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European Union
European Regional Development Fund

A30 Chiverton to Carland Cross Improvement Scheme

Preliminary Environmental Information Report

Chapter 1 Introduction

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1 Introduction

1.1 Purpose of the Preliminary Environmental Information Report

1.1.1 Highways England has commissioned this Preliminary Environmental Information Report (PEIR) to be prepared as part of the Environmental Impact Assessment (EIA) consultation material of the A30 Chiverton to Carland Cross scheme ("the scheme"). The aim of this document is to set out to stakeholders how each EIA topic is being assessed, the potential environmental effects of the scheme and the measures proposed to reduce those effects, to enable an informed response to the consultation.

1.1.2 It should be noted that the scheme design is currently being developed, environmental information is still being assembled and impacts are being identified. The information contained within this PEIR should be regarded as a preliminary account of the principal environmental issues. It details a number of uncertainties and assumptions, and may be subject to change as the EIA work progresses. The EIA will be reported within the Environmental Statement (ES) to be produced in support of the scheme.

1.2 Scope and Content of the Preliminary Environmental Information Report

1.2.1 The scheme qualifies as a Nationally Significant Infrastructure Project (NSIP) under the Planning Act 2008 (the Act) and is assessed under The Infrastructure Planning (EIA) Regulations 2017.

1.2.2 The A30 Chiverton to Carland Cross is a 'highways' NSIP under section 22(2) of the Act (as amended), as it consists of the construction of a highway that is wholly within England, where the Secretary of State (SoS) is the Highway Authority. The scheme consists of the construction of a highway which is other than a motorway, the speed limit is expected to be 50mph or greater, and the area of development is greater than the relevant limit set out in section 22 (4) (c) of 12.5 hectares.

1.2.3 As the scheme is an NSIP, Highways England is required to make an application for a Development Consent Order (DCO) to the Planning Inspectorate. If granted by the Secretary of State, the DCO will provide the necessary authorisation to allow the scheme to be constructed.

1.2.4 Environmental information produced in support of a DCO is reported in two stages:

- The PEIR, prepared to inform the consultation with the stakeholders about the scheme; and,
- The ES, prepared to accompany the DCO application.

1.2.5 The scope of the PEIR is defined by Regulation 12(2) of the EIA Regulations which define PEI as '*information referred to in Part 1 of Schedule 4 (information for inclusion in environmental statements)* which-

- *(a) has been compiled by the applicant; and*
- *(b) is reasonably required to assess the environmental effects of the development (and of any associated development)'.*

1.2.6 The scope of the EIA has been informed through engagement with the Planning Inspectorate through a request to them for a Scoping Opinion. The request was made in August 2017, and was accompanied by a Scoping Report. The Scoping Opinion was received in September 2017. Both the Scoping Report and the Scoping Opinion have been made available by the Planning Inspectorate on their website, via the following link:

https://infrastructure.planninginspectorate.gov.uk/projects/south-west/a30-chiverton-to-carland-cross-scheme/

1.2.7 This PEIR is arranged into different topic chapters, which reflect those which will be used for the Environmental Statement, as follows:

- Air Quality;
- Cultural Heritage;
- Landscape;
- Nature Conservation;
- Geology and Soils;
- Materials;
- Noise and Vibration;
- People and Communities;
- Road Drainage and the Water Environment; and
- Climate Change and Resilience

1.2.8 In addition, an assessment of the potential combined and cumulative effects of the scheme is included.

1.2.9 Each environmental topic chapter within the PEIR describes the local environment, and identifies any sensitive receptors such as designated sites, for example Sites of Special Scientific Interest, Air Quality Management Areas or Noise Important Areas. Baseline environmental surveys that have been carried out for each topic are then described, along with detail of consultation with Local Authorities and other stakeholders. Any likely impacts of the scheme on the local environment and required mitigation are then described.

1.2.10 The Environmental Constraints Plans (Figure 1.3) illustrate the environmental constraints for the wider study area.

1.3 Overview of the Project

1.3.1 The Government's Road Investment Strategy: 2015 to 2020, published in 2014, sets out the vision for the strategic road network and includes a commitment to improve the A30 between Chiverton and Carland Cross to dual carriageway standard.

1.3.2 On 3rd July 2017, the preferred route for the A30 Chiverton to Carland Cross improvement scheme was announced. The preferred route provides a new dual carriageway running to the north of the existing A30 between Chiverton and Chybucca and to the south between Chybucca and Carland Cross (see Figure 1.1 Location Plan). The existing A30 will be kept to provide a local route. The announcement of the preferred route follows a comprehensive review of options and extensive analysis of responses to the 2016 public consultation.

1.3.3 The A30 Chiverton to Carland Cross, hereinafter referred to as the "scheme", comprises the construction of 8.7 miles of dual carriageway between Chiverton

Cross roundabout and Carland Cross junction on the A30. The existing Chiverton Cross and Carland Cross roundabouts are to be replaced with grade separated junctions to provide connections to the local highway network.

1.3.4 The scheme is required as this section of the A30 is the last remaining length of single carriageway between Camborne and the M5 motorway, and regularly experiences congestion and delays.

1.3.5 To accommodate the new dual carriageway, the existing A30 will be retained to provide a local route. It will connect to a number of minor side roads leading to and from Truro to the south of the A30, and to and from Perranporth and Newquay to the north.

1.3.6 The scheme comprises the following main features:

- Scheme length is 8.7 miles.
- 70mph high quality dual carriageway to current standards;
- Connection to existing A30 Blackwater Bypass immediately west of the existing Chiverton Cross roundabout
- Chiverton Cross - full movement, two level junction, offset from the existing location to minimise disruption to the road user during construction
- Chiverton to Chybucca - route is aligned as close to the existing A30 as geometric and other constraints permit
- Chybucca - new restricted movement grade-separated junction with bridge taking the B3284 over the new dual carriageway and west-facing slip-roads only providing access onto the dual carriageway from local routes. (The forecast flows to and from the local roads to the east are insufficient to justify east-facing slip-roads)
- Chybucca – Twobarrows Bridge - route aligned as close to the existing A30 as geometric and other constraints permit. The existing B3284 will be realigned and extended to run parallel to the new dual carriageway adjoin the new bridge at Chybucca
- Twobarrows Bridge – online section utilising the existing bridge
- Carland Cross – full movement grade separated compact junction with dumb-bell roundabouts, re-using the existing roundabout to the south
- Connection to the existing A30 Mitchell Bypass approximately 500m east of existing roundabout
- Four other crossing points where local roads and private accesses cross the new road using under or over bridges, as well as two additional Non-Motorised User under bridges.
- Stopping up of two side roads across the new dual carriageway, with alternative access via the existing local roads to the south.
- Retention of the existing de-trunked A30 for local and slow moving agricultural traffic and Non-Motorised Users
- Local improvements to side roads in order to facilitate access to isolated properties.
- New private access laneways to provide alternative access to those affected by the new dual carriageway.

1.4 The Promoter

1.4.1 Highways England is promoting the A30 Chiverton to Carland Cross scheme. Highways England is the Government company charged with operating,

maintaining and improving England's motorways and major A roads on behalf of the Department for Transport. Formerly the Highways Agency, it became a Government company in April 2015.

1.4.2 Highways England is responsible for motorways and major (trunk) roads in England. Their road network totals over 4,400 miles. Whilst this represents only two per cent of all roads in England by length, these roads carry a third of all traffic by mileage and two thirds of all heavy goods traffic.

1.5 Legislative and Policy Framework

Overview

1.5.1 To support the preparation of the PEIR, it is necessary to review National and Local Planning Policy and how this has informed the overall approach. Further topic specific policies have been considered within each of the topic chapters (set out within Chapter 5 to Chapter 15 of this PEIR).

1.5.2 The Planning Act 2008 (the Act) defines the development consent regime for Nationally Significant Infrastructure Projects. The Scheme is identified as a highways NSIP under section 22 of the Act (as amended and described in full above). The Planning Inspectorate has responsibility for examining DCO applications and for making a recommendation to the Secretary of State as to whether to grant development consent.

1.5.3 The National Policy Statements (NPS) are of primary importance to the decision-making process when DCO applications are being examined. Section 104 of the Act states that:

> (2) In deciding the application the Secretary of State must have regard to –
>
> *(a) any national policy statement which has effect in relation to development of the description to which the application relates (a "relevant national policy statement") …*
>
> *(3) The Secretary of State must decide the application in accordance with any relevant national policy statement, except to the extent that one or more of subsections (4) to (8) applies*."

1.5.4 There is one NPS which is relevant to the proposed A30 Chiverton to Carland Cross, which is the National Policy Statement for National Networks. This NPS forms the basis for decision making for DCO applications for projects such as this scheme.

1.5.5 In addition, the National Planning Policy Framework (NPPF) published in March 2012 sets out the Government's planning policies for England. The NPPF is an "important and relevant"[1] matter to be considered in decision making for NSIPs. The NPPF is supplemented by the Planning Practice Guidance (PPG)[2] web-based resource launched in February 2014. The PPG is updated by the Department for Communities and Local Government as necessary.

1.5.6 It is important to understand that applications under the Act are not subject to s38(6) of the Planning and Compulsory Purchase Act 2004, which states that

[1] National Planning Policy Framework paragraph 3
[2] Department for Communities and Local Government: Planning Practice Guidance: February 2014

determination of a planning application must be made in accordance with the local development plan, unless other material considerations indicate otherwise. Local planning policy may be an important and relevant matter during the consideration of applications for development consent, but such applications do not have to be in accordance with the development plan.

Development plan policies may be relevant considerations where they inform the assessment of potential effects e.g. by identifying land allocations and environmentally sensitive areas. If there is a conflict between the NPS and local policies, however, the NPS takes precedence.

National Policy Statement for National Networks (December 2014)

1.5.7 The National Policy Statements are produced by Central Government and provide policy on specific aspects of national infrastructure. Specifically, these statements clarify:

- How infrastructure contributes to sustainable development;
- How infrastructure takes account of the mitigation of, and adaptation to, climate change;
- How infrastructure objectives have been integrated with other Government policies;
- How actual and projected capacity and demand have been taken into account;
- Consider relevant issues in relation to safety or technology;
- Circumstances where it would be particularly important to address the adverse impacts of development;
- Specific locations, where appropriate, in order to provide a clear framework for investment and planning decisions

1.5.8 The National Policy Statement for National Networks sets the policy against which the Secretary of State for Transport will make decisions on applications for development consent for nationally significant infrastructure projects on road, rail and strategic rail freight interchange developments[3]. Specifically, Paragraph 1.1 states that the purpose of the NN NPS is to establish:

> *"the need for, and Government's policies to deliver, development of nationally significant infrastructure projects (NSIPs) on the national road and rail networks in England. It provides planning guidance for promoters of nationally significant infrastructure projects on the road and rail networks, and the basis for the examination by the Examining Authority and decisions by the Secretary of State."*

<u>Drivers of need for development on the national road network</u>

1.5.9 The NN NPS sets out the 'vision and strategic objectives for the national networks'. This recognises that there is a critical need to provide safe, expeditious and resilient networks that better support social and economic activity, and to provide a transport network that is capable of supporting economic growth and rebalancing the economy[4].

"Government's vision and strategic objectives for the national networks The Government will deliver national networks that meet the country's long-term

[3] National Networks National Policy Statement (Paragraph 1.1)
[4] National Networks National Policy Statement (Paragraph 2.2)

needs; supporting a prosperous and competitive economy and improving overall quality of life, as part of a wider transport system. This means:

- *Networks with the capacity and connectivity and resilience to support national and local economic activity and facilitate growth and create jobs.*
- *Networks which support and improve journey quality, reliability and safety.*
- *Networks which support the delivery of environmental goals and the move to a low carbon economy.*
- *Networks which join up our communities and link effectively to each other.[5]"*

1.5.10 Whilst the NN NPS is not scheme specific, it provides a decision-making framework for applications on the strategic highway network. It does however state that in some cases, it will not be sufficient to simply expand capacity on the existing network, through factors such as junction improvements or new slips roads, implementing 'smart motorways' or improving trunk roads. In these circumstances "*new road alignments and corresponding links… may be needed to support increased capacity and connectivity*"[6].

Assessment Principles

1.5.11 Unlike other types of infrastructure covered by the Planning Act, the NN NPS deals predominantly with linear infrastructure which are designed to link together separate points, provide linear infrastructure connected to a wider network. Development will usually be determined by economic activity and population, and the location of existing transport networks[7].

1.5.12 Paragraph 4.2 sets out that subject to the detailed policies and protections in this NPS, and the legal constraints set out in the Planning Act, there is a presumption in favour of granting development consent for national networks NSIPs that fall within the need for infrastructure established in this NPS. In considering proposed development, and weighing adverse impacts against benefits, the Secretary of State should take into account:

- *Its potential benefits, including the facilitation of economic development, including job creation, housing and environmental improvement, and any long-term or wider benefits;*
- *Its potential adverse impacts, including any longer-term and cumulative adverse impacts, as well as any measures to avoid, reduce or compensate for any adverse impacts[8].*

1.5.13 With regard to alternatives, Paragraphs 4.26 and 4.27 of the NN NPS set out that applicants should comply with all legal requirements and any policy requirements for the assessment of alternatives. Specifically, this will include: reference to the EIA Directive, which requires projects with significant environmental effects to include an outline of the main alternatives studied by the applicant; other legal requirements for the consideration of alternatives, including under the Habitats and Water Framework Directives; or a policy requirement of the assessment of

[5] National Networks National Policy Statement (Vision)
[6] National Networks National Policy Statement (Paragraph 2.27)
[7] National Networks National Policy Statement (Paragraph 4.13)
[8] National Networks National Policy Statement (Paragraph 4.3)

alternatives (such as the flood risk sequential test). Paragraph 4.27 goes on to state that "*all projects should be subject to an options appraisal*".

1.5.14 The general principles of assessment and impacts which are of relevance to a particular topic are set out within each PEIR topic chapter.

National Planning Policy Framework

Role of the NPPF and NPS

1.5.15 The overall strategic aims of the NPPF and the NPS are consistent, however, as set out above, the two documents have two differing roles to play. Paragraph 3 of the NPPF makes it clear that it does not contain specific policies for NSIPs for which particular considerations apply. It goes on to state, however, that it may be an 'important and relevant' matter to be considered in decision making for NSIPs. The role of the NPS will be to assume the function of providing specific policies and provide transport policy which will guide individual development brought under it[9].

1.5.16 Paragraph 6 of the NPPF states that "*the purpose of the planning system is to contribute to the achievement of sustainable development*". The NPPF goes on to state that the "*transport system needs to be balanced in favour of sustainable transport modes, giving people real choice about how they travel*"[10] and "*local planning authorities should identify and protect, where there is robust evidence, sites and routes which could be critical in developing infrastructure to widen transport choice*"[11].

1.5.17 The NPPF mandates that '*significant weight should be placed on the need to support economic growth though the planning system*'[12]. Given this section of the A30 regularly experiences congestion and delays, the proposed delivery of the new dual carriageway running to the north of the existing A30 between Chiverton and Chybucca and to the south between Chybucca and Carland Cross will help support sustainable economic growth.

1.5.18 Paragraph 56 states that *"the Government attaches great importance to the design of the built environment. Good design is a key aspect of sustainable development, is indivisible from good planning, and should contribute positively to making places better for people".*

1.5.19 Paragraph 60 also states that *"planning policies and decisions should not attempt to impose architectural styles or particular tastes and they should not stifle innovation, originality or initiative through unsubstantiated requirements to conform to certain development forms or styles. It is, however, proper to seek to promote or reinforce local distinctiveness".*

1.5.20 Paragraph 115 states that *"great weight should be given to conserving landscape and scenic beauty in National Parks and Areas of Outstanding Natural Beauty, which have the highest status of protection in relation to landscape and scenic beauty. The conservation of wildlife and cultural heritage are important considerations in all these areas…."*

[9] National Networks National Policy Statement (Paragraph 1.19)
[10] NPPF (2012) Paragraph 29
[11] NPPF (2012) Paragraph 41
[12] NPPF (2012) Paragraph 20)

1.5.21 The A30 Chiverton to Carland Cross Environmental Impact Assessment Scoping Report establishes that there are no statutory designated sites within the scheme area, however it references a number within a 1km radius. Paragraph 118 calls on local planning authorities to aim to conserve and enhance biodiversity in determining planning applications by protecting nationally and internationally designated sites from development which would have an adverse effect upon them and, in all locations, by refusing development which could result in significant harm to biodiversity and which cannot be avoided or adequately mitigated or compensated.

1.5.22 Alongside the Cornwall and West Devon Mining Landscape World Heritage Site, the Scoping Report sets out how there are a number of Scheduled Monuments and listed buildings adjacent to the road. It will be necessary to have regard to policies within NPPF Chapter 12, specifically:

- Paragraph 128 which *requires "in determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting".*
- Paragraph 129 which states that Local Planning Authorities should assess the particular significance of a heritage asset that may be affected by a proposed. This assessment should be taken into account when considering the impact of a proposal on a heritage asset, to avoid or minimise conflict between the heritage assets conservation and any aspect of the proposal.
- Paragraph 132 states that *"when considering the impact of a proposed development on the significance of a designated heritage asset, great weight should be given to the asset's conservation. The more important the asset, the greater the weight should be. Significance can be harmed or lost through alteration or destruction of the heritage asset or development within its setting."*
- In relation to Conservation Areas and World Heritage Sites, Paragraph 137 states that *"Local planning authorities should look for opportunities for new development within Conservation Areas and World Heritage Sites and within the setting of heritage assets to enhance or better reveal their significance. Proposals that preserve those elements of the setting that make a positive contribution to or better reveal the significance of the asset should be treated favourably".*
- The NPPF is clear that there is a balance. Paragraph 140 states that *"Local planning authorities should assess whether the benefits of a proposal for enabling development, which would otherwise conflict with planning policies but which would secure the future conservation of a heritage asset, outweigh the disbenefits of departing from those policies".*

1.5.23 Each subsequent topic chapter of this PEIR refers to the relevant paragraphs and sections of the NPPF where considered important and relevant to the assessment of the proposed development.

Planning Practice Guidance

1.5.24 Each topic chapter refers to the relevant sections of the Planning Practice Guidance where considered important and relevant to the assessment of the proposed development.

Local Development Plan

1.5.25 Although a DCO application is not subject to Section 38(6) of the Planning and Compulsory Purchase Act 2004, development plans may be considered an important and relevant matter.

1.5.26 The proposal area falls entirely within the Cornwall Council Local Authority area. Although there are a number of 'saved policies' within the Local Plan, the development plan for the scheme area comprises:

- The **Cornwall Local Plan Strategic Policies (2010-2030)** which was formally adopted on 22 November 2016, which represents the overarching planning policy framework for the whole of Cornwall in the period up to 2030.
- The **Cornwall Local Plan Strategic Policies (2010-2030) Community Network Area Sections** which act as a local focus for debate and engagement and provide the basis for the place-based element of Cornwall's policy framework. The scheme is within both PP6 Truro and Roseland and PP7 St Agnes and Perranporth Community Network Areas.
- The scheme falls partially within the north eastern section of the **Truro and Kenwyn Neighbourhood Development Plan**, which sets out a number of relevant development management policies in the Truro and Kenwyn Neighbourhood Plan Area

1.5.27 There are also a number of guiding documents and supplementary planning documents, set out below, which will also feature as material considerations. Relevant guidance from each of these documents is set out within each topic chapter.

Cornwall Local Plan Strategic Policies (2010-2030)

1.5.28 The A30 Carland Cross to Chiverton Cross is identified on the Key Diagram within the Cornwall Local Plan Strategy (2010-2030) as a Key Infrastructure Improvement. Relevant policies for the project, which are set out in further detail within each topic chapter of the PEIR, are set out as follows:

- **Policy 1** *Presumption in favour of sustainable development*, sets out Cornwall Council's response to the NPPF which states that Council's will take a positive approach that reflects the presumption in favour of sustainable development.
- **Policy 12** *Design* which sets out the Council's ambitions to achieving high quality, safe, sustainable and inclusive design in all development. Development must ensure Cornwall's enduring distinctiveness and maintain and enhance its distinctive natural and historic character.
- **Policy 23** *Natural Environment* states that development proposals will need to sustain local distinctiveness and character and protect and where possible enhance Cornwall's natural environment and assets according to their international, national and local significance. The policy sets out required interventions and mitigation measures for each type of habitat, which will be referenced within Chapter 8 Nature Conservation.
- **Policy 24** *Historic Environment* states that development proposals will be permitted where they would sustain the cultural distinctiveness and significance of Cornwall's historic rural, urban and environment by protecting, conserving and where appropriate, enhancing the significant of designated and non-designated assets. It further states that development within, or within

in the setting, of the Cornwall and West Devon Mining Landscape World Heritage Site (WHS) should accord with the WHS Management Plan.

- **Policy 27** *Transport and Accessibility* states that all developments should provide safe and suitable access to the site for all people and not cause a significant adverse impact on the local or strategic road network that cannot be managed or mitigated.
- **Policy 28** *Infrastructure* sets out that the requirements for developer contributions and when these will be sought.

Local Plan Community Network Area Sections

1.5.29 The proposed scheme falls within two of the Community Network Area Sections. These form the basis for the place-based element of Cornwall's policy framework:

- Policies within the **Truro and Roseland Community Network Area (PP6)** focus on ensuring the housing needs of the community are met (Objective 1) and balancing the provision of employment and housing to reduce commuting (Objective 2). Specifically, in relation to the proposed scheme, Objective 4 is relevant and seeks to enable the use of more sustainable transport modes and reduce congestion through the provision of additional transport infrastructure. Objective 7 also seeks to ensure that the development is adaptable, sustainable and of a high quality design and layout.
- In addition, the proposed scheme also falls within the **St Agnes and Perranporth Community Network Area (PP7)**. This Community Network Area document focuses *on "co-ordinating a strategic approach to the provision of services and public transport to encourage self-containment and sustainable transport"* (Objective 4). In addition, Objective 8 seeks to *"maintain and enhance the area's heritage and environmental assets for the benefit of the local community and to enhance the area's tourism offer".*

Truro and Kenwyn Neighbourhood Development Plan

1.5.30 The proposed scheme falls within the north eastern edge of the Truro and Kenwyn Neighbourhood Development Plan. Alongside promoting sustainable development (Policy E1), sustainable drainage (Policy E2) and green infrastructure (Policy E4), the Neighbourhood Development Plan seeks to promote employment growth at existing and new employment sites. In relation to the proposed scheme, the NDP includes:

- Policy E7 *Character of the Highways and Byways* which seeks to retain and enhance the character and materials of highways and associated structures;
- Policy T1 *Truro Transport Strategy* which sets a requirement for contributions to the delivery of the Truro Transport Strategy.
- Policy T3 *Sustainable Transport*, which requires development to provide for sustainable transport modes, reduce the need to travel and identifies key routes for walking and cycling.

