties are expected to qualify for noise insulation due to operational noise levels.

Effects on all travellers

The Scheme would affect a number of public rights of way to the south of Newtown. Temporary diversions and crossing places would be provided during the construction phase. Long-term connectivity over the Scheme would be provided via a number of overbridges and underpasses and there would be some upgrading of Public Footpaths to Public Bridleways.

Once operational, the Scheme would remove traffic along the existing A483 / A489 New Road and Pool Road. This would have a beneficial effect for residents of Newtown by reducing severance caused by road traffic between residential areas and community facilities and places of employment.

With regard to vehicle travellers, the landscape mitigation and Scheme earthworks would result in a generally enclosed road corridor, but with a variety of characteristics along its length. Drivers using the Scheme would experience less stress than driving through the town as there would be reduced congestion and more overtaking opportunities.

Community and private assets

The Scheme would affect a number of private properties and associated land. The greatest impacts would result from the demolition of two residential properties; Kinsale on Middle Dolfor Road and Gelli on Pool Road and the severance of the Glandulas Holiday Home Park.

There would be no impacts on land used by the community. No land allocated for housing, employment or retail development under the Powys Adopted UDP would be affected. A strip of land across a site which has outline planning permission and which is allocated as ‘residential commitment’ in the Powys Deposit LDP would be taken as ‘easement’. However, this should not significantly affect the developable area of the site.

Much of the land affected by the Scheme is in agricultural use and so there are impacts on a number of agricultural units. The entire area covered by the route of the Scheme is classified as Grade 4 poor quality agricultural land on the published provisional ALC plans, and none is expected to be better than Subgrade 3b. Mitigation in the form of underpasses and over bridges

to accommodate farm machinery is proposed for Coleg Powys, Glandulas Holiday Home Park and Great Brimmon Farm.

Road Drainage and the water environment

The Scheme is located in an area that includes surface watercourses and protected sites of a high importance, groundwater bodies and areas of identified flood risk. A Scheme Drainage Strategy, Flood Consequences Assessment and Water Framework Directive Assessment has been carried out which has informed the impact assessment in relation to the Road Drainage and Water Environment.

Water quality tests undertaken show a negligible magnitude of impact and a neutral significance of effects to the water environment under proposed Scheme conditions with mitigation.

Scheme impacts on flood risk have also shown a negligible adverse significance of effects.

17.3. Mitigation Measures

A number of measures to mitigate predicted environmental impacts in both the construction and operational phases of the Scheme have been suggested by each environmental topic chapter and are described within Section 5 of each of those chapters. Where relevant, mitigation measure have been incorporated into the design of the Scheme and are shown on the Environmental Master Plans (refer to Volume 2, Figure 16.1 and Chapter 16 of this ES).

It is important that all of the environmental mitigation and enhancement measures which form the basis for the final assessment of effects within each of the environmental topic chapters are taken forward and properly implemented. These mitigation measures are included in the draft Register of Commitments (ROC), which is provided within ES Volume 3, Appendix L.2.

17.4. How Project Objectives are fulfilled

The project objectives are outlined in Section 2.4 of this ES. Table 17.4.1 below sets out how these have been fulfilled:

The Scheme largely supports those national, regional and development planning policy outlined in Section 4 and described within the individual specialist topic chapters. It delivers item 70 of the National Transport Plan and ensures one of the 'high ranking' Schemes allocated within Phase 2 of the Trunk Road Forward Programme is completed.

Table 17.4.1. – How project objectives have been fulfilled.