1.6 Availability of the PEIR

1.6.1 Copies of this PEIR will be available as part of the consultation material produced for the A30 Chiverton to Carland Cross public consultations to be carried out in January - March 2018. Details of the consultation events are available in the Statement of Community Consultation ("SoCC") which can be accessed from the following link:

www.highways.gov.uk/a30Chiverton

1.6.2 Hard copies of the consultation materials are also available free of charge at deposit locations along the route of the proposed scheme; details of deposit locations can be found on our project webpage.

1.6.3 There may be a charge for paper copies of the other consultation materials. Please contact Highways England for further details.

If you need help accessing this or any other Highways England information, please call **0300 123 5000** and we will help you.

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Chapter 2 The Project

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2 Project Description

2.1 Introduction

2.1.1 This chapter of the PEIR provides a description of the scheme including the environmental design, construction methodology, the construction programme and the post construction activities based on information available at this time.

2.1.2 An overview of the site location and context is provided in this chapter together with a detailed description of the scheme and outline details of the incorporated environmental mitigation design measures (Section 2.6), the construction, operation and maintenance proposals for the scheme (Section 2.7) and the decommissioning of the scheme (Section 2.8).

2.1.3 Figure 2.1 shows the General Arrangement for the main scheme.

2.2 Need for the Project

2.2.1 Due to the low standard of the route, this section of the A30 experiences congestion and delays throughout the year, with poor journey time reliability. These problems are exacerbated in summer months, when traffic flows increase due to tourist traffic. The route is in need of improvement to meet Highways England's objectives of maintaining the smooth flow of traffic, making the network safer and supporting economic growth.

Local economic growth and social/community regeneration

2.2.2 Current congestion on the existing A30 between Chiverton and Carland Cross forms a bottleneck on the trunk road network in Cornwall, preventing reliable east – west journeys and stifling growth in Cornwall. If not improved, the existing infrastructure will continue to contribute to growing congestion, poor reliability and efficiency, and poor journey times – all of which fail to meet Highways England's business strategy and the Government's strategic vision outlined in the Road Investment Strategy.

Route performance

2.2.3 The issues identified on the current A30 between Chiverton and Carland Cross are:

- sections of narrow carriageways;
- unsuitable bends and gradients for high speed traffic;
- locations with poor forward visibility;
- slow moving agricultural vehicles;
- limited opportunities for overtaking;
- increasing traffic levels outgrowing the capacity of the existing road;
- multiple minor roads and junctions where traffic enters, exits or crosses the A30; and
- numerous properties have direct access to the A30.

2.2.4 The consequences of these issues are:

- congestion and longer journey times, particularly during peak times;
- unreliable journey times;

- queuing at the junctions, due to the interaction between local and strategic traffic, particularly at peak times; and
- queuing when incidents occur with knock on effects to surrounding local routes.

Safety

2.2.5 The current poor alignment, limited overtaking opportunities, side road, junctions and private accesses have caused numerous accidents on this section of the A30. According to a summary of traffic personal injury accidents between 1 January 2012 and 31 December 2016 there was 1 fatality, 17 serious collisions and 94 slight collisions between Chiverton Cross and Carland Cross.

2.2.6 Accidents were more frequent in the vicinity of Chiverton Cross, Carland Cross, Zelah Hill, Chybucca and Callestick / Allet Cross Junction.

Resilience

2.2.7 The A30 is the most important route serving the County of Cornwall for both long-distance and local road users. It runs from Exeter along the middle of the peninsula to Penzance and is approximately 104 miles in length. Of this, 78 miles is dual carriageway.

2.2.8 The single carriageway A30 between Chiverton and Carland Cross is sensitive to incidents. When they impede or block flow there is no alternative direct route, forcing traffic to queue on the main road or divert to minor roads which are not capable of sustaining substantial traffic flows or movements. This situation is worsened by the at grade junctions, including many minor junctions and direct agricultural and residential accesses; all of which increase the likelihood of incidents.

2.3 Project Objectives

2.3.1 The objectives for the scheme were developed from consideration of the national objectives of Department of Transport (DfT) and Highways England, Cornwall Council's transport objectives, and the constraints on the current A30. The transport objectives for the scheme are:

- to contribute to regeneration and sustainable economic growth
- to support employment & residential development opportunities;
- to improve the safety, operation & efficiency of the transport network;
- to improve network reliability and reduce journey times;
- to deliver capacity enhancements to the Strategic Road Network;
- to support the use of sustainable modes of transport;
- to deliver better environmental outcomes; and
- to improve local and strategic connectivity.

2.4 Project Location

Site

2.4.1 The A30 is a main route from London to Land's End and is particularly important as one of two trunk roads connecting Devon and Cornwall, past numerous other settlements including Okehampton, Launceston, Bodmin, Redruth and Hayle. The

A30 Chiverton to Carland Cross section lies north west of Truro and provides businesses and residents in this corridor with access to the wider Strategic Road Network (SRN), predominantly the M5 and A38.

2.4.2 The location of the A30 Carland Cross to Chiverton is shown in Figure 1.1.

Surrounding Area

2.4.3 The surrounding landscape is largely agricultural. The existing route is flanked by grass verges, trees, hedgerows, as well as isolated and small groups of residential dwellings, farms and other businesses and renewable energy installations.

Key Designations

2.4.4 There are no statutory designated sites within the scheme area, but there are a number within 1km including:

- Cornwall and West Devon Mining Landscape World Heritage Site (adjacent to the scheme);
- Chiverton Park Statutory Registered Park and Garden (adjacent to the scheme);
- Newlyn Downs Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI) (both 138 meters to the north of the scheme); and
- Carrick Heaths SSSI (345 meters north of the scheme).

2.4.5 There are also a number of Scheduled Monuments (barrows) and listed buildings and other structures (milestones) adjacent to the road (see Figure 6.1 and Figure 6.2).

2.4.6 The potential impacts of the scheme on the various environmental resources and receptors within the study area are considered in more detail in Chapters 5 to 15.

2.5 Baseline Scenario

2.5.1 The existing A30 trunk road between the M5 motorway at Exeter and Penzance is predominantly dual carriageway. It serves the towns of Okehampton, Launceston, Bodmin, Camborne, St Austell, Truro and Redruth. The stretch of single carriageway between Temple and Higher Carblake has undergone improvement to two lane all-purpose dual carriageway (D2AP) standard and was opened to traffic in summer 2017.

2.5.2 This section of the existing A30 comprises single carriageway linking the existing Chiverton Cross junction at the south-western extent and the existing Carland Cross junction at its north-eastern extent.

2.5.3 At the western extent of the scheme, Chiverton Cross connects the existing A30 trunk road to the A390 from Truro, the A3075 from Newquay and the B3277 from St Agnes. At the eastern extent of the scheme, Carland Cross connects the A39 from Truro to the existing A30 trunk road in addition to the local minor road network. The notable junctions along the scheme are:-

- Chybucca, which connects the B3284 from Truro to the south-east and the B3284 from Perranporth to the west on the north coast.
- Zelah, where the existing A30 connects to the unclassified road between Goonhavern and Shortlanesend by means of a grade separated connector.

- Boxheater, which connects:
  - the A30 to the B3285 from Perranporth and Goonhavern to the west
  - the unclassified road which connects towards St Newlyn East, Cubert and Newquay to the north
  - the unclassified road southward to St. Allen, Trispen and Truro

2.5.4 In addition to the above roads, 10 minor roads connect to the A30 at junctions between Chiverton and Carland Cross. These serve communities each side of the A30 and link into the local road network, providing access to villages and towns to the north and south of the A30. These are predominantly single lane width carriageways with high-sided hedges. There are also numerous individual properties served by direct access to the A30.

2.5.5 Notable structures on the existing A30, which were constructed in the early 1990s as part of the A30 Zelah Bypass scheme, are:

- The Tolgroggan overbridge carries an agricultural access road over the existing A30 trunk road to the south of Zelah village at Tolgroggan Farm. The structure spans a total of 42.5 metres above the rock cutting.
- The Twobarrows underbridge carries the A30 over the class 3 Zelah to Shortlanesend road to the south of Zelah village. The bridge has a clear span of 9.43 metres.
- Two existing culverts below the existing A30 carrying local watercourses to the east of Zelah village.

2.6 Project Description

2.6.1 The scheme comprises the construction of 8.7 miles of new A30 dual carriageway between the existing Chiverton Cross roundabout in the west and Carland Cross roundabout in the east. At the western end, the improvement connects to the existing A30 Blackwater Bypass immediately west of the existing Chiverton Cross roundabout, leading on to the Scorrier Junction further west, and at the eastern end, the scheme connects to the existing Mitchell Bypass approximately 500m east of the existing Carland Cross roundabout.

2.6.2 The existing Chiverton Cross and Carland Cross roundabouts are to be replaced with new grade separated junctions to provide connections to the local major side road network whilst maintaining uninterrupted traffic flow on the mainline A30.

2.6.3 Figure 2.1, shows the General Arrangement for the proposed scheme. The description of the mainline and associated side roads and junctions is outlined below, with the scheme developed in accordance with the Design Manual for Roads and Bridges (DMRB) design standards and best practice.

Mainline Alignment

2.6.4 The scheme consists of a new section of dual carriageway mainline, with a typical overall carriageway width of 21.1m, including two 9.3m carriageways (two 3.65m lanes and 1m hard strips) and a 2.5m central reserve, with local widening along the route to accommodate forward visibility requirements. The verge on both sides is proposed as a 4m grassed verge to accommodate the highway drainage, communication ducts and street furniture and then from the back of verge there are earthworks slopes of between 1:2 and 1:2.5 to tie-in to the existing ground

level. The earthworks slope is dependent on the proposed landscaping works with slackened 1:2.5 slopes required where woodland planting is proposed.

2.6.5 The mainline route vertical alignment seeks to follow the existing ground profile where possible whilst also endeavouring to use highway geometry above desirable minimum design standards. The alignment also accommodates side road crossings under and over the mainline with standard clearances, considers the interaction with the existing A30 for construction practicality purposes when in close proximity and seeks to achieve as close as possible to an overall earthworks balance to avoid any material having to be imported to site or material being taken off site.

2.6.6 The mainline alignment is measured in distance units called chainage. The scheme can be described from west to east as follows:

- Between Ch0+000 and Ch1+000, the road closely follows the existing road level or drops into shallow cut (less than 1m)
- Through the Chiverton Junction, between Ch1+000 and Ch2+000, the route rises onto an approximate 7m embankment with a desirable minimum highway geometry crest curve. The new junction passes under the mainline with two underpass structures.
- Between the Chiverton and Chybucca Junctions, between Ch2+000 and Ch4+000, the route closely follows the existing ground level with isolated areas of low level cuttings and embankments (approximately 2-3m). This section also includes an eastbound and westbound public lay-by and two maintenance lay-bys
- Through the Chybucca junction, between Ch4+000 and Ch5+000, the route continues to closely follow the existing ground level, which will assist the construction of the new mainline through this section where it overlaps with the existing A30 and has a realigned section of the B3284 with associated constraints. The new junction passes over the top of the mainline with an overbridge structure
- East of the junction, between Ch5+000 and Ch5+900, the route drops into a cutting through the existing ridge with a depth up to approximately 3-4m, with a westbound public lay-by and two maintenance lay-bys.
- Between Ch5+900 and Ch6+400, the route moves onto an embankment of up to approximately 10m as it passes over the existing valley and over the realigned Allet Road. This section has the adjacent hamlet of Tresawen and the Town and Country Motors business to the north of the existing A30 and the Nanteague Farm Solar Farm to the south.
- To the east of the valley, between Ch6+400 and Ch7+500, the route moves back into shallow cutting up to approximately 2-3m through the ridge and the following valley feature. In this area, there is an eastbound and westbound public lay-by and two maintenance lay-bys and the route passes adjacent to the village of Marazanvose to the north of the retained existing A30. There is also the Marazanvose side road and the access to a large organic farm which are stopped-up with alternative access via the Shortlanesend Road.
- Between Ch7+500 and Ch8+200, the route drops into a cutting of approximate 4-5m through a ridge, passing between two 133kv overhead pylons that are to be retained. The northern pylon is closer to the new back of verge and requires a shallow retaining structure of up to 4m. There are also two maintenance lay-bys in this section.

- From Ch8+200, the route passes over the existing Two Barrows underbridge before continuing to follow a very similar alignment to the existing A30, through a very tight crest curve and steep down gradient under the Tolgroggan Farm overbridge at Ch8+600. Following a similar level to the existing road will assist the construction of the new mainline alongside the existing and also allow the new Tolgroggan overbridge to be constructed at a similar level to the existing, minimising impact on the adjacent properties. The widened cross-section with the new mainline creates a cutting on up to approximately 5m on the south side with a similar depth cutting on the realigned existing A30 to the north through this section.
- Between Ch8+600 and Ch11+000, the route runs just to the south of the existing A30, passing the village of Zelah between Ch9+000 and Ch9+500. The route passes over two valley features at Ch8+900 and 9+300 and then through a ridge with shallow cuttings and embankments of up to 3-4m. There is a Non-Motorised User underpass at Ch9+260 for Church Lane and a side road underpass for Trevalso Lane at Ch9+700, with the side road dropping into cut and the mainline at-grade. In this area, there are also one eastbound and two westbound public lay-bys and seven maintenance lay-bys.
- From Ch11+000, the route passes over the existing valley and over the realigned Penny-Come-Quick side road, on an embankment of up to approximately 20m and then proceeds towards the Carland Cross junction at Ch13+000, running close to the south of the existing A30, with a cutting of approximately 4-5m and a significant embankment of up to approximately 6m. The adjacent side road to the south in the section that joins the existing A2 at approximately Ch11+450, is to be stopped-up from crossing the new mainline and locally realigned to continue to the south.
- At Ch12+700, the route passes very close to an existing quarry and pond and cuts through possible made ground from the quarry with a depth of approximately 4m. There is also historic tumuli close to the south of the mainline through this section, which requires a shallow retaining structure at Ch12+900. There are three maintenance lay-bys.
- Through the Carland Cross Junction, between Ch13+000 and Ch13+700, the route rises onto two significant embankments of up to approximately 9m and 15-20m with a desirable minimum highway geometry crest curve. The new junction passes under the mainline with an underpass structure. There is also a Non-Motorised User underpass at Ch13+000, with the existing A30 realigned from Ch12+700 to join the new northern junction roundabout, and the existing road that crosses the new route to the existing junction roundabout to the south, then reused as a Non-Motorised User corridor.
- From the Carland Cross junction to the eastern end of the scheme, the route ties back into the existing dual carriageway with one new maintenance lay-by and a cutting to the south of approximately 3-4m.
- The mainline also includes numerous multi-species culverts, of sizes ranging from 900m diameter to 2mx2m boxes, and a multi-species green bridge at Ch7+300, which passes approximately 6-7m above the mainline and has associated landscape planting.

2.6.7 Tables 1-1 to 1-3 provide a summary of the proposed cuttings, embankments and structures, with further details in the following sections.

Table 1-1 Summary of proposed cuttings

Cutting name	Chainage (m)		Maximum cutting depth (m)
	From	To	
Chiverton Cutting	0+600	0+950	2.4
Four Burrows Earthworks 1	2+850	3+100	2.8
Hillview Cutting	5+100	5+850	4.5
Nanteague Cutting	6+450	6+650	3.6
Two Barrows Cutting	7+500	7+850	4.1
Tolgroggan Earthworks	8+400	8+750	3.5
Zelah Earthworks 1	8+950	9+200	4.5
Zelah Earthworks 3	9+400	9+500	3.6
Trevalso Crossing	10+150	10+300	3.3
Penglaze Cutting	11+400	11+600	3.8
Quarry Retaining Wall	12+600	12+950	5.5
Carland Cross Earthworks 3	13+850	14+300	2.3

Table 2-2 Summary of proposed embankments

Embankment name	Chainage (m)		Max embankment height (m)
	From	To	
Chiverton Embankment	0+950	1+950	6.4
Four Burrows Earthworks 2	3+100	3+350	3.1
Tresawsen Embankment	5+850	6+150	8.2
Tolgroggan Earthworks 2	8+750	8+950	3.4
Zelah Earthworks 2	9+200	9+400	5.0
Penny-Come-Quick Embankment	11+000	11+150	9.6
Journey's End Embankment	11+600	12+600	7.0
Carland Cross Earthworks 1	12+950	13+400	9.3
Carland Cross Earthworks 2	13+400	13+850	14.6

Table 2-3 Summary of proposed structures.

Structure location	Approximate Chainage (m)	Structure type and proposed foundation solution
Chiverton Cross – grade separated junction, underbridge west	1+425	Precast Concrete beams; single span; bankseat; reinforced soil walls
Chiverton Cross– grade separated junction, underbridge east.	1+560	Precast Concrete beams; bankseat; single span; reinforced soil walls
Chybucca – grade separated junction	4+830	Overbridge; steel/concrete composite bridge Single span, bankseat; reinforced soil walls
Nanteague Farm – side road from existing A30 to Allet, (Tresawen Underbridge)	5+965	Underbridge; portal frame

Structure location	Approximate Chainage (m)	Structure type and proposed foundation solution
Culvert may be needed to manage water flow in this area as the levels form a valley. Separate mammal culvert at this location.	6+000	Drainage structure – culvert
Nancarrow Farmhouse – overbridge for bats and badgers	7+315	Single span, reinforced soil walls
Twobarrows area, pylon for overhead transmission lines, adjacent to proposed eastbound carriageway	7+650	Retaining wall to pylon foundations
Twobarrows – side road from existing A30 to Shortlanesend	8+125	Existing Underbridge to be assessed
Zelah Lane Farm / Tolgroggan Farm	8+595	Overbridge (accommodation bridge) Steel composite; single span, reinforced soil walls
To the south of Zelah, existing watercourse, tributary to River Allen	8+900	Drainage structure - culvert
Zelah, existing watercourse, tributary to River Allen	9+250	Drainage structure - culvert
Trevalso Farm underpass	9+720	Portal frame box underpass
Culvert may be needed in this area as ground levels fall from north to south, and there is evidence of watercourses north and south of the proposed road.	10+500	Drainage structure – culvert
Penny-Come-Quick – side road from existing A30	11+020	Underbridge – precast concrete beams; single span; RC abutments
Penny-Come-Quick – existing watercourse	11+040	Drainage structure - culvert
Tumulus adjacent to proposed westbound carriageway to the south of Carland Cross	12+880	Retaining wall
Carland Cross – grade separated junction	13+360	Underbridge – precast concrete beams
Carland Cross – possible existing culvert that will need to be maintained and increased in size for drainage and ecology purposes	13+600	Culvert – drainage and multispecies crossing

Chiverton Grade Separated Junction

2.6.8 Chiverton junction is a grade separated junction at approximate Ch1+500, with the junction gyratory carriageway below the mainline using two separate underbridges (Prestressed beam structure on concrete faced reinforced soil abutments with piled bank seats - Width 31m, Length 18m and Headroom 5.3m).

2.6.9 This arrangement allows for four mainline slip roads and four side roads (the A390 to Chiverton, the existing de-trunked A30, the B3277 and the A3075 to Newquay) to connect into the gyratory. This new junction replaces the existing Chiverton roundabout at Ch0+750, with the existing junction removed with the

new scheme. The new junction moved further east to assist the construction of the junction whilst maintaining live traffic on the existing A30 and to minimise impact on the adjacent landowners and businesses

2.6.10 The slip roads consist of a single lane and a hard shoulder, with an overall width of 7.7m. An auxiliary lane is included on the westbound merge to allow traffic to manoeuvre onto the mainline. Verge widths on the slip roads will be 2.8m and 2.5m for the inside and outside verge respectively. The width on the gyratory carriageway is 6.8m and includes a 2.5m verge on both sides with the outside verge including a shared off-carriageway footway/cycleway.

2.6.11 The four junction side roads are all single carriageway roads with carriageway widths of 6.8m with 2.5m verges both sides including an off-carriageway footway/cycleway on the realigned B3277 and A390. The design speed for all is 100kph.

2.6.12 With the mainline rising onto an approximate 7m embankment through the junction, the junction slip roads, connector roads and realigned side roads consist of shallow cutting (approximately 2-3m) close to and through the junction but then rise onto embankments of up to approximately 7m high as they climb to join the mainline or tie back into the existing side roads. The earthworks slopes are generally 1:2.5 except for on the realigned B3277 and on the eastbound diverge slip, where there are adjacent constraints and the slopes steepen to 1:2.

Chybucca Grade Separated Junction

2.6.13 Chybucca junction is a grade separated junction with a two roundabout dumbbell arrangement and a connector road and associated overbridge over the mainline at Ch4+800 (Composite semi integral structure on piled bank seats - Width 11m, Length 33m and Headroom 5.3m). The junction has west-facing slips only, needed for the traffic travelling to and from Newquay and surrounding area further north, and comprise a single lane and a hard shoulder with a width of 7.7m. The verge widths on the slip roads will be as per Chiverton junction.

2.6.14 The carriageway width on the connector road is 7.3m and the verges on both sides are 3.0m and include an off-carriageway shared footway/cycleway.

2.6.15 The junction also connects to the B3284 and the existing de-trunked A30 with local realignment of these side roads to tie into the new junction. The carriageway widths on all side roads will be 6.8m with 2.5m verges on both sides and the design speed of Chybucca side roads is 100kph.

2.6.16 With the mainline close to at-grade through the junction, the junction slip roads, connector road and side roads rise onto embankments of up to approximately 10m high as they pass up and over the mainline, with earthworks slopes of 1:2.5.

Allet Road

2.6.17 The Allet Road is maintained across the new dual carriageway mainline and is realigned to the east to pass under the new mainline through an underpass (Precast concrete portal structure - Width 31m, Length 10m and Headroom 5.3m) at approximate Ch6+000 and reconnect with the de-trunked existing A30. The side road will maintain an existing substantial hedgerow just to east and will pass through a separate multi-species culvert to the east of the side road. The carriageway width will be 6.8m with 1.5m verges both sides, with Non-Motorised

Users to continue to use the carriageway as they do currently. The design speed of the road is 50kph.

2.6.18 With the mainline rising onto an embankment of approximately 20m as it passes over the associated valley feature, the realigned side road is close to at-grade, dropping into shallow cutting (approximately 1-2m) with 1:2.5 earthworks slopes as it passes under the mainline.

Marazanvose Side Road

2.6.19 The Marazanvose side road at Ch7+100 is to be stopped-up with no connection to the de-trunked existing A30 as it does currently. To accommodate the existing properties and farm businesses who currently access onto the existing A30, local widening works are required on the side further south and at the junction with the Shortlanesend Road at its southern end. These widenings and junction improvements are based on vehicle specific movements to and from the associated properties and businesses.

2.6.20 There is also a direct access for Nancarrow Farm in this area at Ch7+300, that is stopped-up from the existing A30, with alternative access provided to the side road to the west.

Realigned existing A30 at Zelah

2.6.21 Where the new proposed dual carriageway mainline overlaps the existing A30 and passes over the existing Two Barrows underbridge (Existing in-situ reinforced concrete structure with minor modifications - Width 34.4m, Length 9.5m and Headroom 5.3m), west of Zelah between Ch7+500 and CH8+700, the existing de-trunked A30 is realigned to maintain this as a parallel side road route to the new mainline, whilst also creating a new staggered priority junction with the Shortlanesend Road, which passes under the new mainline through the existing Two Barrows underbridge.

2.6.22 The realigned single carriageway width is 6.8m, with 2.5m verges on both sides including a new off-carriageway footway/cycleway. There will be localised verge narrowing at Two Barrows underbridge to accommodate the 1:2.5 earthworks slopes between the side road and the mainline. The design speed of this realigned existing A30 is 100kph.

2.6.23 With the mainline passing over the existing Two Barrows underbridge and the realigned existing A30 needing to drop to create the junction with the Shortlanesend Road and then be at-grade with the mainline to pass through Tolgroggan Farm overbridge, the side road drops into a cutting of up to 10m through this section, with earthworks slopes generally of 1:2.5, except for where passing through the pinch point adjacent to Two Barrows underpass where they steepen to 1:2.

Tolgroggan Farm

2.6.24 This is a private farm access that passes over the new dual carriageway mainline and the existing de-trunked A30 at Ch8+600 using a new overbridge (Composite 2 span semi integral structure on piled bank seats - Width 7m, Length 60m and Headroom 5.3m). The adjacent existing bridge is demolished with the new crossing providing a 3.65m carriageway and 0.5m verges on both sides.

2.6.25 This private access is also a public Bridleway.

Trevalso Lane

2.6.26 Trevalso Lane is maintained across the new dual carriageway and passes under the new mainline and the existing de-trunked A30 through an underpass at approximate Ch9+700 before connecting to the realigned Henver Lane which itself connects back to the existing A30. The carriageway width is 4m to match existing, with 1.5 verges on both sides and Non-Motorised Users to continue to use the carriageway as they do currently. The design speed for the side road is 50kph.

2.6.27 With the mainline on shallow embankment (up to approximately 2m) through this section, the realigned side road drops into cutting of approximately 5-6m with 1:2 earthworks slopes as it passes under the mainline.

Penny-Come-Quick Side Road

2.6.28 Penny Come Quick side road at Ch11+000 is realigned to the east into the existing valley, to pass under the new mainline through an underpass (Prestressed beam structure on concrete faced reinforced soil abutments with piled bank seats - Width 34m, Length 10m and Headroom 5.3m) and reconnect with the de-trunked existing A30. The carriageway width is 6.8m with a 1.5m verges on the eastern side and a 5m verge on the western side for visibility through the underpass. Non-Motorised Users will continue to use the carriageway as they do currently. The design speed of the side road 85kph.

2.6.29 With the mainline rising onto an embankment of approximately 20m as it passes over the associated valley feature, the realigned side road is close to at-grade, dropping into shallow cutting (approximately 1-2m) with 1:2.5 earthworks slopes as it passes under the mainline.

Carland Cross Side Road

2.6.30 The adjacent side road to the south in the section between Penny-come-quick and Carland Cross, that joins the existing A2 at approximately Ch11+450, is to be stopped-up from crossing the new mainline and locally realigned to continue to the south.

2.6.31 The carriageway width of the realignment is 4m with 1.5m verges both sides to match existing and is close to at-grade with minimal earthworks.

Carland Cross Grade Separated Junction

2.6.32 Carland Cross junction is a grade separated junction at approximate Ch13+350, with a two roundabout dumbbell layout and a connector road and an associated underpass (Precast concrete portal structure with precast head walls - Width 50m, Length 15m and Headroom 5.3m) under the mainline. The southern roundabout of the junction re-uses the existing roundabout junction and retains the existing access to the A39 side road.

2.6.33 The northern junction roundabout connecting to the new eastbound merge and diverge, utilises a compact junction arrangement to minimise impact on the adjacent Carland Cross Windfarm and associated turbine topple zones, whilst the westbound diverge and merge use the southern existing junction roundabout with a standard full grade separated layout.

2.6.34 The slip roads consist of a single lane and a hard shoulder, with an overall carriageway width of 7.7m. Verge widths on the slip roads are 2.8m and 2.5m for the inside and outside verge respectively. The connector road carriageway width is 6.8m and includes a 2.5m verge on both sides with the outside verge including a shared off-carriageway footway/cycleway.

2.6.35 With the mainline rising onto an approximate 10m embankment through the junction, the junction slip roads and connector road consist of shallow cutting (approximately 2-3m) close to and through the junction and underpass but then rise onto embankments of up to approximately 7m high as they climb to join the mainline.

2.6.36 Where the new dual carriageway mainline overlaps the existing A30 west of the junction, the existing single carriageway is realigned to maintain this as a parallel side road route to the new mainline and tie into the new northern roundabout of the junction. The realigned single carriageway width is 6.8m, with 2.5m verges on both sides including a new off-carriageway footway/cycleway. The design speed of the realigned side road is 100kph.

2.6.37 The earthworks slopes are generally 1:2.5 through the junction, including an embankment of approximately 15-20m with the eastbound merge to the east, however, on the mainline to the west of the junction, the slopes steepen to 1:2 with the adjacent constraints of the windfarm in this area.

Drainage Design

2.6.38 The highway drainage will consist of filter drains and surface water channels, with kerb and gulley systems where necessary. The highway drainage will be designed to cater for a 1 in 1 year return period event without surcharging and will ensure that there is no surface water flooding for a 1 in 5 year return period event.

2.6.39 The highway drainage design follows the hierarchy of discharge, as laid out in DMRB HD33/16. The current GI suggests that infiltration will be possible in places for the scheme, particularly for lower return period events. For the larger return period storms it is recommended that a connection is also made to connect to watercourse at Greenfield Runoff Rate.. The design will ensure that the attenuation ponds/ infiltration basins can accommodate the 1 in 100 year event with 40% allowance for climate change, in accordance with Cornwall Council requirements. The design will be in accordance with the requirements of HA103/06.

2.6.40 The proposed A30 mainline and junction slip road drainage will be adopted and maintained by Highways England. All other highway drainage will be the responsibility of the local Cornwall Council. Separate drainage networks and attenuation/infiltration ponds have been provided for each statutory body.

2.6.41 Several watercourses/streams cross the route of the proposed scheme. Flows in these watercourses are maintained within their catchment through culverts where possible. The proposed cross drainage culverts have been designed to convey the 1 in 100-year storm event plus a 40% allowance for climate change. A freeboard of 300mm has been included. The culverts may require a 150mm embedment for environmental purposes. The culverts have been designed in accordance with the requirements of DMRB HA107/04, CIRIA Report 689 and Cornwall Council Drainage requirements.

Walking, Cycling and Horse-Riding

2.6.42 The A30 is a heavily trafficked road and does not generally cater for pedestrians and cyclists. There are bus stops on the A30 at Marazanvose and Zelah, and a narrow footway on one side of the road between Zelah and Mount Pleasant. These are considered the only locations along the A30 where people are likely be walking alongside the A30 carriageway. Walking, cycling and horse-riding activity is more common on the side roads where communities are severed rather than along the A30 itself. From Chiverton Cross to Carland Cross, there are currently ten locations where people can cross the line of the proposed A30, including the two terminal junctions. These crossings are a mix of A-, B- and unclassified roads and all rural in character.

2.6.43 Improving the A30 corridor will not only relieve traffic congestion, but will also provide an opportunity to improve facilities for walking, cycling and horse-riding. The aim is to mitigate any potential adverse impacts and enhance any short-comings with the existing infrastructure. A key element of the strategy is to grade separate all the existing side road crossings including ‘quiet lanes’ with either an overbridge or underpass. An underpass is being provided at Church Lane for the village of Zelah and at Ch13+000 for Newlyn Downs, which would open up public access to the heathland and adjacent historic landscape.

2.6.44 The existing A30 will be noticeably quieter when the new dual carriageway is open, and will provide a safer and more pleasant route for walking, cycling and horse-riding. Pedestrians, cyclists and horse riders will be prohibited from using the new A30 dual carriageway mainline and directed to use the existing de-trunked A30 instead. Proposals for how the existing A30 roadspace can be reallocated are in their early stages.

2.6.45 Lighting

2.6.46 Lighting on the scheme is under review however it is currently assumed the scheme would not have road lighting on the mainline, but that all major junctions would be lit with 10m high lighting columns.

2.6.47 The use of a warmer colour temperature LEDs, luminaire louvres and back shields are proposed to mitigate light spill for any adjacent sensitive receptors.

2.6.48 For bats, measures such as lower mounting height columns, warm LED colour temperatures and hedge planting for wayfinding could be considered.

2.6.49 Day-time lighting is also proposed at the two Non-Motorised User underpasses at Church Lane and Carland Cross, with the lighting turned off between the twilights to facilitate use of the underpasses by the local ecology.

Vehicular Restraint Systems

2.6.50 Vehicular restraint system (VRS) barriers are proposed in the central reserve between the two carriageways and in the verges to protect traffic from potential hazards. In the central reserve, it is currently assumed that a rigid concrete barrier will extend the entire length of the scheme. In the verges, this will be a steel open box beam or tension corrugated barrier system, situated in front of all hazards such as traffic signs and street furniture, significant earthworks, bridge abutments etc.

Fencing

2.6.51 The majority of fencing along the scheme will be badger/otter proof fencing. Badger/otter fencing will be timber post and four rail fencing with welded steel mesh attached that either extends above the rails to prevent climbing over or below the rails into the ground to prevent digging under.

Road Signs and Markings

2.6.52 Large Advanced and Local Direction Signs (ADS/LDS) are proposed in advance of the junctions on the mainline and the associated side roads and within the junctions, and also at isolated locations along the mainline for destination information. Warning signs and regulatory signs are provided within the junctions and the side roads. The large ADS/LDS signs will be unlit but the smaller regulatory and warning signs (speed limit, give way, stop, roundabout ahead etc.) will require lighting.

Kerbing

2.6.53 Kerbs will not be used on the mainline, to facilitate the over the edge drainage proposals, however kerbs will be used at side roads and junction slip roads and connector roads.

2.6.54 Kerbs at side roads are proposed as full-battered (splayed) whilst kerbs at junctions are half battered with adjacent footway/cycleways. The kerbs are either precast solid concrete with Kerbs at junctions will be either solid half-battered kerbs or kerb-drains used to convey surface water to drainage systems. All kerbs will be precast concrete.

Pavement

2.6.55 The mainline and side road carriageways have a fully flexible pavement construction of varying depths to suit the traffic volumes.

2.6.56 Mainline and side road foundations will be either foundation class 2 or foundation class 3 using MCHW1 cl. 803 – type 1 subbase with an underlying granular capping layer as required.

Technology

2.6.57 The scheme includes limited technology to support the maintenance and operation of the new road and has been developed in agreement with the Highways England Maintenance, Operations and Technology teams.

2.6.58 There are four CCTV camera stations, one at the three major junctions and one in between Chybucca and Carland Cross, one new weather station (location to be confirmed but likely to be close to the existing station at around Ch7+100), emergency telephones in all public lay-bys and also traffic counters in four of the public lay-bys.

2.6.59 No Variable Message Signs (VMS) are proposed with the scheme, however, the maintenance lay-bys have been located and sized such that they could accommodate VMS signs in the future.

Temporary Works

2.6.60 Full details of the temporary works including the temporary compounds and topsoil storage areas will be included in the Buildability Report, which will be prepared for the ES.

2.6.61 It is currently proposed to include two main compounds located at each end of the scheme, known as the Eastern and Western compounds. The Eastern compound will include with the main office buildings / welfare facilities, car parking / mini bus parking and the induction centre. Both compounds will provide traffic management / maintenance, material storage, satellite offices, fuel storage, washout pits for concrete and sweepers, waste segregation area and topsoil subsoil storage.

2.6.62 Compounds for the junction and side road overbridge and underbridge construction are located at the following locations:

- Chiverton Junction underbridges
- Chybucca Junction overbridge
- Allet Road underbridge
- Green overbridge at Marazanvose
- Tolgroggan Farm overbridge
- Trevalso Lane underbridge
- Penny-come-quick underbridge
- Carland Cross Junction underbridge

2.6.63 These will provide welfare facilities, site office, storage for piling, formwork and reinforcement materials, fabrication area for bridge beams, plant lay down area, storage for highway materials and local topsoil / subsoil storage.

2.6.64 Areas have also been identified for bulk stone and topsoil stockpiling and storage in addition to the areas within the compounds and these are shown on the General Arrangement drawings in Figure 2.1.

2.6.65 To maximise efficiency and safety for both general traffic and the contractor's staff during construction, localised areas of temporary roads will be required to allow traffic to be temporarily diverted from the area of the permanent works. These include the following areas:

- Chiverton Junction – Between the realigned B3277 and A3075 side roads;
- Chybucca Junction – between the realigned B3284 side road and the existing A30 the northern side of the junction;
- Trevalso Lane – Temporary access to maintain side road access (assumed not able to temporarily stop-up); and
- Carland Cross - Temporary access for windfarm.

Temporary Drainage

2.6.66 Where possible, the permanent earthworks drainage will be installed early, with cut-off ditches and filter drains, and these will manage the surface water run-off towards and within the site and discharge it into the existing watercourses via the temporary/permanent ponds as required.

2.6.67 The contractor would also need to obtain temporary discharge consents from Cornwall Council and Environment Agency and implement extensive pollution

control measures in order to maintain existing water quality and ecological interests within the existing rivers and watercourses.

2.6.68 Temporary settlement ponds will be created in the same location as the proposed permanent ponds to ensure any site surface water discharge to the adjacent watercourses is of the required quality, with any suspended solids given the opportunity to settle out.

2.6.69 To mitigate spills, it is assumed that all generator machinery will be installed with a drip tray and that there will be spill kits located on-site at all discharge points.

2.6.70 At watercourse crossings, during the construction of the permanent culverts, it is assumed that multiple temporary smaller pipes (same cross-sectional area as the existing) will be used adjacent to the new crossing with the watercourses locally temporarily realigned to suit.

Diversions of Statutory Utilities

2.6.71 The scheme affects a number of Statutory Utilities that run longitudinally along or transversely across the existing A30 and the associated local side road network.

2.6.72 This includes a major high-pressure gas main, two renewable energy windfarms at Chybucca and Carland Cross, strategic transatlantic and local telecommunications, water mains and high, medium and low voltage power.

2.6.73 The existing services crossing the new scheme are either diverted under or over the new route or realigned to avoid the need to cross the route.

2.6.74 The existing services running along the existing A30 or side roads, that are affected when the new route follows the same line as the existing, are diverted into the realigned existing A30 or side roads to facilitate easier, safer and less disruptive ongoing future maintenance.

2.6.75 New power and telecommunications services are also required to serve the new technology and lighting provisions on the scheme, including the CCTV camera stations, weather station, emergency telephones and junction and NMU crossing lighting.

2.6.76 For some of the major diversions, with long lead-in times for material procurement and construction, Highways England are considering whether these could be completed in advance of the main construction works, making the main works more efficient and safe during construction.

Permanent and Temporary Land-Take

2.6.77 Permanent and Temporary land-take requirements are shown within the proposed scheme boundary line on the General Arrangement drawings in Figure 2.1.

2.6.78 Permanent land-take is required to construct, operate and maintain the new scheme and includes the footprint of all the proposed highway infrastructure, earthworks and drainage works and also includes the areas for environmental mitigation, such as landscape planting, areas of replacement habitat and drainage ponds. Further details on the essential landscaping areas are shown on the Environmental Masterplan drawings in Figure 7.6.

2.6.79 Temporary land-take is required to assist the contractor in the construction of the scheme, including site compounds and topsoil storage areas, and can also be required for the construction of part of the works with a permanent easement right retained for operation and maintenance.

Environmental Mitigation Design Measures

2.6.80 Environmental mitigation measures shown on the Preliminary Environmental Masterplans (Figure 7.6) and described in this PEIR are considered to be essential. The Environmental Masterplans incorporate mitigation measures identified as part of the environmental assessment process, and would be developed further during the detailed design phase of the scheme.

2.6.81 The Environmental Masterplans incorporate habitat replacement for important and notable habitats and species as appropriate. This includes habitat creation for grasslands, heathland, hedgerows and woodlands designed to benefit bats, badgers, otters and reptiles. New road crossing structures for these species have been provided within appropriate locations and associated fencing and hedgerow planting to funnel the animals under or over the road. Bat boxes would also be provided.

2.6.82 Lighting specifications have also been designed to be sympathetic to bat species. This includes directional lighting with back plates, LED luminaires and the avoidance of white and blue wavelengths, which are known to attract bats as they attract food sources.

2.6.83 The landscape strategy has been prepared to address mitigation requirements for both ecology and landscape assets. The design rationale has focused on replacement of vegetation lost during construction, enhancing natural habitats and providing screening vegetation. Where planting is proposed, it would include native species reflecting those currently on site, and would be of local provenance. This design rationale also sits in line with the requirements of Cornwall Council's Cornwall design Guide (2013) where proposed landscaping should be based on locally sourced species native to Cornwall and appropriate to the specific locality.

2.6.84 Local native species would be introduced in areas where vegetation removal is required to accommodate construction. Swathes of native tree and shrub species would be punctuated with more mature standard trees giving instant height and impact, helping to settle the scheme within the surrounding landscape. Over time, this vegetation would mature to offer effective integration and screening whilst also reinforcing the character of the local landscape. Hedgerows would also be incorporated to define new boundaries and tie into the existing field pattern. Cornish hedgerows are used where appropriate to the local character and to provide acoustic mitigation.

2.6.85 To avoid significant observed adverse effects from noise and vibration, minimise as far as sustainable other likely significant adverse effects from the scheme and reduce existing and future significant observed adverse effects, a noise barrier is proposed at (indicative) chainage 6+850.000 to 7+400.000. This will be integrated into the landscape and visual mitigation design. Low noise surfaces would also be incorporated as part of the scheme.

2.7 Construction, Operation and Long Term Management

Sequence of Construction Activities

2.7.1 The construction activities for the scheme would be typical of a major road scheme and consist of the following:

- Advance/preparatory works to be undertaken prior to construction including advanced ecology mitigation (moving of badger setts and vegetation clearance etc.) and archaeological investigation;
- Site establishment and any further vegetation clearance;
- Main construction works involved in the scheme drainage and bulk earthworks and where needed statutory utility diversions;
- Junction bridge structure construction at Chiverton, Chybucca and Carland Cross;
- Road works and other associated side road, Non-Motorised User and ecology structures; and
- Final tie-ins and soft landscape works.

Chiverton Junction

2.7.2 This is a large fill operation and would require the material from the cut areas local to this area i.e. Ch2+500 – Ch3+100 and also cut area east of Chybucca at. Ch4+800 – Ch5+900 and Ch6+400 – Ch7+800. It is possible that the twin bridges at Chiverton Junction would be built at the same time as the earthworks is ongoing. The early construction of the Chybucca Junction and associated overbridge structure is critical to allow the A30 traffic to be diverted up and over the new structure, creating an uninterrupted haul road from east of Chybucca to Chiverton. It is possible that only part of the bulk earthworks would be completed at Chiverton in the first earthworks season, whilst the Chybucca crossing is being created, and then the remainder is completed in the second season when site won material can be brought from east of Chybucca. This will be detailed in the final ES.

Carland Cross Junction

2.7.3 This is another large fill area and there are no large cut areas near-by. It is possible that these works are a good location for importing fill as it is at the east end of the project with good access to the existing dual carriageway. The material from Penny-come-quick may have to be hauled over a temporary Bailey bridge (over the A30) to maximise programme. The Carland Cross junction under bridge would be constructed at the same time as earthworks is ongoing.

Chybucca Junction

2.7.4 The programme would aim to construct the Junction overbridge as early as possible so that the connection road for the two roundabouts can be completed.

2.7.5 The remainder of the scheme construction would have to fit in around these three main junctions with pockets of cut/fill to be completed after the bridges have been completed. i.e. Allet Road underbridge, Tolgroggan Farm overbridge, Trevalso Lane and Penny-Come –Quick underbridge.

The construction programme would require two earthworks seasons in 2020 and 2021 with an estimated completion 8 months after last earthworks season. The scheme is anticipated to be open for traffic December 2022 and completed 2023.

Programme

2.7.6 The start date for the construction phase would depend upon a number of factors including the grant of a development consent order. It is currently anticipated that the construction activities for the scheme would commence in March 2020, as identified in the Road Investment Strategy

2.7.7 Projects are planned and designed to meet the future, anticipated needs and characteristics of a certain year. For the purpose of this PEIR, the scheme opening and design years have been taken as 2022 and 2038 respectively.

2.7.8 The construction programme would be finalised by the main contractor in advance of the works. The duration of the works is currently estimated to require a construction period of at least 30 months, including two full earthworks seasons and excluding advance works/vegetation clearance/major utility diversions, archaeological testing and de-trunking of the existing road.

2.7.9 Following construction there will be a 36-month environmental aftercare maintenance and monitoring period.

Hours of working

2.7.10 The site workforce could be approximately 50-100 staff at any one time and would consist of management and administration staff, civil and structural engineers/surveyors, machine drivers, ground workers, steel fixers and electricians.

2.7.11 The expected site hours are 07:30 to 19:00 Monday to Friday in the summer months, with Saturday working 07:30 to 13:00. Working hours would likely be adjusted in line with the daylight hours through the winter months. Limited night time and weekend working is likely to be required for the tie-ins to the existing road network.

Construction Access and Vehicle Movements

2.7.12 During the construction of the new scheme, there will be deliveries of new materials to site, as well as movement of material and earthworks within the site. The earthworks strategy and mass haul proposals will confirm how site won material will be moved around site and if necessary where material will need to be imported to site or exported off-site as a waste. Full details of the earthworks strategy will be confirmed in the Buildability Report, which will be prepared for the ES and will include an overview of the vehicle movements anticipated on site throughout the construction phase.

2.7.13 With the combination of 1:2 and 1:2.5 earthworks slopes and over ten significant drainage ponds, the scheme is generating an earthworks deficit of approximately 150,000m3, of which it is currently assumed that 50,000m3 will be imported to site and the remaining 100,000m3 will be won from within the site.

2.7.14 In addition to this, with an average depth of 350mm, the scheme is estimated to generate a topsoil volume of approximately 400,000m3, which will need to be

stored before being re-used on the new embankment and cutting slopes and within the adjacent essential landscaping areas.

2.7.15 Construction traffic for any delivery of new materials to site will primarily use the existing A30 but will access the construction site and compounds off the associated side roads including the A390, B3284, A39, Allet Road, Shortlanesend Road and Penny-Come-Quick Road.

2.7.16 A haul road will be established by the contractor through the site, so it is assumed that all the site won material will be moved within the site using the haul road rather than the existing A30, with plant crossings required on some of the side roads.

2.7.17 It will be the responsibility of the Contractor to ensure that the site is operated safely and kept secure to prevent unauthorised access to members of the public. This will include the site accesses, site haul routes and the protection of scaffolding and open excavations. The haul route would be placed along sections of the scheme which would likely consist of single sized stone on a geotextile membrane. This would generate dust and would need regular watering.