Project Objective	How this is fulfilled
Objective 1 – Maintain economic base Maintain economic base of Newtown measured by levels of local employment by the date in the local development plan (2025).	**To be delivered by others**
Objective 2 – Meeting relevant environmental targets Within Newtown settlement boundary limit and within 200m of the Scheme; Meet targets and comply with appropriate environmental legislation and policies by 2018; Reduce greenhouse gas emissions along Pool Road and New Road by 3% from 2008 levels, by 2018 (in accordance with Wales Transport Strategy).	The calculation of mass emissions (refer to Chapter 5) showed that with the Scheme, pollutant emissions would decrease in line with the reduction in congestion in Newtown town centre and the free flow conditions expected on the bypass. Emissions would generally be expected to decrease in future years compared to the existing situation as a result of more stringent emissions control legislation, with the exception of hydrocarbons which showed an increase in emissions. Therefore the objective to reduce greenhouse gas emissions along Pool

Project Objective	How this is fulfilled
	Road and New Road by 3% from 2008 levels, by 2018 is expected to be met comfortably.
Objective 3 – Removing through traffic from local roads Reduce through traffic on Heol Treowen, Plantation Lane and Milford Road by 50% over 2008 levels by 2018; Reduce HGVs on Heol Treowen, Plantation Lane by 90% from 2008 levels, by 2018.	The predicted traffic figures as presented in Volume 2 Figure 2.9 show that the reduction in through traffic on Heol Treowen is 34%, Plantation Lane is 47% and Milford Road is 39%. The predicted traffic figures as presented in Volume 2 Figure 2.9 show that the reduction in HGVs on Heol Treowen is 56%, Plantation Lane is 33% and Milford Road is 28%. Whilst the above do not fully meet Objective 3, Prohibition Orders and traffic calming measures would be imposed to minimise through traffic and HGVs on these roads. These would ensure that the Objective is met.
Objective 4 – Increasing level of usage for non-car forms of transport For travel with origin and destination within Newtown, achieve modal shift of 10% from car to non-car forms of transport (cycling, walking and public transport), over 2008 levels, by 2018; For travel with origin or destination within Newtown, achieve modal shift of 2% from car to public transport, over 2008 levels, by 2018.	**To be delivered by others**
Objective 5 – Integration of public transport Within Newtown limit interchange penalty linking bus services and train services to 20 minutes, by 2018; Within Newtown, during morning and evening peak hours (0700-0900 and 1600-1800) limit interchange penalty between bus services to 10 minutes, by 2018.	**To be delivered by others**
Objective 6 – Improve journey time consistency (North-South, East-West) Reduce journey times during morning and evening peak hours (0800-0900 and 1615-1715) on A489/A483 between A470/A489 junction (Caersws) and A483/B4389 junction (Aberbechan junction) by 10% by 2018; Reduce journey times during morning and evening peak hours (0800-0900 and 1615-1715) on A489/A483 between A483/unnamed C class Road at 'The Dingle, and A483/B4389 junction (Aberbechan junction) by 10% by 2018; Reduce journey times during morning and evening peak hours (0800-0900 and 1615-1715) on A489/A483 between A483/unnamed C class Road at 'The Dingle', and A470/A489 junction (Caersws) by 10% by 2018.	The predicted reduced journey times with the Scheme, during morning and evening peak hours (0800-0900 and 1615-1715) on A489/A483 between A470/A489 junction (Caersws) and A483/B4389 junction (Aberbechan junction) would be in excess of 25% by 2018. The predicted reduced journey times, with the Scheme, during morning and evening peak hours (0800-0900 and 1615-1715) on A489/A483 between A483/unnamed C class Road at 'The Dingle, and A483/B4389 junction (Aberbechan junction) would be in excess of 35% by 2018. The predicted reduced journey times, with the Scheme, during morning and evening peak hours (0800-0900 and 1615-1715) on A489/A483 between A483/unnamed C class

Project Objective	How this is fulfilled
	Road at 'The Dingle', and A470/A489 junction (Caersws) would be in excess of 25% by 2018. Overall, this objective should be exceeded with the Scheme.
Objective 7 – Reduction in accidents Within Newtown settlement boundary limit, reduce road traffic accidents on A483(T), A489(T), Heol Treowen, Plantation Lane and Milford Road by 25% by 2018.	The reduction in accidents within the Newtown boundary by 2018, with the Scheme, is predicted as follows: • A489 (T) – in excess of 40%; • A483 (T) – 25% reduction; • Heol Treowen – 25% reduction; • Plantation Lane – in excess of 40%; • Milford Road – in excess of 40%;. The above shows that this objective should be exceeded with the Scheme.

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