2.7.18 Prior to the commencement of the main construction works, the Contractor would be required to refine and expand the Outline Environmental Management Plan (OEMP) into a Construction Environmental Management Plan (CEMP) which will include a series of construction method statements covering the full range of construction activities to be carried out during the works including site clearance, bulk earthworks, road works and landscaping (refer to Chapter 16 for further details).

Plant, Equipment and Lighting

2.7.19 A list of the key plant and equipment that would be used in the major areas of the project will be provided in a Buildability Report, which is currently being developed for the Preliminary Design.

2.7.20 The bulk earthworks will be constructed with typical earthworks moving plant such as excavators and dump trucks, track loaders and towed rollers.

2.7.21 The structures, which include, pre-cast portal frame bridges, composite bridges and prestressed concrete beam bridges, will be constructed with plant such as pilling rigs, cranes (crawler/mobile), concrete mixer trucks, disc cutters, scaffolding and forklift trucks.

2.7.22 Working hours are likely to be adjusted in line with the daylight hours through the winter months and limited night time working only required for the tie-ins to the existing road network. Lighting of the compounds and at work sites along the site will be limited.

2.7.23 Plant crossings will be provided on all roads except on the existing A30.

Footpath and Public Rights of Way

2.7.24 It is assumed that all footpaths, cycle routes and bridleways proposed to be retained in the scheme will be maintained during construction with local temporary diversions as required. It may be possible that temporary closures will be required but these will be for short periods and will be agreed with the Local Authority Public Rights of Way (PRoW) Officer and the relevant user groups.

Environmental Management Plan

2.7.25 An Outline EMP will been developed and provided in the ES. The Outline EMP will summarise scheme specific actions, identified through the EIA process and will be presented in the Register of Environmental Actions and Commitments (REAC) contained the ES. Further details are provided in Chapter 16 Environmental Management.

Site Waste Management Plan

2.7.26 The generation and handling of waste materials from the construction phase is an important aspect of the environmental assessment and environmental control and management during construction. So as to ensure compliance with legislative requirements in relation to the management of waste, and to demonstrate their Duty of Care, the appointed contractor would be required to expand the outline Site Waste Management Plan (SWMP) prepared for the ES, for the construction phase of the scheme.

Traffic and Transport Management Plan

2.7.27 A Traffic and Transport Management Plan would be prepared by the appointed contractor prior to works commencing, to be agreed with Highways England and Cornwall Council. The Traffic and Transport Management Plan would ensure minimal disturbance as a result of construction activities, for the existing mainline A30 and local side road network. Road space, road closures and any associated temporary traffic management and signals would need to be authorised and confirmed in advance by either Highways England for the A30 or Cornwall Council for the local side roads, and would include consideration of any other works and any planned events.

2.7.28 A draft Traffic and Transport Management Plan will be prepared during the Preliminary Design completion and will be available for submission with the ES.

2.7.29 It is assumed that traffic management will be in place of the existing A30 for the full construction period whilst on the local side roads it will be only be required for more targeted shorter durations.

2.7.30 The traffic management will reduce the temporary lane widths to at least 3m and temporary speed limits may be implemented to ensure safety of construction operations and road users.

2.7.31 The current traffic management phasing at the five critical points of the scheme is as follows:

Chiverton Junction

- Divert A3075 traffic on to northern slip roads. Construct a temporary carriageway at the roundabout to straighten alignment;
- Construct new A30 westbound on slip and off slip. Construct new westbound carriageway between Chybucca and Chiverton;
- Divert A30 east and west bound traffic on to new slip roads. Construct new local road slip roads to the south of the junction;
- Put traffic on the duel section of the A30 into single lane running to allow hardened section of central reservation to be constructed. Construct cross over;

- Open new Chiverton roundabout to provide new north south and east west movements. Put A30 into 1 on 1 contraflow to allow cutting and road construction on eastbound carriageway;
- Switch contraflow on to westbound carriageway; and
- Complete tie-ins and fully open.

Chybucca

- Construct new Perranporth link road and temporary carriageways along the north side of the site. Construct temporary alignment for B3284;
- Switch A30 traffic onto temporary alignment. Switch B3284 traffic onto temporary alignment. Stop up right hand movement at B3284;
- Complete new junction and transfer existing Chybucca traffic movements onto new junction. Construct east bound carriageway; and
- Switch A30 traffic on to new eastbound carriageway. Construct westbound carriageway.

Zelah Realigned Existing A30

- Construct temporary access for Tolgroggan farm. Demolish existing bridge;
- Construct offline section of new local road. Narrow existing A30 eastbound carriageway to 1 lane to provide construction access and working area; and
- Switch A30 traffic onto new local link road – construct new A30 offline.

Trevalso Lane

- Construct temporary farm access or use alternative access road from the south; and
- Construct first half of structure offline. Move A30 traffic over completed structure. Construct second half of bridge.

Carland Cross

- Construct temporary access track for wind farm;
- Construct new link road and north roundabout (phased construction to maintain wind farm access);
- Open new link road and roundabout to provide temporary alignment for A30 east and westbound traffic. Stop up old A30;
- Import fill across old A30 to construct fill area to the east of the new junction. (Note Bailey bridge option could be used in phase 1 to permit earlier movement of material);
- Open A30 east bound on slip to east and west bound traffic (check design width). Put A30 into contraflow. Construct new A30 westbound off slip; and
- Move traffic into contraflow on new westbound carriageway – complete central reservation and eastbound carriageway.

Maintenance Proposals

2.7.32 A Maintenance and Repair Strategy Statement has been prepared for the scheme, which identifies the assets to be maintained and how these will be maintained during operation.

2.7.33 The maintenance proposals will be developed with engagement with all key stakeholders, including the Highways England's Maintenance and Operation team and contractors, Cornwall Council and the Statutory Undertakers.

2.8 Demolition

2.8.1 The traffic and economic assessment demonstrates that the proposed improvements would operate adequately for the first 15 years of opening to the Design Year of 2038. Typically, highway schemes are designed to have a material life-span of between 20 and 40 years before major maintenance and upgrading is required dependant on material properties, maintenance and usage. Elements including structural concrete and steelwork have extended design lives of up to 120 years.

2.8.2 It is considered highly unlikely that the scheme would be decommissioned after the various design life listed as the road is likely to have become an integral part of the infrastructure in the area. Decommissioning would not be either feasible or desirable, and is therefore not considered further within this PEIR.

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A30 Chiverton to Carland Cross Improvement Scheme
Preliminary Environmental Information Report

Chapter 3 Considerations and Alterations

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3 Consideration of Alternatives

3.1 Introduction

3.1.1 This chapter presents a summary of the alternative options which have been considered and the justification for the Scheme.

3.1.2 A Scheme Assessment Report was published in June 2017 which provides a full description and assessment of the alternative options, including the public consultation and the recommendations of a preferred route. This can be found at the following link:

https://highwaysengland.citizenspace.com/he/a30-chiverton-to-carland-cross-improvement-scheme/results/scheme-assesstment-report.pdf

3.2 Alternatives Considered 1980-2014

3.2.1 Cornwall Council and Highways England conducted extensive studies for the improvement of the A30 between Chiverton Cross and Carland Cross in the past, as summarised in Table 3-1.

Table 3-1 List of Alternatives 1980-2014

Year	Summary of Alternatives Considered
1980-1990s	Cornwall County Council (now Cornwall Council) considered improvements between Carland Cross and Chiverton Cross in two separate sections: • Carland Cross to Zelah was included in the Government's white paper Roads for Prosperity in 1989, but not implemented • Zelah to Chiverton Cross roundabout The Zelah bypass was constructed in 1991 to alleviate the narrow roads through the village of Zelah from the increasing volumes of traffic along the A30.
2002-2009	In 2002 the Highways Agency (now Highways England) reviewed options. A single option was presented to a public consultation in May 2004, following which the Secretary of State for Transport made a preferred route announcement in March 2005. However, the South West Regional Assembly (SWRA) recommended that the scheme should be delivered in the longerterm. In July 2006 the Secretary of State for Transport accepted SWRA's advice and indicated that funding was unlikely before 2016 at the earliest.
2006-2008	Following SWRA's assessment that improving the full length to dual carriageway standard was not a priority, the Highways Agency commissioned a safety improvement scheme in December 2006, which could be delivered within the ten year plan. An initial Scheme Assessment Report was produced which: • described the options considered • described the impact of those options in terms of traffic, safety, economic and environmental impact • recommended a strategy for improving this section of A30 prior to 2016

3.2.2 In 2014, Highways England developed a route strategy for the A30, which led to the scheme being included in the Department for Transport's Road Investment Strategy (RIS) for 2015-2020[1], published in December 2014.

[1] https://www.gov.uk/government/collections/road-investment-strategy

3.3 Assessment Methodology

3.3.1 The Road Investment Strategy (RIS) for 2015-2020 sets out the list of schemes to be developed by Highways England over the period from 2015-2020, and includes the A30 Chiverton to Carland Cross.

3.3.2 Possible solutions for schemes named in the RIS were identified by Highways England after collating evidence on network performance issues and from local stakeholders. Following an options assessment, a recommended solution emerged for which an outline and strategic business case was made.

3.3.3 The list of possible solutions was then developed building on the previous options assessment and strategic business case. This included further assessment identifying that a full dual carriageway standard route (either on-line or off-line) would be the only option that would fully address the scheme objectives out of a possible 11 options considered, including improvements to bus and rail services.

3.3.4 Subsequent to the RIS publication, Highways England undertook Project Control Framework (PCF) Stage 1 to identify feasible options for a full dual carriageway standard route.

3.3.5 This led on to PCF Stage 2 to further investigate a number of mainly offline solutions to achieve the Scheme requirements, and to carry out a public consultation to select a preferred route.

3.3.6 During Stage 2, the project team undertook the following activities:

- Traffic modelling and economic appraisal for options
- Engineering design for options
- Environmental surveys
- Environmental assessment and mitigation design for options
- Stakeholder engagement
- Public consultation
- Design and assessment of alternatives emerging from public consultation
- Supplementary consultation on alternatives
- Option refinement
- Assessment and reporting

3.3.7 Following public consultation, a number of options for each element of the Scheme were identified to address concerns raised during the consultation. The process of assessment of the various scheme options was formed of the following stages:

- Prior to option selection workshop:

    i. Each alternative for each element of the Scheme was developed so that there was like-for-like comparison in terms of scale, quantum, purpose, etc.
    ii. Each project discipline reviewed each element and summarised the assessed impacts, such that the likely impacts and effects of each element were understood.
    iii. From analysis of each discipline summary assessment of each option, key risk areas were identified for sharing with the workshop group. The National Policy Statement for National Networks weighting for

each generic impact assessed was assigned to the described impact for each discrete alternative.

- At the option selection workshop:

iv. The workshop participants reviewed drawings of each assessed alternative and the assessment undertaken. The summarised significant impacts for each alternative were described by relevant specialists to ensure a common understanding of all salient issues.

v. When all salient issues were listed for each alternative, a pairwise comparison was undertaken i.e. two alternatives were compared; advantages and disadvantages were listed; and conclusions reached on which alternative to take forward for comparison with any further option. This pairwise comparison process was repeated until a preferred option emerged.

3.3.8 Following the workshops, those options that were 'carried forward', as identified in Table 3-2, were then subject to a further information gathering event for key stakeholders prior to preferred route selection.

Table 3-2 List of Alternatives

Location	Options	Rejected or Carried Forward
1. Chiverton	At Grade Throughabout (Hamburger) Discarded	Discarded
	At Grade Gyratory Discarded	Discarded
	Dumbell closer to existing roundabout – Location A Discarded	Discarded
	Gyratory at consultation location – Location B Carried forward	Carried forward
	Gyratory – Location C (between Locations A and B) Discarded	Discarded
	NMU provision for the above Carried forward	Carried forward (Opportunity)
2. Chybucca	More southerly realignment at Chybucca with online section	Carried forward
	Reduce separation between the existing A30 and the proposed dual carriageway.	Carried forward
3. Marazanvose:	Alignment initially south of existing A30 with online sections to reduce severance in Nancarrow	Carried forward
	Alignment moved north of Marazanvose	Carried forward
	Alignment and side road moved north of Marazanvose	Carried forward
	Northern option, old A30 to south of D2AP (similar to Buildability Workshop Alt 3.)	Discarded
	New junctions either side of Zelah i.e. at Boxheater or Penny-come-Quick and provide all movements at Twobarrows	Discarded
	Alignment south of Boswellick Farm extending beyond Penny-come-Quick – a major off-line southern alternative.	Discarded
4. Trevalso	Underbridge to retain connection to the existing A30	Carried forward (Opportunity)
5. Carland Cross	Northern link for existing A30 to remove proposed bridge and existing A30 to allow existing barrows group to be re-connected	Carried forward

3.3.9 A summary of the reasons why those alternatives described in Table 3-2 were discarded is provided in Table 4.2 of the Scoping Report[2].

3.3.10 On 3rd July 2017 the preferred route for the A30 Chiverton to Carland Cross scheme was announced as a modified version of the route presented at consultation.

3.4 Reasonable Alternatives Studied

PCF Stage 1

3.4.1 As part of PCF Stage 1 two options were identified which included:

- An on-line option where it aligned close to the existing road corridor and re-used the corridor occupied by the existing Zelah Bypass; and
- a wholly off-line solution (i.e. it did not affect the existing A30) thus allowing it to be used as a continuous route for local traffic separate from the new dual carriageway.

3.4.2 It was concluded that the off-line option was preferable for the following reasons:

- reduced air quality and noise impacts to properties alongside the existing road;
- better opportunities for re-use of the existing road for local connectivity, including non-motorised use, as well as part of the Land's End to John O'Groats cycling route;
- less disruption during construction; and
- potentially quicker and cheaper to construct.

3.4.3 This led on to PCF Stage 2 to further investigate an off-line option and carry out a public consultation to select a preferred route.

PCF Stage 2

3.4.4 During October and December 2016, the public and other stakeholders were consulted on a single mainly off-line alignment, which included a variation around Chybucca.

3.4.5 Following this, in 2017, the alignment and junction designs were revisited in a series of multi-disciplinary workshops involving environmental specialists, highways engineers, town planners and transport planners; all working on behalf of or for Highways England. Feedback from the public and other stakeholders, such as Historic England, Natural England and Cornwall Council was also considered.

3.4.6 In June 2017, a preferred route and site for the two junctions at Chiverton Cross and Carland Cross, as well as an area of land to be protected from further development in order that the scheme can be delivered, was identified.

3.4.7 The current design of the preferred route has been refined further following environmental assessment undertaken as part of the EIA (with progress to date

[2] https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010026/TR010026-000004-Scoping%20Report.pdf

reported in this PEIR) and PCF Stage 3. Amendments to the preferred option are detailed in Section 3.7.

3.5 Consultation on Options

3.5.1 Highways England held a public consultation from 15 October to 2 December 2016 to:

- raise awareness and understanding of the need and rationale for the proposed improvements;
- obtain objective feedback to enable the scheme design to be refined and developed;
- identify any opportunities to improve the proposal.

3.5.2 At the consultation, a single route with two alignment options at Chybucca was presented. The consultation events were well attended, with an average of 208 visitors per event, totalling 835. Approximately 1,400 questionnaires were taken from events and deposit points and 698 questionnaire responses were received, online or in paper form.

3.5.3 Of those who responded to the consultation, 95% support the need for improvements to this section of the A30. This is largely in line with previous consultations; the 2015 events received support from 94% of those who gave feedback. 92% supported the principle of a dual carriageway with grade separated junctions; 86% supported the retention of the existing A30 as a route for local traffic.

3.5.4 The Public Consultation Report[3] describes the consultation, highlighting the choices offered and the manner in which the scheme was presented. Feedback from the consultation is analysed, discussed and the findings summarised.

3.5.5 The areas where the public felt the scheme could be improved were:

- Chiverton Cross Junction and a more efficient passage of vehicles from St. Agnes to Truro.
- A more southerly alignment at Chybucca, not separating the properties of Callestick Vean and using more of the existing highway.
- Addition of east facing slip road at Chybucca to form an all-movements junction
- Impact on productive farmland, particularly at Nancarrow Farm.

3.5.6 Following the public consultation, a number of alternatives were suggested which were taken forward and considered. The following alternative alignments and junction layouts were further assessed against a refined consultation layout:

- Chiverton Cross:
  - Gyratory close to existing junction
  - Gyratory replacing dumbbell at consultation location
- Chybucca: more online making better use of existing road and reducing farm severance

[3] https://highwaysengland.citizenspace.com/he/a30-chiverton-to-carland-cross-improvement-scheme/results/ropc-report-only.pdf

- Marazanvose to Zelah (all tying into Twobarrows Bridge on Zelah bypass):
  - Southern Route
  - Northern Route Option 1
  - Northern Route Option 2 (with new northern local route)
- Carland Cross: alternative route for a Northern link to allow existing barrows group to be reconnected and remove proposed bridge on Newlyn Downs.

3.5.7 The environmental assessment of these alternatives is provided within Chapter 7 of the Scheme Assessment Report[4].

3.6 Justification for Chosen Option

3.6.1 The environmental assessment undertaken for the options presented at PCF Stage 2 led to a preferred option. The reasoning for the preferred option is set out below and is split into route locations for clarity. The main alignment was designed to minimise the impacts of farm holdings where possible and avoid impacts on statutorily protected assets such as Scheduled Monuments.

3.6.2 At Chiverton Cross, a single gyratory grade-separated junction east of the existing junction was chosen out of three possible options for the following reasons:

3.6.3 Increased capacity on the gyratory junction.

- The location at Chiverton is limited by the presence of businesses and dwellings. The proposed location of the junction (east) allows for the larger gyratory (additional 6100m² of carriageway and sidewalks);
- Properties to the south (e.g. Roscarnick Farm) may experience a decrease in noise levels due to increased distance from the A30 and landscaping which may provide some screening effects;
- The proposed route would cost an additional £3m than the consultation base estimate of £114.8m. However, the recouped benefits for the increased size would be £3.6m.

3.6.4 Two options for the route alignment at Chybucca were considered and the alignment to the south of Callestick Vean was chosen for the following reasons:

- In regard to noise and vibration there is likely to be a beneficial effect at Callestick Vean as the A30 will be further from the property than the northern route.
- The route limits the disruption to the existing field pattern.
- Disruption to private access would be minimised with the online route.

3.6.5 Three possible options for the alignment at Marazanvose were considered and the southern option closest to the existing carriageway was chosen for the following reasons:

- The preferred route to the south would move the carriageway further from the Chyverton Registered Park and Garden, reducing the impact on landscape and the historic setting.

[4] https://highwaysengland.citizenspace.com/he/a30-chiverton-to-carland-cross-improvement-scheme/results/scheme-assesstment-report.pdf

- The preferred route would require between 6200 and 17500m² less carriageway and side roads compared with the consultation and northern options. This reduction in hardstanding reduces the overall land take required by up to 31,100m².
- The chosen option would avoid Marazanvose hamlet becoming an island in between the new and old A30 carriageways.

3.6.6 An additional crossing point at Trevalso was added following public consultation for the following reasons:

- Sight decrease in pollutant exposure at Henver Cottage and Henver Lane House due to increased distance to the roadside.
- The addition of the underpass, which lies near to bat maternity roosts, is likely to be of benefit at this location; a large number of lesser and greater horseshoe bats have been recorded in this area. The crossing point may provide additional mitigation in this area.
- This option creates no adverse harm to designated heritage assets.
- No Public Rights of Way (PRoW) or open access land will be affected by the crossing.

3.6.7 The layout of the junction at Carland Cross was chosen for the following reasons:

- The route alignment bisects the remnant section of heath to the south of the current A30. This option allows reconnection of an ancient barrow landscape at Warrens Barrow, currently severed by the existing A30.
- The layout would receive additional cost benefits of £3.8m.
- The alternative route would result in reduced earthwork requirements.
- No PRoW or areas of open access land are impacted.

3.7 Amendments to the Preferred Option

3.7.1 Since the Preferred Route Announcement, the following changes to the design have been made:

General

- Tie ins updated to tie into the Stage 3 terrain model.

Mainline

- The proposed mainline was extended by 170m at the eastbound extent to ensure the vertical alignment tied into the alignment of the existing A30.
- 19 substandard transition lengths were increased to provide a length corresponding with q = 0.3 m/sec^3, as per TD 9/93.
- 6No. Lay-bys were added as per TD 69/07 requirements (the Stage 2 proposal had 1No. lay-by on each carriageway).
- A number of relaxations in the vertical alignment were removed.

Junctions

- The slip roads at Chiverton Junction, Chybucca Junction and Carland Cross Junction were updated to be fully compliant with DMRB, including full mainline SSD provided from the back of the nose as per TD22/06 Figure 4/3A.

- The Chiverton gyratory was moved 100m East to ensure the earthworks for the eastbound diverge did not encroach into Starbucks land and the service area.
- The Shape of Chiverton Junction's gyratory was updated from round to oval to remove the need for a retaining structure at the East bound diverge.
- The ICDs on Chybucca's roundabouts were increased to provide entry path deflection as per TD 16/07. In addition, the southern roundabout was moved 6m south east.

Side Roads

- Trevalso culvert crossing was upsized from a mammal crossing to a vehicular crossing. Subsequently Henver lane was realigned to suit.
- Transition curve lengths were added to the side roads as per TD 9/93.
- Verge widths updated to standard as per TD 27/05, with the exception of the lane crossings at Tolgroggan and Trevalso.
- The clearances were increased at Tolgroggan overbridge and Carland Cross underbridge to provide headroom as per TD 27/05.

3.7.2 The Scheme design considered as part of the PEIR therefore differs slightly from that which was included in the Scoping Report. However, this is not considered to be a material change and therefore resubmission of the Scoping Report is not required.

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Preliminary Environmental Information Report

Chapter 4 Approach to Environmental Impact Assessment

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4 Approach to Environmental Impact Assessment

4.1.1 This chapter of the PEIR details the approach taken to undertake the Environmental Impact Assessment (EIA) of the scheme. The chapter introduces the requirements of the Design Manual for Roads and Bridges (DMRB) and sets out the overall approach to the assessment of the likely effects of the scheme. It also includes details of the consultation undertaken to date and general assumptions and limitations.

4.1.2 Further details of topic specific methodologies, such as survey methods, are provided in each relevant topic chapter of this PEIR.

4.2 Legislative and Policy Framework

4.2.1 The legislative framework for EIA is set by the EIA Directive (European Directive 2011/92/EU, as amended). As set out in Chapter 1, the scheme meets the criteria to be considered a Nationally Significant Infrastructure Project (NSIP) under the Planning Act 2008 (the Act) and therefore the EIA has been set out in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 which transposes the EIA Directive.

4.2.2 Chapter 1 sets out the relevant legislation and policy that will be taken account in the EIA process.

4.3 Requirements of DMRB

4.3.1 All aspects of the development and design of major highway projects are governed by guidance set out in the volumes of the DMRB. Guidance on EIA for highway projects is given in Volume 11[1], with guidance on environmental design in Volume 10[2]. Additional supplementary guidance is provided by Interim Advice Notes[3].

4.4 Environmental Assessment Methodology

Relevant EIA Guidance

4.4.1 The EIA process has taken into account relevant guidance, including the following.

- Design Manual for Roads and Bridges (DMRB) Volume 11, Section 1 Aims and Objectives of Environmental Assessment HA 200/08[4].
- DMRB Volume 11, Section 2 General Principles of Environmental Assessment, including HA 201/08[5], HA 202/08[6], HA 204/08[7], HA 205/08[8] and HD 48/08[9]
- Interim Advice Note 125/09(W) Supplementary Guidance for Users of DMRB Volume 11 'Environmental Assessment'

[1] http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/index.htm
[2] http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol10/index.htm
[3] http://www.standardsforhighways.co.uk/ha/standards/ians/
[4] http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section1/ha20008.pdf
[5] http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section2/ha20108.pdf
[6] http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section2/ha20208.pdf
[7] http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section2/ha20408.pdf
[8] http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section2/ha20508.pdf
[9] http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section2/hd4808.pdf

4.4.2 Other topic specific legislation and good practice guidance has been considered and details of these can be found in the topic chapters within this PEIR.

Key Elements of the General Approach

4.4.3 The assessment of each environmental topic forms a separate chapter of this PEIR. For each environmental topic chapter within this PEIR, the following has been addressed in conformity to the Highways England Project Control Framework (PCF), DMRB and EIA Regulations.

- Legislative and policy framework.
- Definition of the study area.
- Identification of potential impacts (including effects arising during the construction and operational phases).
- Assessment methodology.
- Description of the baseline environmental conditions.
- Details of any consultation.
- Assessment Assumptions and limitations (include the gaps and uncertainties for the purpose of PEIR)
- Identification of design, mitigation and enhancement measures, where appropriate.
- An assessment of the effects of the scheme
- Details of any monitoring requirements.

4.4.4 Each topic chapter provides details of the methodology for baseline data collection and evaluation of effects based on EIA good practice guidance documents, new emerging guidance and relevant topic specific guidance where available.

4.4.5 Cumulative effects with other proposed developments are assessed within Chapter 15 of this PEIR.

4.5 Identification of Baseline Conditions

4.5.1 It is essential for an EIA that sufficient data is obtained to form the basis of the assessment. Each topic chapter will include a description of the current (baseline) environmental conditions. This is based on the study area identified for each topic chapter.

4.5.2 The following baseline scenarios have been considered (without the scheme), where relevant, for comparison against the situation with the scheme in place.

- The baseline year for the assessment is topic specific and is dependent on the availability of existing data and new surveys. It is either 2015 or 2016.
- The start of construction is March 2020
- The dual carriageway element of the scheme is "open for traffic" in December 2022, however the scheme construction does not finish until 2023.
- The whole scheme is operational from 2023.
- The design year, 15 years after opening is 2038

4.5.3 Baseline data has been obtained from desk study sources and previous surveys undertaken at PCF stage 2, and from surveys commissioned specifically for the scheme. The identification of existing baseline conditions has been informed by data from these sources. Future baseline scenarios have been informed by extrapolation of the currently available data by reference to, for example,

Government policy, other planning applications, climate change and expert judgement of the individual topic specialists. Clearly, the more distant a future baseline is, the greater the uncertainty is in relation to the conditions that would pertain at that time.

4.5.4 Each topic chapter identifies the limitations of the assessment and whether there were any difficulties encountered in compiling the information that is presented in this PEIR.

4.6 Assessment of Effects

4.6.1 The EIA process requires the identification of the likely significant environmental effects of the scheme. This includes consideration of the likely effects during the construction and operational phases of the scheme.

4.6.2 Volume 11, Section 2 of the DMRB (HA 205/08[10]) provides guidance on the determination of significance of environmental effects for highway schemes. This includes consideration of the following.

- Environmental value (or sensitivity) of a resource or receptor;
- The level of impact; and
- The level of significance of an effect.

4.6.3 These aspects are discussed in the following sections.

Sensitivity or Value of Receptors

4.6.4 Receptors are defined as individual environmental features that have the potential to be affected by a scheme. For each topic, baseline studies have informed the identification of potential environmental receptors. Some receptors will be more sensitive to certain environmental effects than others. The sensitivity or value of a receptor may depend, for example, on its frequency, extent of occurrence or conservation status at an international, national, regional or local level.

4.6.5 Sensitivity is defined within each PEIR topic chapter and takes into account factors including the following:

- Vulnerability of the receptor to change;
- Recoverability of the receptor (ability of recover from a temporary impact); and
- Importance of the receptor.

4.6.6 As a general guide, the definitions set out in Table 2.1 of HA205/08[10] have been taken into account (except where topic guidance requires otherwise). This includes a five-point scale for assigning environmental value or sensitivity as shown in Table 4-1.

Table 4-1 Criteria and DMRB Definitions of Sensitivity (or Value)

Value/sensitivity	Typical Descriptions
Very High	Very high importance and rarity, international scale and very limited potential for substitution.
High	High importance and rarity, national scale, and limited potential for substitution.

[10] http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section2/ha20508.pdf

Medium	High or medium importance and rarity, regional scale, limited potential for substitution.
Low (or lower)	Low or medium importance and rarity, local scale.
Negligible	Very low importance and rarity, local scale.

Based on Table 2.1 of HA205/08

Magnitude of Impact

4.6.7 In DMRB, Volume 11 Section 2 Part 7 HA218/08[11] defines an 'impact' as:

'Change that is caused by an action; for example land clearing (action) during construction which results in habitat loss (impact)'.

4.6.8 For each topic, the likely environmental impacts have been identified. The likely environmental change arising from the scheme has been identified and compared with the baseline (the situation without the scheme). Impacts are divided into those occurring during the construction and operation phases.

4.6.9 The categorisation of the magnitude of impact is topic specific but generally takes into account factors such as the following:

- Extent;
- Duration;
- Frequency; and
- Reversibility.

4.6.10 When undertaking an EIA, environmental impacts are classified as either permanent or temporary, as appropriate. Permanent changes are those which are irreversible (e.g. permanent land take) or will last for the foreseeable future (e.g. noise from generated road traffic). With respect to temporary impacts, the following has been used as a guide within this assessment, unless defined separately within the topic assessments:

- Short-term: one to three years;
- Medium-term: four to nine years; and
- Long-term: greater than nine years.

4.6.11 Where environmental impacts are episodic, the frequency of the events has been predicted as far as possible.

4.6.12 Impacts are also defined as either adverse or beneficial. Depending on discipline, they may also be described as follows.

- Direct: Arise from activities associated with the scheme. These tend to be either spatially or temporally concurrent.
- Indirect: Impacts on the environment that are not a direct result of the scheme, often produced away from the scheme or as a result of a complex pathway.

4.6.13 As a general guide, the definitions set out in Table 2.2 of HA205/08 have been taken into account (except where topic guidance requires otherwise). This includes a five-point scale for assigning impact magnitude as shown in Table 4-2.

[11] http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section2/ha21808.pdf

Table 4-2 Criteria and DMRB Definitions of Impact Magnitude

Magnitude of Impact	Typical criteria descriptions
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 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 of one or more characteristics, features or elements (Beneficial).
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

Based on Table 2.2 of HA205/08

Significance of Effects

4.6.14 In DMRB, Volume 11 Section 2 Part 7 HA218/08[12], 'effect' is defined as:

'Term used to express the consequence of an impact (expressed as 'significance of effect'), which is determined by correlating the magnitude of the impact to the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria. For example, land clearing during construction results in habitat loss (impact), the effect of which is the significance of the habitat loss on the ecological resource'.

4.6.15 The term 'effect' is therefore used to express the consequence of an impact (expressed as the 'significance of effect'). This is identified by considering the magnitude of the impact and the sensitivity or value of the receptor.

4.6.16 The magnitude of an impact does not directly translate into the significance of effect. For example, a significant effect may arise as a result of a relatively modest impact on a resource of national value/sensitivity, or a large impact on a resource of local value/sensitivity. In broad terms, therefore, the significance of the effect can depend on both the impact magnitude and the value or sensitivity or importance of the receptor.

4.6.17 Each chapter defines the approach taken to the assessment of significance. Where appropriate, topic chapters have adopted the general approach set out in DMRB HA 205/08 (see Table 4.3). The evaluation of significance takes into account industry and professional guidance; codes of practice; policy objectives

[12] http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section2/ha21808.pdf

regulations or standards; advice from statutory consultees and other stakeholders, as well as expert judgement of the EIA practitioners, based on specialist experience. For some topics, a simplified or quantitative approach is considered appropriate.

Table 4-3 Approach to Evaluating Significance of Effect

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

Based on Table 2.4 of HA205/08

4.6.18 Where more than one significance level is provided, professional judgement has been used to determine the significance of effect. Slight, moderate, large or very large effects may be beneficial or adverse.

4.6.19 Except where guidance requires otherwise, the significance of effect is described using the terms very large, large, moderate, slight and neutral. The broad definitions of these terms are provided in Table 4-4.

Table 4-4 DMRB Descriptors of Significance of Effect Categories

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

Based on Table 2.3 of HA205/08

4.6.20 In terms of the EIA Regulations, significant effects are generally those where the significance of the effect is 'moderate' or greater.

4.7 Design, Mitigation and Enhancement Measures

4.7.1 One of the key requirements of an EIA is that measures are taken to avoid, reduce and, if possible, remedy significant adverse environmental effects. These are termed mitigation measures and their development is part of an iterative EIA process. Measures have been developed in response to findings of surveys and initial assessments.

4.7.2 The scheme assessed within this PEIR includes a number of measures designed to avoid or reduce significant adverse environmental effects arising, where practicable.

4.7.3 Those measures forming part of the scheme design are summarised within Chapter 2. Any additional measures identified during the detailed design will be included in the Environmental Assessment. The assessment of effects has taken into account the following measures:

- Measures included as part of the scheme design, such as those measures shown on Figure 2.1 scheme General Arrangement. These are sometimes referred to as 'embedded mitigation'.
- Measures to be adopted during construction to avoid and minimise environmental effects, such as pollution control measures.
- Additional measures identified during the EIA process to further prevent, reduce and, where possible, offset any adverse effects on the environment. These are shown on Figure 7.6 Environmental Master Plans.

4.7.4 Mitigation is a measure intended to avoid, reduce and, where possible, remedy significant adverse environmental effects. Where required, mitigation measures have been identified within each topic chapter, together with an assessment of the effects with the mitigation measures in place.

4.7.5 Enhancement is a measure that is over and above what is required to mitigate the adverse effects of a scheme. Where possible, enhancement measures have or will be identified within each topic chapter.

4.8 Monitoring

4.8.1 Procedures for monitoring mitigation measures will be developed as part of the EIA process of the scheme where significant adverse effects on the environment resulting from the construction and operation of the scheme are predicted. This is essential to determine if effects occur as predicted or if operations remain within acceptable limits, and if mitigation measures are as effective as predicted and if remedial action is required. A description of any proposed monitoring measures is provided within each topic chapter of this PEIR.

4.8.2 A Register of Environmental Actions and Commitments (REAC) will be created and included in the Outline EMP as part of the final ES. This will include details of any monitoring required, what should be monitored and how results should be used to effect necessary action. Further details can be found in Chapter 16 Environmental Management.

4.9 Combined and Cumulative Effects

4.9.1 Combined and cumulative effects result from multiple actions on receptors over time and are generally additive or interactive (synergistic) in nature. They can also be considered as effects resulting from incremental changes caused by other past, present or reasonably foreseeable actions together with the project, identified as:

- Combined effects from a single project (the interrelationship between different environmental factors); and
- Cumulative effects from different projects (with the project being assessed).

4.9.2 The combined and cumulative effects of the scheme in conjunction with other proposed developments have been assessed and the findings are presented within Chapter 15 of this PEIR.

4.10 Consultation to Date

4.10.1 This section provides a brief summary of the consultation undertaken to date on the scheme. It includes an outline of the statutory and non-statutory consultation and outlines proposed ongoing consultation activities. The Consultation Report will be available as part of the DCO submission.

4.10.2 A proactive approach has been taken to consultation undertaken during the EIA process 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 PEIR and the measures required to mitigate potential environmental impacts. This consultation has been carried out on both a formal and informal basis.

Consultation Undertaken Prior to Route Selection

4.10.3 The scheme has been through a number of extensive studies and consultation exercises since 1980 (see Table 3 1 in Chapter 3).

4.10.4 In 2016 a Preferred Scheme Consultation took place between 15 October to 2 December 2016 on a single mainly off-line alignment, which included two alignment options at Chybucca. More details on this are provided in Chapter 3 Consideration of Alternatives. Section 3.5 provides a summary of the Consultation on Options.

4.10.5 Following this, a series of multi-disciplinary workshops were held in 2017, to examine the alignment and junction designs. These comprised environmental specialists, highways engineers, town planners and transport planners; all working on behalf of or for Highways England. As noted in Chapter 3, feedback from the public and other stakeholders was also taken into account.

4.10.6 A Scheme Assessment Report was published in June 2017 which provides a full description and assessment of the alternative options, including the public consultation and the recommendations of a preferred route. This can be found at the following link:

https://highwaysengland.citizenspace.com/he/a30-chiverton-to-carland-cross-improvement-scheme/results/scheme-assesstment-report.pdf

Scoping Report Consultation

4.10.7 A Scoping Report[13] was prepared for the scheme to inform the request for a Scoping Opinion from the Planning Inspectorate (PINS). The Scoping Report sets out the proposed scope of work and methods to be applied in carrying out the EIA, and the proposed structure of the ES. The Scoping Report was submitted to PINS on 10 August 2017.

4.10.8 The Scoping Report was issued to 22 bodies including Local Authorities, relevant statutory undertakers, Statutory Environmental Bodies (SEB), Parish Councils and health bodies. Nine consultees replied by the statutory deadline. A full list of the consultees and respondents are outlined within the Scoping Opinion[14], which was received from PINS on 20 September 2017. The Scoping Report and Scoping Opinion are available at the following link:

4.10.9 https://infrastructure.planninginspectorate.gov.uk/projects/south-west/a30-chiverton-to-carland-cross-scheme/?ipcsection=docs

4.10.10 Topic specialists have addressed issues identified in the Scoping Opinion relating to their disciplines. A document showing how each issue has been addressed will be provided as part of the full ES.

4.10.11 As part of Scoping, major accident and/or natural disaster has been scoped out of this EIA. This is because major accidents and disasters will be sufficiently addressed within the scheme design and relevant discipline chapters. Further details for scoping out major accidents and/or natural disaster is provided within the Scoping Report[13].

Section 42 and 47 Consultation

4.10.12 Highways England will hold a statutory period of consultation in accordance with the Planning Act 2008 (Act) for a period of six weeks from 29 January to 12 March 2018. Statutory consultation will be held under sections 42, 47 and 48 of the Act. During the consultation the following groups will be consulted.

- All prescribed consultees under section 42 (1) (a).
- All relevant local authorities under section 42 (1) b).
- All relevant land interest parties under section 42 (1) (d).
- Consultation with the community living in the vicinity and surrounding area under Section 47.

4.10.13 The purpose of the consultation will be to invite consultees to participate and respond to the scheme proposals. Highways England has a duty under Section 49 to take account of the responses. The results of the statutory consultation will be reported in the Consultation Report as part of the DCO Submission.

4.10.14 Consultation will include a variety of events and opportunities for consultees to provide comment. A summary of the formal consultation carried out, including who was consulted and the methods used will be included in the ES.

[13] https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010026/TR010026-000004-Scoping%20Report.pdf
[14] https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010026/TR010026-000033-Scoping%20Opinion.pdf

Consultation Events and Public Viewing Places

4.10.15 A series of exhibition events will be held to provide an opportunity for the public and statutory consultees to view the scheme proposals, to discuss queries or concerns with members of the project team and to comment on the proposals by completing a questionnaire. All consultation venue locations and dates will be based on accessibility for individuals, including a selection of weekend and evening venues, accessible entrances and clear signage.

4.10.16 Details of the consultation events are available in the Statement of Community Consultation which can be accessed from the following link:

www.highways.gov.uk/a30Chiverton

4.11 PINS Engagement

4.11.1 Meetings will be held with the Planning Inspectorate (PINS) to discuss procedural and legal aspects, to confirm and clarify requirements and timings of the DCO submission and scheme programme and to discuss the requirements of the assessment of the scheme.

4.12 Ongoing Consultation

Statements of Common Ground

4.12.1 A Statement of Common Ground (SoCG) is a written statement setting out issues of agreement, and is prepared jointly by an applicant and other parties, including statutory and non-statutory stakeholders. As such, the SoCG also establishes issues about the design and / or impacts of the project which are not agreed between the applicant and parties.

4.12.2 The SoCG are in the process of being developed and will be submitted as part of the DCO submission.

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5 Air Quality

5.1 Introduction

5.1.1 Air quality is a consideration in any development proposal involving significant changes in the nature and location of emissions to air. The scheme would change the flows on the existing road, and would change traffic flows on other roads in a wider surrounding area. This would result in changes to pollutant emissions from vehicle traffic and changes in ambient air quality at nearby receptors.

5.1.2 A detailed DMRB assessment has therefore been undertaken to establish the potential effects of the scheme on local and regional air quality as outlined in the Scoping report. A detailed assessment of construction phase impacts has been scoped out of this assessment, however, a review of impacts has been undertaken following guidance in HA207/07 [1] in order to feed into the Outline EMP to be submitted as part of the ES with the DCO. This chapter describes the assessment of construction and operational effects arising from the scheme.

5.2 Legislation and Policy Framework

5.2.1 Details of relevant European, national and local legislation, policy and guidance will be provided in the ES, which will accompany the DCO application to be made in Summer 2018.

5.2.2 Potential effects on air quality resulting from the scheme have been assessed following the principles in relevant guidance outlined in DMRB HA207/07 [1], associated Interim Advice Notes (IANs) and the Department for the Environment, Food and Rural Affairs' (Defra's) Local Air Quality Management Technical Guidance (LAQM TG.16) [2]. Relevant guidance documents used for the air quality assessment are listed below:

- HA207/07 Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 1, May 2007 [1];
- IAN 170/12 v3 Updated air quality advice on the assessment of future NOx and NO2 projections for users for the DMRB Volume 11, Section 3, Part 1 Air Quality, November 2013 [3];
- IAN 174/13 Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 Air Quality (HA207/07), June 2013 [4];
- IAN 175/13 Updated advice on risk assessment related to compliance with the EU Directive on ambient air quality and on the production of scheme Air Quality Action Plans for users of DMRB Volume 11, Section 3, Part 1 Air Quality (HA207/07), June 2013 [5];
- IAN 185/15 Updated traffic, air quality and noise advice on the assessment of link speeds and generation of vehicle data into 'speed-bands' for users of DMRB Volume 11, Section 3, Part 1 'Air Quality and Volume 11, January 2015 [6];
- Note on Highways England's Interim Alternative Long Term Annual Projection Factors (LTTE6) for Annual Mean NO2 and NOx Concentrations between 2008 and 2030, draft, October 2013 [7];

- MPI-28-082014: Highways England Major Projects' Instructions – Determining the correct base year traffic model to support air quality assessments (August 2014); and
- Defra's Local Air Quality Management Technical Guidance (LAQM TG.16) [2].

5.3 Study Area

5.3.1 The air quality assessment comprises three sub-topics:

- Construction dust assessment, which is related to the risk of dust nuisance and dust with potential to affect human health and ecosystems at a local level;
- Local air quality, which relates to pollutants with potential to affect human health and ecosystems at a local level; and
- Regional air quality, which relates to pollutants dispersing over a larger area, with potential to affect human health, ecosystems or climate change.

5.3.2 The study area for the assessment of local air quality has been defined following guidance contained in HA207/07. It comprises: all land within 200m of the centre line of the existing road; land within 200m of the centre line of the improvement scheme; and land within 200m of any other 'affected roads'.

5.3.3 The Affected Road Network (ARN) was identified by the criteria published in HA207/07, based on changes between Do Minimum (DM) and Do Something (DS) scenarios. A road is in the ARN if one or more of the following criteria are true:

- Road alignment will change by 5m or more;
- Daily traffic flows will change by >=1,000 AADT;
- Heavy Duty Vehicle (HDV) flows will change by >=200 AADT;
- Daily average speed will change by >=10 kph; and
- Peak hour speed will change by >=20 kph.

5.3.4 For the regional air quality assessment, the ARN is defined as those links in the traffic reliability area (TRA) which meet any of the criteria below in the scheme opening year or design year (+15 years):

- Daily traffic flows will change by 10% AADT or more;
- HDV flows will change by 10% AADT or more; and
- Daily average speed will change by 20km/hr or more.

5.3.5 Figure 5.1 shows the air quality study area.

5.3.6 The study area is the affected local ARN and was defined using traffic data provided by the traffic consultants, it covers the following areas;

- A30 between Chiverton and Carland Cross;
- A and B roads between Redruth, Truro and Peranporth.

5.4 Potential Impacts

Construction Phase

5.4.1 During construction, potential air quality effects arise from dust emissions due to earthworks and construction activity associated with the scheme. These impacts are assessed in section 5.10.

Operational Phase

5.4.2 During the operational phase, potential air quality effects arise from emissions from vehicles using the road network. These impacts are assessed in section 5.10.

5.5 Assessment Methodology

Construction Dust Assessment

5.5.1 Dust emissions arising from construction and demolition activities are likely to be variable in nature and would depend on the type and extent of activity, soil type and moisture, road surface conditions and weather conditions.

5.5.2 Construction, demolition and earthwork activities from the scheme may all have an impact on local air quality. Trackout of material onto local roads where it can be re-suspended may also affect air quality. Trackout refers to the transport of dust and PM_{10} from construction areas onto the road network.

5.5.3 A qualitative assessment of the impacts of nuisance dust arising during construction has been undertaken, using guidance set out in paragraph 3.45 of DMRB HA207/07. Properties within 200m of dust producing activities have been identified and appropriate mitigation recommended where required.

5.5.4 The emissions from heavy goods vehicles (HGVs) associated with the construction of the scheme have been scoped out of the assessment due to the temporary nature of the works and the minimal impact the additional vehicles would have on overall pollutant concentrations.

5.5.5 The emissions from site equipment have been scoped out of the assessment due to the temporary nature of the works and the minimal impact the site equipment would have on overall pollutant concentrations.

Local Air Quality Assessment

5.5.6 A detailed assessment has been carried out using an air dispersion model (ADMS-Roads v.4.1.1.0) has been employed to determine the potential effects on annual mean NO_2 concentrations at selected sensitive receptors (locations of relevant human exposure and designated ecological sites), in accordance with HA207/07 guidance. In particular, modelled concentrations have been compared with the EU limit value for annual mean NO_2 following the method detailed in IAN175/13 to provide a clear indication of the scheme's potential to affect the UK's ability to comply with the Air Quality Directive [8].

5.5.7 HA207/07 provides guidance on whether an assessment should be detailed or simple. A detailed assessment will usually involve dispersion modelling to assess the scheme impacts, whereas a simple approach would usually follow a spreadsheet-based assessment of changes in emissions. The reason for adopting a detailed rather than simple approach is in accordance with the HA207/07 guidance.

Assessment Scenarios

5.5.8 The assessment for local air quality has been undertaken for the following scenarios:

- 2016 Baseline scenario;
- 2023 Projected baseline;
- 2023 Do-Minimum (DM) scenario: the traffic scenario at the year of opening without the scheme;
- 2023 Do-Something (DS) scenario: the traffic scenario at the year of opening with the scheme;

5.5.9 For local air quality the opening year of the scheme is likely to be the worst case scenario as vehicle emissions and background pollutant concentrations are anticipated to decrease over time due to improvements in fuel technologies.

5.5.10 Future baseline projections have been carried out to assess the implications of vehicle emissions not improving as quickly as predicted by Defra. Evidence from monitoring across the UK has indicated concentrations of pollutants are not reducing as quickly as predicted. To account for this, the future baseline projections scenarios were also calculated for 2023 following the methodology in IAN 170/12/v3.

5.5.11 The assessment in this chapter uses data provided from the traffic model for the future years which includes a number of future developments.

Local Air Quality Modelling

5.5.12 The inputs to the modelling process included:

- Traffic data;
- Receptor locations;
- Meteorological data; and
- Background concentrations.

5.5.13 Further details of the dispersion modelling inputs are provided within the ES, which will accompany the DCO application to be made in Summer 2018.

Traffic Data

5.5.14 Traffic data has been provided for the air quality assessment by the Arup transport team. Traffic data provided represents the average conditions occurring in four specific time periods (morning peak, inter-peak, afternoon peak and off peak). For the time periods in Table 5.1 the following data parameters were provided:

- Traffic flow, defined as vehicles/hour;
- Percentage heavy duty vehicles (HDV);
- Vehicle speeds, in kilometres per hour (kph); and
- Speed band information for use in calculation of emission factors in accordance with IAN 185/15.

Table 5.1: Traffic time periods

Traffic period	Time period
AM peak (AM)	3 hours (07.00 – 10.00)
Inter-peak (IP)	6 hours (10.00 – 16.00)
PM peak (PM)	3 hours (16.00 – 19.00)
Off peak (OP)	12 hours (19.00 – 07.00)

5.5.15 Emissions from traffic data were calculated using the emission factors provided in the latest version (version 1.1, July 2015) of IAN 185/15. Using this methodology allows the effects of reducing or creating congestion to be more effectively assessed within the air quality study area.

5.5.16 The GIS software, Arcmap, was used to assist in inputting the road link information into the air quality model.

Receptors

5.5.17 Human and ecological receptors have been identified and added to the air quality dispersion model.

5.5.18 The building usage was determined using the Ordnance Survey Address Base Plus dataset, and air quality calculations were made at the nearest façade to the busiest road.

5.5.19 A total of 587 human receptors are included in the assessment, and selected for using the following criteria and using professional judgement:

- Proximity to the affected roads;
- Representativeness of the maximum effects of the scheme in that region; and
- At risk of exceeding the annual mean NO_2 Air Quality Objective (AQO).

5.5.20 The list includes dwellings, hospitals, educational establishments; they area shown as dots on the human receptors drawing Figure 5.2. All locations, referred to as 'receptors' are treated as being equally sensitive.

5.5.21 For the ES all effects at receptors will be assessed. For the PEIR a selection of 73 receptors along the scheme. This sub-set has been included as results along the A30 have been verified using real world modelling whereas verification was not possible for the full affected road network. Full results for all assessed receptors will be provided in the ES.

Designated Habitat Sites

5.5.22 To assess the impacts on ecosystems the study area was reviewed to identify Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Sites of Special Scientific interest (SSSI) within 200m of the ARN. Four designated sites were identified along the A30, B3285 and A390. Details of the designated sites are provided in Table 5.2. All four sites are shown in the ecological receptors drawing, Figure 5.3.

5.5.23 Effects at ecological receptors have been assessed in accordance with Annex F of DMRB HA207/07.

5.5.24 Receptor transects (receptor points at specified distances away from the roadside) for each of the assessed designated sites up to 200m from the source have been included to allow assessment of the drop off in emissions and deposition at increasing distances from the road. All ecological receptor locations were modelled at a height of 0m.

5.5.25 Following guidance in IAN 174/13, in the first instance, the magnitude of change in annual mean NO_x concentrations at the designated sites has been determined. The guidance notes that where the magnitude of change is less than 0.4µg/m^3 then the effects are considered to be imperceptible and unlikely to be significant.

Table 5.2: Designated habitats used in the assessment

Site Name	Designation	Habitat
Penhale Dunes	SAC & SSSI	Calcareous grassland
Carrick Heaths	SSSI	Fen, marsh and swamp
Fal & Helford	SAC	Estuaries
Newlyn Downs	SAC	Dwarf shrub heath

Meteorological Data

5.5.26 The effect of meteorological conditions on dispersion is accounted for in the dispersion model. The most significant factors that affect dispersion are wind speed, wind direction and atmospheric stability. The meteorological data site considered to be most representative of conditions across the study area was Camborne. The site is located 7km east of the scheme. Data from this site was obtained[1] in model-ready format. The wind rose (to be presented in the ES, which will accompany the DCO application to be made in Summer 2018) derived from this data identified the predominant wind direction as being south-westerly. Further detail on the meteorological data will be provided in the ES which will accompany the DCO application to be made in Summer 2018.

Background Concentrations

5.5.27 'Background' air quality is a concept used to enable assessment of the effects of particular emissions sources, without the need for all sources in the area to be considered explicitly. For the purposes of this assessment, the background air quality represents the contribution of all other relevant sources of air pollutants apart those from roads specifically included in the air quality model. The pollution is added to the background pollution concentrations.

5.5.28 The Defra air quality website [9] includes estimated background air pollution concentrations for NO_x and NO_2, for each 1km by 1km square covering England.

5.5.29 The 'in-grid square' and 'out-grid square' contribution from motorway, trunk 'A' road and primary 'A' road sectors have been removed from the background annual mean NO_x concentration estimates, and background annual mean NO_2 estimates have been corrected using the Defra's Background NO_2 Calculator [10]. This process has been undertaken to avoid double counting of road traffic emissions from those road sources included in the dispersion model.

5.5.30 Background concentrations used for modelling purposes have been taken from the Defra background mapping. Comparison with the local authority monitoring data indicated a good relationship between the modelled results and the monitored data. The Defra modelled results were within ±15% of observed concentrations. Details of the comparison and details of sites selected are included in the ES.

Model Verification

5.5.31 A comparison of estimated and measured NO_2 concentrations has been undertaken. This process is known as model verification. Verification has been

1 Data provided by ADM Ltd.

undertaken for the base year, using the principles laid out in Section A3.223 of LAQM TG.16. Additional receptor points have been included within the baseline modelling to represent the location of diffusion tube sites within 200m of the ARN to provide information for the verification exercise. The location of selected verification points is shown in Figure 5.4.

5.5.32 The objectives of the model verification are to evaluate model performance, determine if model adjustment is required, and to provide confidence in the assessment.

5.5.33 LAQM TG.16 suggests that if modelled annual mean NO_2 concentrations are within ±25% and preferably within ±10% of the monitored concentration and there is no systematic under or over prediction, then model adjustment is not considered necessary to further improve modelled results. IAN 174/13 notes the desirability of achieving ±10% verification where concentrations are close to or above the air quality threshold.

5.5.34 Modelled results may not compare as well at some locations for a number of reasons including:

- Uncertainties in estimated traffic flow and speed data;
- Model setup (including street canyons, road widths, receptor locations);
- Model limitations (treatment of roughness and meteorological data);
- Uncertainty in monitoring data (notably diffusion tubes, e.g. bias adjustment factors and annualisation of short-term data); and
- Uncertainty in emissions/emission factors.

5.5.35 The above factors were investigated as part of the model verification process to minimise the uncertainties as far as practicable.

5.5.36 Some monitoring locations are not suitable for model verification purposes as there may be specific local influences or they are located too close to the road where LAQM TG.16 advises they should not be used. Therefore, each site was examined and considered whether it was suitable for use in the verification study and some locations were consequently removed. For those monitoring sites not used, the justification for their removal will be provided in the ES, which will accompany the DCO application to be made in Summer 2018.

5.5.37 Further detail on the verification process will be provided in the ES, which will accompany the DCO application to be made in Summer 2018.

5.5.38 For the PEIR the model verification was undertaken along the A30; for the ES a full verification exercise will be undertaken including all areas within the ARN.

NOx to NO_2 Conversion

5.5.39 The approach to calculating the conversion of roadside NO_x to NO_2 has followed the guidance in LAQM TG.16 and the LAQM website. This approach allows the calculation of NO_2 from NO_x concentrations, taking into account the difference between ambient NO_x concentration with and without the development, the concentrations of ozone and the different proportions of primary NO_2 emissions in different years. This approach is available as a spreadsheet calculator [11]; the version released in June 2016 (v5.1) has been used.

Assessment of Future NO_x and NO_2

5.5.40 Emission controls on vehicles have been introduced in an attempt to reduce concentrations of NO_2 in the atmosphere. Levels of atmospheric NO_2 have not reduced as quickly as predicted due to ineffective emission controls on some vehicles. IAN 170/12v3 has been used to carry out sensitivity testing of future NO_x and NO_2 trends. As outlined in the IAN, the projection factors provided on the Defra website [12] may be too optimistic and the long term trend factors provided with the IAN may be too pessimistic resulting in unrealistic projections. Highways England has produced an interim set of factors [7] to take a conservative approach to the anticipated improvements in air quality due to improved emission controls. The interim factors (LTTE6) do not take the most optimistic view of the benefits of Euro 6/VI vehicles. Additionally, they do not include the benefits of Euro6/VI vehicles having an immediate impact upon emissions. Instead a more conservative approach is taken with improvements of NO_2 concentrations starting to be realised around 2015. Due to this conservative approach taken in the LTTE6 factors, it is the professional opinion of suitably qualified and experienced specialists that the interim factors are the most suitable for this assessment.

Regional Air Quality Assessment

5.5.41 Emission factors have been calculated for the regional assessment study area based on the regional assessment screening criteria outlined in Section 5.3.4. Emissions have been calculated using the traffic characteristics (AADT flows, average vehicle speeds and percentage HDVs) and road length for each affected road in the study area. The emission factors given in IAN 185/15 have been used. Total annual emissions for both the base year (2016), Do-Minimum and Do-Something scenarios (2023) and Design year (2038) for the purposes of the regional assessment have been calculated. As emission factors are not available for 2038, the traffic data for 2038 have been processed assuming emission factors for the latest year for which factors are available 2030.

Compliance Risk Assessment

5.5.42 IAN 175/13 provides the guidance in relation to the assessment of the risk of the scheme being non-compliant with the EU Directive on Ambient Air Quality (2008/50/EC). The compliance risk assessment is undertaken using the modelling results obtained from the local air quality assessment. To undertake compliance risk assessment, the following information is required:

- Local air quality modelled results;
- Defra's Pollution Climate Model (PCM) outputs for the compliance road network [13]; and
- Defra's zones and agglomerations maps [14].

5.5.43 Defra uses the PCM model to report against compliance with the EU Directive 2008/50/EC. The current PCM model results available have concentrations predicted for each year between 2015 and 2030.

5.5.44 To determine the study area for the compliance risk assessment the local air quality study area is compared to the compliance link locations as selected by Defra. Where the two networks intersect this is defined as the compliance risk road network (CRRN) and forms the basis of the assessment of compliance risk.

5.5.45 The impacts of the scheme (i.e. the change in concentrations predicted by the ADMS-Roads model) are added to the modelled concentrations in the Defra PCM model for the opening year of the scheme.

5.5.46 To determine the compliance risk of the scheme, the Compliance Risk Flow Chart in Annex A of IAN 175/13 has been followed.

TAG Air Quality Assessment

5.5.47 DMRB HA207/07 indicates that a Transport Analysis Guidance (TAG) assessment should be undertaken for road schemes. The TAG assessment of air quality is an estimation of the overall change in people's exposure to concentrations of NO_2 and PM_{10}. These pollutants are identified as of particular concern with respect to compliance with the UK AQS objectives and EU limit values.

5.5.48 The assessment involves calculating the relative exposure of sensitive receptors to the predicted change in air quality arising from the scheme.

5.5.49 The study area for the TAG assessment is the same as the study area of the local air quality assessment.

5.5.50 The TAG assessment creates an overall 'score' for the scheme, which is calculated on the basis of the number of residential properties within 200m of affected roads and the overall sum of the changes in NO_2 and PM_{10} at these properties. The spatial distribution of these changes is then assessed against subsets of the population, including subsets based on monetary income and age. As part of the TAG, annual mass emissions of NO_x, PM_{10} and CO_2 will be calculated.

5.5.51 The results of the TAG will be calculated for the Environmental Statement.

Operational Assessment Criteria

5.5.52 Evaluation of the significance of the local air quality findings has been undertaken in accordance with IAN 174/13. The key criteria outlined in IAN 174/13 against which air quality should be considered are:

- Is there a risk that environmental standards will be breached?
- Is there a high probability of the effect occurring?
- Will there be a large change in environmental conditions?
- Will the effect continue for a long time?
- Will many people be affected?
- Is there a risk that protected sites, areas, or features will be affected?
- Will it be difficult to avoid, or reduce or repair or compensate for the effect?

5.5.53 The evaluation of the significance of nitrogen deposition results requires advice from an ecologist and therefore the significance of changes to air pollution at ecological designated sites will be discussed in the ES.

5.5.54 To assess the magnitude of change at receptor locations as a result of the scheme, including ecological receptors, IAN 174/13 provides criteria as shown in Table 5.3. These are based upon the fact that whilst modelled results are considered reasonably accurate, there is still an element of residual uncertainty, hereafter referred to as Measure of Uncertainty (MoU). This is due to inherent

uncertainty in air quality monitoring, modelling and the input data used in the assessment.

Table 5.3 Magnitude of change criteria

Magnitude of change in concentration (µg/m^3)	Value of change in annual average NO_2 and PM^{10}
Large (>4)	Greater than full MoU value of 10% of the AQO (4µg/m^3)
Medium (>2 - 4)	Greater than half the MoU (2µg/m^3), but less than the full MoU (4µg/m^3) of 10% of the AQO
Small (>0.4 - 2)	More than 1% of objective (0.4µg/m^3) and less than half of the MoU i.e. 5% (2µg/m^3). The full MoU is 10% of the AQO (4µg/m^3)
Imperceptible (≤ 0.4)	Less than or equal to 1% of AQO (0.4µg/m^3)

5.5.55 Where predicted annual mean NO_2 concentrations are below the AQO or the magnitude of change is <0.4µg/m^3 imperceptible effects are likely.

5.5.56 IAN 174/13 also provides guidelines to aid the interpretation of significance of public exposure. Table 5.4 shows the guideline criteria used in this assessment.

Table 5.4 Guideline for number of properties constituting a significant effect

Magnitude of change in NO_2 (µg/m^3)	Number of receptors with:	
	Worsening of AQO already above objective or creation of a new exceedance	Improvement of an AQO already above objective or the removal of an existing exceedance
Large (>4)	1-10	1-10
Medium (>2 - 4)	10-30	10-30
Small (>0.4 - 2)	30-60	30-60

5.6 Baseline Conditions

5.6.1 In order to provide an assessment of the significance of any new development proposal (in terms of air quality), it is necessary to identify and understand the baseline air quality conditions in and around the study area. This provides a reference level against which any potential changes in air quality can be assessed. Since the baseline air quality is predicted to change in the future (mainly because vehicle emissions are changing), the baseline situation has also been predicted for the opening year. The DM scenario is the predicted baseline for the opening year, and includes any other proposed schemes with a high level of certainty of being built.

5.6.2 Baseline air quality data has been gathered from the following sources for the air quality study area:

- Defra Air Quality Management Area (AQMA) website [15];
- Defra Pollution Climate Model (PCM) data for relevant years [14];
- Data from monitoring surveys carried out by Highways England and from local authority monitoring;

- GIS locations of sensitive receptors (residential properties, schools, hospitals and care homes) from OS Address Base Plus mapping; and
- GIS boundaries of designated ecological sites from Natural England [16].

Local Air Quality Management Summary

5.6.3 Comparing baseline conditions for relevant pollutants against the AQOs detailed in the UK Government's Air Quality Strategy (AQS) [17] and the EU limit values, the following has been concluded:

- National assessments [17] have demonstrated that there is no risk of carbon monoxide, 1,3-butadiene or benzene concentrations exceeding relevant UK AQS objective and EU limit value thresholds due to emissions from traffic anywhere in the UK. As such, concentrations of these pollutants have not been modelled as it is unlikely these pollutants will be a cause for concern in terms of potential exceedances as a result of the scheme.
- For particulate matter (PM_{10} and $PM_{2.5}$), there are no AQMAs designated for an exceedance of UK AQS objective and EU limit value thresholds for particulate matter within the study area.
- Exceedances of the annual mean NO_2 AQO and EU limit value threshold of 40µg/m^3 have been identified within the air quality study area. On this basis, NO_2 is the focus of the air quality assessment for the scheme.

Air Quality Management Areas (AQMA)

5.6.4 There are two AQMAs in the study area. Cornwall Council (CC) declared an AQMA in Truro in 2015 due to exceedances of the annual and 1-hour mean NO_2 objectives; and the Kerrier AQMA, declared in 2005 due to exceedances of the annual mean NO_2 objective.

5.6.5 Truro AQMA is located around Truro town centre and it extends east and west of the town along the A390. The Kerrier AQMA is an area encompassing the Camborne, Redruth and Pool regeneration area. The location of the AQMAs in relation to the scheme is shown in Figure 5.5.

5.6.6 The Clean Air for Cornwall Strategy includes the Air Quality Action Plan (AQAP) for the Truro and Kerrier AQMAs. There are a number of measures included in the AQAP to improve air quality in the Truro and Kerrier AQMAs; these are predominantly transport focussed measures such as extensions of park and ride schemes, signalisation of key junctions and improvements in cycle and pedestrian facilities. The scheme is also listed as an improvement measure as the dualling of the road would help improve traffic flow in the area and discourage vehicles from travelling through Truro.

5.6.7 The Clean Air for Cornwall Strategy also notes that CC is investigating the need for an AQMA in Grampound. The A390, which is the main route through Grampound, is included in the study area of this assessment.

Monitoring Data

5.6.8 Monitoring of air quality for (NO_2 and NO_x) has been undertaken across the study area by Highways England and by CC. The location of monitoring across the study area is shown in Figure 5.4. Information from both sets of data have been used to establish baseline air quality conditions.

Local Authority Monitoring Data

5.6.9 CC operates diffusion tube monitoring at 36 sites across the study area. The monitoring in Truro accounts for over half the monitoring in the study area with 24 sites. There is also monitoring located in Chacewater, Grampound, Newquay and Threemilestone. Concentrations of annual mean NO_2 as exceeding the objective in the study area have been recorded in 2016 at Newquay, Grampound and Truro.

5.6.10 LAQM.TG16 discusses the relationship between annual mean and hourly mean NO_2 concentrations. It is considered that where monitored annual mean NO_2 concentrations are greater than 60µg/m^3, there is the potential for the hourly mean NO_2 objective to be exceeded. There are three locations in Truro where monitored concentrations in recent years have been greater than 60µg/m^3.

5.6.11 The results of local authority monitoring at the 36 sites in the study area will be provided in the ES, which will accompany the DCO application to be made in Summer 2018. No monitoring of PM_{10} is undertaken in the study area.

5.6.12 There is no CC monitoring along the A30 in the study area. The location of the monitoring is shown in Figure 5.4. The full results will be presented in the ES, which will accompany the DCO application to be made in Summer 2018.

Scheme-Specific Monitoring

5.6.13 Highways England carried out monitoring of NO_2 and NO_x using diffusion tubes at 16 monitoring sites. Nine of the sites were located where humans may be exposed to a change in emissions. The other seven sites were at locations of sensitive ecology.

5.6.14 Monitoring was undertaken for a period of 10 months (August 2016 – May 2017) adjacent to the existing A30 and the scheme. Monitoring was undertaken at the sensitive ecology sites for a period of six months (November 2016 – May 2017).

5.6.15 The raw monitored results for each period will be shown in the ES, which will accompany the DCO application to be made in Summer 2018. If data capture is less than 75% at any location (i.e. 9 months), monitored results have been annualised, to determine a representative annual mean concentration for comparison with the annual mean NO_2 objective. This has been undertaken following the methodology set out in LAQM.TG16.

5.6.16 Calculated annual mean NO_2 concentrations have been bias-adjusted using the national spreadsheet method as no automatic monitors were available in the proximity of the survey with which to co-locate diffusion tubes. It is necessary to bias adjust diffusion tube results as these are not a reference method and therefore generally have lower accuracy. A bias-adjustment factor of 0.92 has been applied to the annualised NO_2 concentrations.

5.6.17 The monitored concentrations at all monitoring sites are all below the annual mean NO_2 objective with a maximum of 37.5µg/m^3 being recorded at the junction of the A30 and the B3824. The full results will be presented in the ES, which will accompany the DCO application to be made in Summer 2018.

Defra PCM Modelling

5.6.18 Predicted roadside NO_2 concentrations were obtained from Defra's PCM model for the years 2015 and 2023. In the study area Defra PCM mapping indicates no exceedances in 2015 at road links in the ARN. In 2023 Defra PCM mapping indicates all links will still comply with EU limit values. In the South West zone Defra PCM mapping indicates one exceedance in 2015 along the A4, located 211km from the ARN. This road is predicted to have a concentration of 54 $\mu g/m^3$. By 2023 Defra PCM mapping indicates all links will comply with EU limit values in the zone.

Modelled Baseline Concentrations

5.6.19 In addition to the air quality monitoring information, baseline concentrations have also been predicted at relevant human and ecological receptor locations across the study area and results of the baseline modelling are included in Section 5.10.

5.7 Consultation

5.7.1 In addition to the scoping report[2] additional consultation has been undertaken about air quality with Cornwall Council.

5.7.2 Discussions with Cornwall Council were held to discuss the methodology and gather the monitoring data for 2016 to be used for model verification. The method of assessment was agreed with the local air quality officer.

5.8 Assessment Assumptions and Limitations

5.8.1 Air quality dispersion modelling has inherent areas of uncertainty, including:

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

5.8.2 To reduce uncertainty, sensitivity testing of emissions data has been carried out using the most recent guidance from Highways England (IAN 170/12v3). The methodology used within this assessment is designed to provide a robust assessment, reducing uncertainty caused by the above limitations.

5.8.3 Uncertainties or limitations related to transport data are discussed within the Traffic Forecasting Report (TFR). The TFR outlines the forecasting assumptions and deals with uncertainty in forecasting by discussing low and high growth. The Local Model Validation Report (LMVR) also outlines modelling assumptions for the development of the base model. The Traffic Data Collection Report (TDCR) reports on the data collection for the traffic model. These limitations have been overcome as far as possible by verifying the modelled concentrations against

[2] https://infrastructure.planninginspectorate.gov.uk/projects/south-west/a30-chiverton-to-carland-cross-scheme/

monitoring results in appropriate locations. The traffic data used is appropriate for the purposes of this air quality assessment.

5.9 Design, Mitigation and Enhancement Measures

Construction Mitigation

5.9.1 Best practice mitigation measures to minimise effects from construction dust will be incorporated into the scheme CEMP.

Operational Mitigation

5.9.2 The scheme design moves traffic away from local sensitive receptors. By moving traffic away from receptors it allows a greater distance over which pollutants can disperse. No significant impacts have been concluded, hence no other design specific mitigation is incorporated for air quality.

5.10 Assessment of Effects

Construction Effects

5.10.1 The construction dust assessment has been divided into four geographical sections to help describe the scheme impacts across the whole scheme area. The sections are displayed in Figure 5.8.

5.10.2 The main dust producing activities can be divided into two types, due to the distinct localised effects from different activities as well as the similarities between on-site activities and potential mitigation measures. These are:

- Impacts related to the borrow pits, compound areas and soil storage areas; and
- Impacts related to the construction and demolition of roads, bridges and other road related infrastructure and trackout.

Following the guidance in DMRB HA207/07, the number of sensitive receptors within 200m proximity to both the construction and demolition activities, have been identified for each of the construction sections. This is set out in Table 5.5 and Table 5.6.

Table 5.5: Number of receptors within 200m of borrow pits, compound sites and soil storage areas within each of the four construction and demolition sections

Section	Number of receptors within 200m
Section 1 of 4 – Chiverton	5
Section 2 of 4 – Kenwyn	4
Section 3 of 4 – Marazanvose to Zelah	2
Section 4 of 4 – Carland Cross	3

Table 5.6: Number of receptors within 200m of construction and demolition areas within each of the four construction, demolition and trackout sections

Section	Number of receptors within 200m
Section 1 of 4 – Chiverton	12
Section 2 of 4 – Kenwyn	6
Section 3 of 4 – Marazanvose to Zelah	24
Section 4 of 4 – Carland Cross	5

5.10.3 Borrow pits and soil storage areas are not yet agreed at this stage. Therefore only compound sites have been assessed.

5.10.4 For the first category (compound sites) the section which has the highest number of receptors is section two. Sections one, three and four also identified receptors which could be at risk of being impacted by the activities taking place. With no mitigation these sites could have negative no, impacts on the sensitive receptors, especially during drier months. Mitigation measures will be required to reduce the impact from dust.

5.10.5 The second category (construction, demolition and trackout) has two sections where there are larger numbers of residential properties within 200m of the activities. These are sections one and four which are concentrated in the towns of Chiverton, Marazanvose and Zelah where construction activities occur and also Mitchell where trackout is expected to occur along the existing A30 route. The other sections have fewer receptors within 200m which may be impacted by dust. With no mitigation, the impacts from the activities being undertaken in these sections could have negative effects on the sensitive receptors, especially during the drier months. Mitigation measures would be required to reduce the impact from dust.

5.10.6 Overall it is identified that the scheme could impact upon receptors during the construction phase and mitigation is required to minimise the frequency and intensity of any dust episode.

Operation Effects

Affected Road Network

5.10.7 Following the DMRB HA207/07 screening criteria, the ARN has been identified for the area around the scheme for the 2023 opening year scenario. The 2023 ARN is shown in Figure 5.1.

5.10.8 Roads have been included in the ARN mainly based on changes to the total AADT (where total AADT changes by plus or minus 1,000 vehicles per day). A smaller number of links are included based on changes to HDV volumes or speeds. A summary of the changes in traffic across the network is provided in Figure 5.6.

Compliance Links

5.10.9 Where the ARN overlaps with Defra Pollution Climate Mapping (PCM) links, these have been selected and used to determine the compliance risk road network (CRRN). In this assessment the CRRN has been identified in a number of roads

around Truro which make up the CRRN. As shown in the CRRN drawing Figure 5.7.

Model Verification

5.10.10 For this PEIR only modelled results at existing monitoring locations along the route of the existing A30 within the study area were used for model verification based on the method set out in section 5.5.31. Details will be provided in the ES, which will accompany the DCO application to be made in Summer 2018. The full study area will be verified in the ES.

Human Receptors

5.10.11 This section describes the predicted results at human receptor locations as a result of the scheme in the baseline year (2016) and opening year (2023).

5.10.12 Results have been presented in geographic areas known as discussion regions. Selected receptors have been chosen in each discussion region to summarise the changes in air quality as a result of the scheme. For the PEIR six discussion regions have been selected, further discussion regions will be added to the ES. The regions for the PEIR are as follows:

- Discussion region 1 - West of Chiverton
- Discussion region 2 - scheme area – Chiverton
- Discussion region 3 - scheme area – Kenwyn
- Discussion region 4 - scheme area – Marazanvose to Zelah
- Discussion region 5 - scheme area – Carland Cross
- Discussion region 6 - East of Carland Cross

5.10.13 The full table of results at all 73 receptor locations along the A30 will be reported within the ES, which will accompany the DCO application to be made in Summer 2018. Results for all receptors across the study area will be presented in the ES (the remaining 514 receptors).

Discussion Region 1 – West of Chiverton

5.10.14 In this discussion region five receptors have been selected to represent the scale of impacts associated with the scheme. There are no monitoring locations in this discussion region. Modelled baseline concentrations have been predicted to all be well below the NO_2 annual mean objective.

Table 5.7 NO_2 concentrations at selected receptors – Discussion region 1

Receptor	Grid reference (m)		Annual mean NO_2 ($\mu g/m^3$)			
	X	Y	2016 Base	2023 DM	2023 DS	Change (DM - DS)
86	172255	44359	15.1	14.3	16.2	1.9
259	170326	43814	15.8	14.7	14.8	0.1
268	172614	44899	14.3	13.3	13.8	0.5
517	173330	45436	18.9	17.9	18.7	0.8
240	174332	46299	26.7	25.5	26.8	1.3

5.10.15 There are no predicted exceedances of the annual mean NO_2 objective in 2023 as a result of the scheme.

5.10.16 This region is outside the scheme and traffic flows increase by approximately 3,250 vehicles per day (AADT) as a result of the scheme.

5.10.17 The receptors in this region are predicted to experience an increase in NO_2 concentrations between 0.1µg/m^3 and 1.9µg/m^3. These changes do not result in any new exceedances. The point of maximum increase of 1.9µg/m^3 is predicted to occur at receptor 240 just south of Three Burrows where a concentration of 26.8µg/m^3 is modelled in 2023. This is well below the AQO and is therefore not considered to be at risk of exceeding the AQO.

Discussion Region 2 – scheme area Chiverton

5.10.18 In this discussion region four receptors have been selected to represent the scale of impacts associated with the scheme. There were two scheme-specific monitoring points in this region the results showed concentrations were below the annual mean NO_2 objective with a maximum of 20.7µg/m^3 being monitored at Chiverton Cross. Modelled baseline concentrations have been predicted to all be well below the NO_2 annual mean objective.

Table 5.8 NO_2 concentrations at selected receptors – Discussion region 2

Receptor	Grid reference (m)		Annual mean NO_2 (µg/m^3)			Change (DM - DS)
	X	Y	2016 Base	2023 DM	2023 DS	
236	175810	48046	19.3	18.7	9.8	-8.9
331	175271	47493	11.9	11.3	9.9	-1.4
491	175065	47817	6.6	6.0	8.8	2.8
515	174805	47342	8.1	7.5	10.1	2.7

5.10.19 There are no predicted exceedances of the annual mean NO_2 objective in 2023 as a result of the scheme.

5.10.20 In this region there will be a new alignment for the A30, therefore traffic will move away from some receptors and closer to others. The traffic on the existing A30 will decrease by around 27,000 AADT; the traffic flow the on the scheme A30 will be around 42,500 AADT.

5.10.21 Where the scheme moves the existing A30 away from receptors concentrations are predicted to decrease by up to 8.9µg/m^3. This maximum change is predicted at receptor 236 where annual mean concentrations decrease from 18.7µg/m^3 to 9.8µg/m^3. Where the scheme moves the A30 closer to existing receptors concentrations are predicted to increase by up to 2.8µg/m^3. This maximum change is predicted at receptor 491 where annual mean concentrations increase from 6.0µg/m^3 to 8.8µg/m^3. This is well below the AQO and is therefore not considered to be at risk of exceeding the AQO.

Discussion Region 3 – scheme area Kenwyn

5.10.22 In this discussion region three receptors have been selected to represent the scale of impacts associated with the scheme. There were three scheme specific monitoring points in this region the results showed concentrations were below the annual mean NO_2 objective with a maximum of 37.5µg/m^3 being monitored at the junction of the A30 and B3284. Modelled baseline concentrations have been predicted to all be well below the NO_2 annual mean objective.

Table 5.9 NO_2 concentrations at selected receptors – Discussion region 3

Receptor	Grid reference (m)		Annual mean NO_2 ($\mu g/m^3$)			Change (DM - DS)
	X	Y	2016 Base	2023 DM	2023 DS	
103	179915	50355	22.0	21.0	13.0	-8.0
224	179046	49581	14.6	13.8	9.2	-4.6
265	179893	50283	14.0	13.2	19.6	6.4

5.10.23 There are no predicted exceedances of the annual mean NO_2 objective in 2023 as a result of the scheme.

5.10.24 In this region there will be a new alignment for the A30, therefore traffic will move away from some receptors and closer to others. The traffic on the existing A30 will decrease by around 20,000 AADT; the traffic flow on the scheme A30 will be around 32,000 AADT.

5.10.25 Where the scheme moves the existing A30 away from receptors concentrations are predicted to decrease by up to 8.0µg/m^3. This maximum change is predicted at receptor 103 where annual mean concentrations decrease from 21.0µg/m^3 to 13.0µg/m^3. Where the scheme moves the A30 closer to existing receptors concentrations are predicted to increase by up to 6.4µg/m^3. This maximum change is predicted at receptor 265 (Marazanavose Farm) where annual mean concentrations increase from 13.2µg/m^3 to 19.6µg/m^3. This is the maximum increase at any receptor as a result of the scheme. The farmhouse will be located close to the roadside of the new A30. This is well below the AQO and is therefore not considered to be at risk of exceeding the AQO.

Discussion Region 4 – scheme area Marazanvose to Zelah

5.10.26 In this discussion region five receptors have been selected to represent the scale of impacts associated with the scheme. There was one scheme specific monitoring point in this region, the result showed concentrations were below the annual mean NO_2 objective with of 31.8µg/m^3 being monitored north of Zelah. Modelled baseline concentrations have been predicted to all be well below the NO_2 annual mean objective.

Table 5.10 NO_2 concentrations at selected receptors – Discussion region 4

Receptor	Grid reference (m)		Annual mean NO_2 ($\mu g/m^3$)			Change (DM - DS)
	X	Y	2016 Base	2023 DM	2023 DS	
90	181525	52337	15.7	14.9	12.2	-2.7
185	181754	52596	23.7	22.7	10.1	-12.5
142	181845	52691	27.4	26.3	9.5	-16.8
450	182391	53015	16.0	15.1	8.1	-6.9
363	181511	52113	8.4	7.8	10.2	2.4

5.10.27 There are no predicted exceedances of the annual mean NO_2 objective in 2023 as a result of the scheme.

5.10.28 In this region there will be a new alignment for the A30, therefore traffic will move away from some receptors and closer to others. The traffic on the existing A30

will decrease by around 21,000 AADT; the traffic flow on the scheme A30 will be around 32,000 AADT.

5.10.29 Where the scheme moves the existing A30 away from receptors concentrations are predicted to decrease by up to 16.8µg/m^3. This maximum change is predicted at receptor 142 where annual mean concentrations decrease from 26.3µg/m^3 to 9.5µg/m^3. Where the scheme moves the A30 closer to existing receptors concentrations are predicted to increase by up to 2.4µg/m^3. This maximum change is predicted at receptor 363 where annual mean concentrations increase from 7.8µg/m^3 to 10.2µg/m^3. This is well below the AQO and is therefore not considered to be at risk of exceeding the AQO.

Discussion Region 5 – scheme area Carland Cross

5.10.30 In this discussion region four receptors have been selected to represent the scale of impacts associated with the scheme. There was one scheme specific monitoring point in this region, the result showed concentrations were below the annual mean NO_2 objective with 19.9µg/m^3 being monitored close the Carland Cross roundabout. Modelled baseline concentrations have been predicted to all be well below the NO_2 annual mean objective.

Table 5.11 NO_2 concentrations at selected receptors – Discussion region 5

Receptor	Grid reference (m)		Annual mean NO_2 (µg/m^3)			Change (DM - DS)
	X	Y	2016 Base	2023 DM	2023 DS	
562	184810	54010	11.5	10.9	9.0	-1.9
400	186114	54585	7.6	7.1	7.4	0.3
524	186139	54726	14.0	13.5	14.5	1.1
223	186198	54731.3	12.5	12.0	12.8	0.9

5.10.31 There are no predicted exceedances of the annual mean NO_2 objective in 2023 as a result of the scheme.

5.10.32 In this region there will be a new alignment for the A30, therefore traffic will move away from some receptors; at this location it does not get closer to existing receptors within 200m. The traffic on the existing A30 will decrease by around 25,000 AADT; the traffic flow the on the scheme A30 will be around 32,000 AADT. East of Carland Cross where the scheme re-joins the existing A30 alignment the change in traffic flow will be around 5,600 AADT.

5.10.33 Where the scheme moves the existing A30 away from receptors concentrations are predicted to decrease by up to 1.9µg/m^3. This maximum change is predicted at receptor 562 where annual mean concentrations decrease from 11.5µg/m^3 to 9.0µg/m^3. The scheme joins back to the existing A30 alignment east of Carland Cross. Where the road joins the existing alignment NO_2 annual mean concentrations at receptors are predicted to increase by a maximum of 1.1µg/m^3 in 2023. This maximum change occurs at receptor 524 where the concentration is predicted to be 14.5µg/m^3 in 2023. This is well below the AQO and is therefore not considered to be at risk of exceeding the AQO.

Discussion Region 6 – East of Carland Cross

5.10.34 In this discussion region five receptors have been selected to represent the scale of impacts associated with the scheme. There are no monitoring locations in this

discussion region. Modelled baseline concentrations have been predicted to all be well below the NO_2 annual mean objective.

Table 5.12 NO_2 concentrations at selected receptors – Discussion region 6

Receptor	Grid reference (m)		Annual mean NO_2 (µg/m^3)			Change (DM - DS)
	X	Y	2016 Base	2023 DM	2023 DS	
80	189606	56704.5	9.6	9.1	9.6	0.5
211	191593	57614.2	11.7	11.0	11.5	0.5
389	187999	55684.4	13.8	13.2	14.2	1.0
504	190772	57218.2	13.7	13.2	14.0	0.8
541	187144	54938.7	14.8	14.3	15.4	1.1

5.10.35 There are no predicted exceedances of the annual mean NO_2 objective in 2023 as a result of the scheme.

5.10.36 This region is outside of the scheme, traffic flows increase by approximately 5,600 vehicles per day (AADT) as a result of the scheme.

5.10.37 The receptors in this region are predicted to experience an increase in NO_2 concentrations between 0.5µg/m^3 and 1.1µg/m^3. These changes do not result in any new exceedances. The maximum point of increase of 1.1µg/m^3 is predicted to occur at receptor 541 just east of Mitchell where a concentration of 15.4µg/m^3 is modelled in 2023. This is well below the AQO and is therefore not considered to be at risk of exceeding the AQO.

Summary of Impacts on the A30

5.10.38 There are no modelled exceedances of the annual mean NO_2 objective in the baseline or in the Do-Minimum or Do-Something 2023 scenarios along the A30. There are both negative and positive impacts as a result of the scheme where it either moves towards or away from existing receptors. The maximum increase in annual mean NO_2 as a result of the scheme is 6.4µg/m^3 and occurs at Marazanvose Farm where the new road moves close to the property. The total concentrations at this location with the scheme in place are well below the AQO for annual mean NO_2 at 19.6µg/m^3. The maximum decrease in annual mean NO_2 as a result of the scheme is 16.8µg/m^3 where the A30 would be moved away from existing receptors.

5.10.39 The modelled results show all concentrations will be well below the AQO and therefore it is considered the scheme will not result in any risk of exceeding the AQO along the A30.

Review of scheme Impacts Across the ARN

5.10.40 Figure 5.6 shows the changes in traffic volumes across the traffic network, the results of dispersion modelling for this area will be provided in the ES. For the purpose of this PEIR chapter a high level review has been undertaken to review areas which will experience improved air quality or potentially be impacted by the change in traffic volumes.

5.10.41 The majority of links in the ARN experience a reduction in traffic flows. The roads which experience an increase in traffic are the A30 and roads which feed directly into the A30 from the main settlements in the region.

5.10.42 Table 5.13 provides a summary of the main roads which experience changes in traffic volumes as a result of the scheme (other than the A30).

Table 5.13 Changes in traffic volumes

Increases in traffic volumes	Decreases in traffic volumes
B3298 – Scorrier to Gwennap	Chasewater to Devoran
A393 – Gwennap to A39	A390 – A30 to Truro
B3284 – Truro to A30	A390- South of Truro
A3076 – A30 to Gummows Shop	A39 – Carland Cross to Truro
A3058 Gummows Shop to A392	A390 – Truro to Hewas Water
A3058 – St Stephen to Sumercourt	B3275 – A390 to Brighton
	A39 – Truro to A393 Junction
	Shortlandsend to Zelah
	B3285 – Perranporth to Goonhavern
	A392 – Trevarren to A3075
	A3075 – A392 to A30

Ecological receptors

5.10.43 Ecological receptors have been modelled for the PEIR. Full results will be provided in the ES following the analysis of nitrogen deposition. Early results indicate predictions of the scheme having a negligible impact on sensitive ecological results as highlighted in the Scoping Report[3] remain true.

Regional emissions

5.10.44 Regional emissions calculation will be provided in the final ES.

Compliance with the Air Quality Directive

5.10.45 IAN 175/1317 sets the method which has been followed to assess compliance with the air quality directive based on Pollution Climate Mapping (PCM) data provided by Defra.

5.10.46 All PCM links in the study area are located around Truro. This area will be assessed in detail in the ES and results will be provided. Based on Defra's predicted NO_2 annual mean concentrations at PCM links around Truro in 2023 it is considered there would be a low risk of delaying compliance due to the large increase which would be required to exceed the limit value. This section will be completed in the ES chapter.

Compliance with local planning policies

5.10.47 The local planning policies to be listed in the ES, which will accompany the DCO application to be made in Summer 2018 and the actions and measures in the

[3] https://infrastructure.planninginspectorate.gov.uk/projects/south-west/a30-chiverton-to-carland-cross-scheme/

council's Air Quality Action Plan have been considered against the impacts resulting from the scheme.

5.10.48 The scheme along the A30 does not result in any exceedances of the air quality objectives, it moved traffic away from the main urban areas and therefore does not act against the objectives of local planning policies. The scheme is one of the measures CC identify as being able to help improve air quality in Truro.

Significant effects

5.10.49 IAN 174/13 provides guidance on evaluating overall scheme significance. The overall significance of the scheme is based on all elements of the scheme which have been assessed and the results discussed within this section. The significance of effects will be updated in the ES to show results for the full study area.

5.10.50 Along the A30 no concentration exceeded the annual mean NO_2 AQO of 40µg/m^3. Therefore, there is no requirement to complete a table showing the number of receptors where a worsening or improvement in air quality as a result of the scheme is predicted. As noted previously these results are based on LTTE6 emission factors which present the Highways England assessment of a conservative estimate of future vehicle emission improvement.

5.10.51 The questions and answers related to human health from IAN 174/13 are –

- "Is there a risk that environmental standards will be breached?"
  - No, there are no predicted exceedances of the NO_2 AQO along the A30.
- "Will there be a large change in environmental conditions?"
  - Yes, there are receptors which will experience a 'large' change in environmental conditions.
- "Will the effect continue for a long time and will many people be affected?"
  - Long duration effects are considered to be an increase in concentration which require more than 6 years to return to the predicted DM concentration; equivalent to an increase of greater than 2 µg/m^3. As noted there are no receptors where the standard is exceeded and a significant change is predicted.
- "Will it be difficult to avoid, or reduce or repair or compensate for the effect?"
  - The scheme will not result in significant changes and the assessment has been based on worst case assumptions for future vehicle emission rates.

5.10.52 The findings from each of the key questions related to human health on the A30 have provided evidence that the answers will result in a conclusion of '**not significant**'.

5.10.53 The question and answer related to ecological health from IAN 174/13 is–

- "Is there a risk that designated sites, areas, or features will be affected?"
  - Following DMRB HA207/07 guidance, the effect of the scheme on annual mean NO_x concentrations at designated sites will been considered in the ES.

5.10.54 Table 5.14 summarises the overall significance taking into account effects on human and ecological receptors and the schemes potential impact upon EU compliance. The findings indicate that overall the scheme will have no significant impact on air quality.

Table 5.14 Operational phase overall significance

Key criteria questions	Yes / no
Is there a risk that environmental standards will be breached?	No
Will there be a large change in environmental conditions?	Yes
Will the effect continue for a long time?	No
Will many people be affected?	No
Is there a risk that designated sites, areas, or features will be affected?	*
Will it be difficult to avoid, or reduce or repair or compensate for the effect?	No
On balance is the overall effect significant?	No*
**To be completed and or finalised in the ES chapter.*	

5.11 Monitoring

5.11.1 Should significant impacts be identified in the ES, monitoring of air quality may be required. This will be addressed in the ES.

5.12 Summary

5.12.1 The assessment has examined the potential effects of the scheme on local air quality during the opening year 2023.

5.12.2 A review of the current air quality legislation and planning policies relevant to the scheme has been undertaken. This assessment covers each of the main areas highlighted as being essential for an air quality assessment in the NN NPS.

5.12.3 The baseline assessment demonstrates that there are no existing exceedances of the annual mean NO_2 objective along the A30.

5.12.4 Assessment of annual mean NO_2 concentrations in 2023 indicated that the scheme effect is considered to be not significant.

5.12.5 Assessment of EU compliance concluded that the scheme is not likely to impact the Zone's predicted date for compliance with the EU limit value.

5.12.6 Based on the professional judgement of suitably qualified and experienced specialists, it is concluded that the scheme's impact along the A30 on air quality concentrations is not significant.

Further work

5.12.7 It should be noted that at this stage the information is preliminary, and is based mostly on the 2017 scheme design, as described in Chapter 2. Further EIA work is currently being undertaken to confirm the scale and significance of predicted environmental impacts arising from the scheme design. The final EIA work will be

reported within the ES, which will accompany the DCO application to be made in Summer 2018.

5.12.8 Predicted air quality concentrations for the wider affected road network will be provided following verification of areas beyond the A30 mainline.

5.12.9 A regional air quality assessment will also be completed.

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Preliminary Environmental Information Report

Chapter 6 Cultural Heritage

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6 Cultural Heritage

6.1 Introduction

6.1.1 This chapter of the PEIR provides information on cultural heritage assets which may be subject to effects arising from the scheme as far as information is available at this point in time. It assesses the likely significant effects of the scheme in respect of those heritage assets, which are within the footprint of the scheme, within 300m or 1km of the scheme.

6.1.2 The objectives of this assessment for PEIR are to:

- Identify, describe and characterise the cultural heritage environment within the vicinity of the scheme;
- Assess the value of the cultural heritage environment within the vicinity of the scheme;
- Identify and assess the magnitude the potential effects of the scheme on the cultural heritage environment within the vicinity of the scheme;
- Identify appropriate mitigation measures;
- Assess the magnitude of the mitigated effects of the scheme with the mitigation measures in place; and
- Assess the significance of the residual effects of the scheme.

6.2 Legislative and Policy Framework

Legislation

6.2.1 The legislation presented below is relevant to the assessment of effects on the historic environment for the scheme:

- Ancient Monuments and Archaeological Areas Act (AMAA) 1979; and
- Planning (Listed Buildings and Conservation Areas) (P(LBCA) Act 1990.

6.2.2 The AMAAA largely relates to Scheduled Monuments and Section 61(12) defines sites that warrant protection due to their being of national importance as 'ancient monuments'. A monument is defined by the Act as "any building, structure or work above or below the surface of the land, any cave or excavation; any site comprising the remains of any such building, structure or work or any cave or excavation; and any site comprising or comprising the remains of any vehicle, vessel or aircraft or other movable structure or part thereof".

6.2.3 Section 61 of the Act states that deliberate damage to a monument is a criminal offence and any intrusive works taking place within one will require Scheduled Monument Consent (SMC) from the Secretary of State. For non-intrusive work, such as geophysical surveys, Historic England are responsible for issuing licences under Section 42 of the Act.

6.2.4 Section 1 of the P(LBCA) Act defines a listed building as "a building which is for the time being included in a list compiled or approved by the Secretary of State under that section. For the purpose of the Act any object or structure fixed to the building, which, since on or before 1 July 1948, has formed part of the land and is comprised within the curtilage of the building is treated as part of the building". 'Building' is defined as including any structure or erection and any part of a

building". The key elements of this Act relevant to this assessment are outlined below:

- Section 66 places a responsibility upon the decision-maker in determining applications for planning permission for a scheme that affects a listed building or its setting to have special regard to the desirability of preserving the building or its setting or any features of special architectural or historic interest which it possesses; and
- Section 72 of the Act places a duty upon the decision maker in determining applications for planning permission within conservation areas to pay special attention to the desirability of preserving or enhancing the character or appearance of that area.

National Policy Statement for National Networks

6.2.5 The National Policy Statement for National Networks (NPS) sets out the need for and Government's policies to deliver development of Nationally Significant Infrastructure Projects (NSIPs) on the national road and rail networks in England. The policies for the conservation of the historic environment are set out in Chapter 5, which states "Those elements of the historic environment that hold value to this and future generations because of their historic, archaeological, architectural or artistic interest are called 'heritage assets'. Heritage assets may be buildings, monuments, sites, places, areas or landscapes. The sum of the heritage interests that a heritage asset holds, or its value, is referred to as its significance. Significance derives not only from a heritage asset's physical presence, but also from its setting. Non-designated heritage assets of archaeological interest that are demonstrably of equivalent significance to Scheduled Monuments, should be considered subject to the policies for designated heritage assets. The absence of designation for such heritage assets does not indicate lower significance".

6.2.6 The NPS advises "the Secretary of State should also consider the impacts on other non-designated heritage assets (as identified either through the development plan process by local authorities, including 'local listing', or through the nationally significant infrastructure project examination and decision making process) on the basis of clear evidence that the assets have a significance that merit consideration in that process, even though those assets are of lesser value than designated heritage assets".

National Policy

6.2.7 National Planning policies on the conservation of the historic environment are set out in the National Planning Policy Framework (NPPF) and should be adhered to in conjunction with NPS, where the NPS does not cover a specific issue. The NPPF was published on 27th March 2012, replacing all previous Planning Policy Statements, including Planning Policy Statement 5 (PPS 5): Planning for the Historic Environment. Guidance to help practitioners implement this policy, including the legislative requirements that underpin it, is provided in Planning for the Historic Environment Practice Guide (June 2012) produced to support the previous PPS 5 (2010).

6.2.8 Non-designated heritage assets as well as those designated under the above legislation are given protection under the NPPF. Policies dealing with the conservation and enhancement of the historic environment is set out principally in

Section 12 of the NPPF, which directs local planning authorities to set out "a positive strategy for the conservation and enjoyment of the historic environment, including heritage assets most at risk through neglect, decay or other threats. In doing so, they should recognise that heritage assets are an irreplaceable resource and conserve them in a manner appropriate to their significance".

6.2.9 Paragraph 131, states:

"In determining planning applications, local planning authorities should take account of:

- the desirability of sustaining or enhancing the significance of heritage assets and putting them to viable uses consistent with their conservation; and
- the positive contribution that conservation of heritage assets can make to sustainable communities including their economic vitality; and the desirability of new development making a positive contribution to local character and distinctiveness".

6.2.10 Paragraph 132, states:

"Great weight should be given to the conservation of the significance of designated heritage assets and that harm to this significance (either through alteration or destruction of the asset, or through development within its setting) requires 'clear and convincing justification'. The harm or loss needs to be outweighed by the public benefits of the proposed development and substantial harm to or loss of a grade II listed building; park or garden should be exceptional. Substantial harm to or loss of designated heritage assets of the highest significance, notably scheduled monuments, protected wreck sites, battlefields, grade I and II* listed buildings, grade I and II* registered parks and gardens, and world heritage sites, should be wholly exceptional".

6.2.11 Paragraph 135, states:

"The effect of an application on the significance of a non-designated heritage asset should be taken into account in determining the application. In weighing applications that affect directly or indirectly non-designated heritage assets, a balanced judgement will be required having regard to the scale of any harm or loss and the significance of the heritage asset."

6.2.12 Paragraph 139, states:

"Non-designated heritage assets of archaeological interest that are demonstrably of equivalent significance to scheduled monuments should be considered subject to the policies for designated heritage assets."

Local Policy

6.2.13 The Cornwall Local Plan (2010-2030) was adopted in November 2016 and contains the following policies which are relevant to the scheme:

Policy 2 - Spatial Strategy: 1. Respecting and enhancing quality of place

6.2.14 Proposals should maintain and respect the special character of Cornwall, recognising that all urban and rural landscapes, designated and undesignated, are important by:

- Ensuring that the design of development is high quality and demonstrates a cultural, physical and aesthetic understanding of its location;

- Considering the impact of development upon the biodiversity, beauty and diversity of landscape and seascape, character and setting of settlements, wealth of natural resources, agricultural, historic and recreational value of Cornwall;
- Identifying the value and sensitivity, of the character and importance of landscapes, biodiversity and geodiversity and historic assets;
- Protecting, conserving and enhancing the natural and historic landscape, heritage, cultural, biodiversity and geodiversity assets of Cornwall in recognition of their international, national and local status, in accordance with national legislation and policy, as amplified by the other policies of this plan.

Policy 24 - Historic Environment

6.2.15 Development proposals will be permitted where they would sustain the cultural distinctiveness and significance of Cornwall's historic rural, urban and coastal environment by protecting, conserving and where appropriate enhancing the significance of designated and non-designated assets and their settings.

6.2.16 Development proposals will be expected to:

- sustain designated heritage assets;
- take opportunities to better reveal their significance;
- maintain the special character and appearance of Conservation Areas, especially those positive elements in any Conservation Area Appraisal;
- conserve and, where appropriate, enhance the design, character, appearance and historic significance of historic parks and gardens; and
- conserve and, where appropriate, enhance other historic landscapes and townscapes, including registered battlefields, including the industrial mining heritage.

6.2.17 Development within the Cornwall and West Devon Mining Landscape WHS and its setting should accord with the WHS Management Plan. Proposals that would result in harm to the authenticity and integrity of the Outstanding Universal Value should be wholly exceptional.

6.2.18 If the impact of the proposal is neutral, either on the significance or setting, then opportunities to enhance or better reveal their significance should be taken.

6.2.19 All development proposals should be informed by proportionate historic environment assessments and evaluations (such as heritage impact assessments, desk-based appraisals, field evaluation and historic building reports) identifying the significance of all heritage assets that would be affected by the proposals and the nature and degree of any effects and demonstrating how, in order of preference, any harm will be avoided, minimised or mitigated.

6.2.20 Great weight will be given to the conservation of the Cornwall's heritage assets. Where development is proposed that would lead to substantial harm to assets of the highest significance, including undesignated archaeology of national importance, this will only be justified in wholly exceptional circumstances, and substantial harm to all other nationally designated assets will only be justified in exceptional circumstances.

6.2.21 Any harm to the significance of a designated or non-designated heritage asset must be justified. Proposals causing harm will be weighed against the substantial public, not private, benefits of the proposal and whether it has been demonstrated

that all reasonable efforts have been made to sustain the existing use, find new uses, or mitigate the extent of the harm to the significance of the asset; and whether the works proposed are the minimum required to secure the long term use of the asset.

6.2.22 In those exceptional circumstances where harm to any heritage assets can be fully justified, and development would result in the partial or total loss of the asset and/or its setting, the applicant will be required to secure a programme of recording and analysis of that asset, and archaeological excavation where relevant, and ensure the publication of that record to an appropriate standard in a public archive.

6.2.23 Proposals that will help to secure a sustainable future for the Cornwall's heritage assets, especially those identified as being at greatest risk of loss of decay, will be supported.

Standards and Guidance

6.2.24 In addition to compliance with the NN NPS and NPPF, this assessment for PEIR has been compiled in accordance with professional standards and guidance. The standards and guidance which relate to this assessment are:

- CIfA, 2017, Standard and guidance for historic environment desk-based assessment;
- CIfA, 2014a, Code of Conduct;
- Highways Agency 208/07, Design Manual for Roads and Bridges, Volume 11, Section 3, Part 2;
- Historic England, 2015, Good Practice Advice in Planning (GPA2) Managing Significance in Decision - Taking in the Historic Environment - this advice note provides information to support the NPPF and Planning Practice Guidance (PPG), such as aiding in assessing the significance of heritage assets;
- Historic England, 2015, Good Practice Advice in Planning (GPA3) The Setting of Heritage Assets - this advice note sets out a staged approach for assessing the impact of a proposed development on the heritage significance of assets, due to changes in their setting;
- English Heritage, 2008, Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment - this document sets out the approach to making decisions and offering guidance about all aspects of England's historic environment;
- English Heritage, 2011, Seeing the History in the View, a Method for Assessing Heritage Significance within Views - this document presents a method for understanding and assessing heritage significance within views; and
- Department for Communities and Local Government, 2014, Planning Practice Guidance 18a: Conserving and enhancing the historic environment, Scoping and consultation.

6.3 Study Area

6.3.1 The Study Area considered in the assessment comprises:

- The area within the scheme boundary (hereafter known as the ‘scheme footprint’);

- 300m from the centreline of the scheme (hereafter known as the 'inner study area') was applied for the identification of all heritage asset types (designated, non-designated and potential) to establish archaeological context and potential; and

6.3.2 1km from the centreline of the scheme (hereafter known as the 'outer study area') was applied for the identification of all designated heritage assets.

6.3.3 The inner study area for the project was based upon guidance provided in DMRB Volume 11, Section 3 Part 2 Chapter 5 with regard to baseline data gathering. The 1km outer study area was founded upon professional judgement regarding the distance over which significant effects on the setting of heritage assets could occur, based on the authors' experience of undertaking historic environment EIA for a wide variety of development types.

6.4 Potential Impacts

Construction

6.4.1 Where the scheme is contained within the existing A30 corridor and alongside areas of prior disturbance, the potential for the presence of as-yet unknown archaeological remains would have been previously removed. However, where the scheme requires excavation below existing ground surface within areas of fields, including compound areas, possible remains may exist.

6.4.2 Construction activity, including movements of plant, temporary lighting and temporary compounds, would take place within the wider setting of listed buildings and upstanding non-designated heritage assets within the study area. These works would be temporary and of limited duration.

6.4.3 Views from heritage assets towards permanent works such as new roads, cuttings, embankments and other structures are considered to be construction impacts for the purposes of the assessment. Likewise, removal of elements of the existing A30, such as lighting of junctions, are considered to be construction effects.

6.4.4 The ZTV was not available for use in the PEIR, and therefore judgments as to the visibility of the scheme from heritage assets have been made using professional judgement based on site visits. However, the visual component of setting assessments for the final ES will be revisited utilising the ZTV, and revised accordingly.

Operation

6.4.5 Impacts on the historic environment during the operational phase will result from the use of the scheme; this will include traffic noise, new lighting, and the visibility of moving vehicles on the road. There will be no physical impacts on below-ground archaeology during operation, as these will have occurred during the construction phase.

6.4.6 Noise and traffic models for the operation of the scheme were not available for use in the PEIR. Operational impacts have therefore been generalised, and will be considered specifically in the ES.

6.5 Assessment Methodology

6.5.1 The DMRB provides a three-stage approach to assessment, determining the importance of the heritage asset, the magnitude of impact and the significance of effect. This approach is described in more detail in the following sections.

Assessment of value

6.5.2 The assessment methodology for assessing effects is based on the principle that the environmental effects of the scheme, in relation to a single heritage asset, should be determined by identifying the asset's value, assessing the magnitude of change the scheme would have on the asset's significance (where significance is defined as the attributes that give the asset its importance) and then combining these two elements to identify the significance of effect. The following tables provide further detail on the process for assessing effects.

6.5.3 The importance or value of each heritage asset within the study area was determined according to the DMRB criteria set out in Table 6-1.

Table 6-1 Importance/Value criteria for heritage assets

Criteria for establishing importance/value of heritage assets	
Value	**Typical descriptors**
Very High	Internationally important assets, including World Heritage Sites and nominated sites. Assets that can contribute significantly to acknowledged international research objectives.
High	Nationally important assets, including Scheduled Monuments, Grade I and II* Listed Buildings, Grade I and II* Registered Parks and Gardens, Registered Battlefields, Protected Wreck Sites. Assets that can contribute significantly to acknowledged national research objectives. Other listed buildings, which can be shown to have exceptional qualities in their fabric or historical associations not adequately reflected in the listing grade. Conservation areas containing very important buildings. Undesignated structures of clear national importance. Undesignated assets of schedulable quality and importance. Assets that can contribute significantly to acknowledged national research objectives.
Medium	Regionally important assets, including designated assets, Conservation Areas containing buildings that contribute significantly to its historic character, Grade II Registered Parks and Gardens, Grade II Listed Buildings, and non-designated assets. Designated or undesignated assets that contribute to regional research objectives.
Low	Local important assets, including Locally listed buildings. Historic (unlisted) buildings of modest quality in their fabric or historical association. Assets compromised by poor preservation and/ or poor survival of contextual associations. Assets of limited value, but with potential to contribute to local research objectives.

Criteria for establishing importance/value of heritage assets	
Value	**Typical descriptors**
Negligible	Buildings of no architectural or historical note. Features with very little or no surviving archaeological interest.

Magnitude of Impacts

6.5.4 The approach used to assess magnitude of impacts on heritage assets considers the change upon the receptor. This takes into account the severity of impact of the scheme, together with the vulnerability of the receptor to change. The approach used is based on professional judgment and experience. It also reflects guidance on 'substantial harm' and 'less than substantial harm' in the NPPF and established methodologies in the DMRB. Table 6-2 summarises the types of impact and magnitude used in the assessment, adapted from DMRB.

Table 6-2 Broad criteria for assessing the magnitude of change/impact

Magnitude of impact	Description and nature of change/impact
Major	Substantial harm to, or total loss of, an asset's significance as a result of changes to its physical form or setting. This would include for example, demolition, removal of physical attributes critical to an asset, loss of all archaeological interest or the transformation of an asset's setting in a way that fundamentally compromises its ability to be understood or appreciated. The scale of change would be such that it could result in a designated asset being undesignated or having its level of designation lowered.
Moderate	Less than substantial harm to an asset's significance as a result of changes to its physical form or setting. For example, physical alterations that remove or alter some elements of significance but do not substantially alter the overall significance of the asset; notable alterations to the setting of an asset that affect appreciation of it; or the unrecorded loss of archaeological interest.
Minor	Limited harm to an asset's significance as a result of changes to its physical form or setting (less than substantial harm) For example, physical changes that alter some elements of significance but do not noticeably alter the overall significance of the asset; and small small-scale alterations to the setting of an asset that hardly affect its significance.
Negligible/Neutral	No appreciable change to an asset's significance. Negligible change or no material change to the site or feature. No real change in our ability to understand and appreciate the resource and its historical context and setting.
No Change	No change.

Significance of Effect

6.5.5 By combining the magnitude of impact (or change) and the importance of each heritage asset, an assessment has been made of the significance of effect, taking

into account the possibility and nature of mitigation. The resultant effects may be either negative (adverse) or positive (beneficial) or neutral, depending on the nature of the impact.

6.5.6 In accordance with DMRB, significance of effect upon the heritage resource is assessed used the matrix in Table 4-3 Chapter 4.

6.5.7 Where the matrix suggests more than one likely outcome, for instance slight or moderate, professional judgement has been used in conjunction with the descriptors in Table 6-3 to arrive at a robust conclusion.

Evaluation of effect

6.5.8 The significance of the effects on the heritage assets has been assessed using the approach defined in Table 6-3. Effects are defined on a nine point scale (very large beneficial, large beneficial, moderate beneficial, slight beneficial, neutral, slight adverse, moderate adverse, large adverse or very large adverse).

Table 6-3 Evaluation criteria

Significance of effect	Effect
Very Large Adverse	Partial or total loss of a site of Very High Importance.
Large Adverse	Result in the total, or almost total, loss of heritage assets. Be highly intrusive and would seriously damage the setting of the heritage resource such that its context is seriously compromised and can no longer be appreciated or understood. Be strongly at variance with the form scale and pattern of a heritage resource or conservation area. Be in serious conflict with government policy for the protection of the heritage resource.
Moderate Adverse	Be out of scale with or at odds with the scale pattern or form of the heritage resource or conservation area. Be intrusive in the setting (context) and adversely affect the appreciation and understanding of the resource. Result in loss of features such that their integrity of the heritage resource is compromised, but not destroyed. Be in conflict with local or regional policies for the protection of the heritage.
Slight Adverse	Have a detrimental impact on the context of a heritage feature such that its integrity is compromised and appreciation and understanding of it is diminished. Not fit perfectly with the form scale pattern and character of a heritage resource or conservation area. Be in conflict with local policies for the protection of the local character of the heritage resource.
Neutral	Maintain existing historic features in the townscape. Have no appreciable impacts either beneficial or adverse on any known or potential heritage assets. Result in a balance of beneficial and adverse impacts. Not result in severance or loss of integrity context or understanding within a historic landscape. Not be in conflict with and do not contribute to policies for the protection or enhancement of the heritage.

Significance of effect	Effect
Slight Beneficial	Restore or enhance the sense of place of a heritage feature through good design and mitigation. Remove or mitigate visual intrusion (or other indirect impacts) into the context of heritage features such as that appreciation and understanding of them is improved. Not be in conflict with national regional or local policies for the protection of the heritage. Marginally enhance the integrity understanding and sense of place of a site or group of sites.
Moderate Beneficial	Provide potential for significant restoration of characteristic features or their setting through the removal, relocation or mitigation of existing damaging or discordant impacts on the heritage resource. Contribute to regional or local policies for the protection or enhancement of the heritage resource. Enhance the integrity, understanding and sense of place of a site or group.
Large Beneficial	Result in the removal, relocation or substantial mitigation of very damaging or discordant existing impacts (direct or indirect) on the heritage. Result in extensive restoration or enhancement of characteristic features or their setting. Form a major contribution to government policies for the protection or enhancement of the heritage resource. Remove or successfully mitigate existing visual intrusion such as that the integrity understanding and sense of place of a site or group of sites is re-established.
Very Large Beneficial	As 'Large beneficial' where the effect would be upon a site of Very High Importance

6.5.9 Adverse effects of moderate significance or above represent a significant effect that requires mitigation.

6.6 Baseline Conditions

This assessment has considered the known designated and non-designated heritage assets within the scheme footprint, inner study area and outer study area. Approximate historical periods, as defined by Historic England[1], are provided in Table 6 4.

[1] Historic England, PastScape, http://www.pastscape.org.uk/TextPage.aspx (accessed 28 September 2017)

Table 6-4 Definition of archaeological time periods

Period name	Date range	Additional periods, where needed
Palaeolithic	500,000 – 10,000BC	
Mesolithic	10,000 – 4,000BC	
Neolithic	4,000 – 2,200BC	
Bronze age	2,200 – 700BC	
Iron age	700BC – AD43	
Romano-British	AD43 - 410	
Early medieval (Anglo-Saxon)	410 - 1066	
Medieval	1066 - 1540	
Post-medieval	1540 - 1901	Tudor - 1485 - 1603 Elizabethan - 1558 - 1603 Stuart - 1603 – 1714 (Jacobean 1603 – 1625) Hanoverian – 1714 –1837 (Georgian 1714– 1830) Victorian - 1837 - 1901
20th Century	1901 - 2000	
21st Century	2001 - 2100	

6.6.1 All heritage assets and archaeological findspots (the latter are included to provide contextual information on the likelihood of archaeological remains within the scheme boundary) will be detailed in the full ES.

Designated heritage assets

6.6.2 One post-medieval designated heritage asset is recorded within the footprint of the scheme, a post-medieval milestone - Milestone at SW 771486 NE (NHLE no. 1140923).

6.6.3 Although not within the footprint of the scheme, six designated heritage assets are noted within 10m of the edge of the works area, which include a World Heritage Site (WHS), two Scheduled Monuments (SM), one Registered Park and Garden (RPG) and two listed structures:

- Two areas of scheduled Bronze Age barrows - Two bowl barrows 290m and 375m north of Higher Ennis Farm (NHLE no. 1017050, alongside the scheme) and a Bowl barrow 100m south west of Callestick Vean (NHLE no. 1016103, approximately 5m from the scheme);
- The post-medieval Cornwall and West Devon Mining Landscape - Gwennap Mining District WHS (NHLE no. 1000105, alongside the scheme);
- Chyverton Park, a post-medieval Grade II Registered Park and Garden (NHLE no. 1000512, approximately 0.5m from the scheme); and
- Two post-medieval Grade II listed boundary stones - Boundary Stone at SW 778487 NE (NHLE no. 1140922) and a Boundary Stone at SW 773486 NE (NHLE no. 1136600), both approximately 10m from the scheme.

6.6.4 Within the inner 300m study area, 26 designated assets are recorded, eight SMs, eight Grade II Listed Buildings (LB) and ten Grade II listed structures, which comprise:

- Eight scheduled Bronze Age barrows, including one long barrow and the Heritage at Risk Warren's Barrow (NHLE no. 1016888, approximately 15m south of the scheme);
- Four Grade II listed post-medieval farmhouses, including Chyverton Home Farmhouse (NHLE no. 1141552, approximately 145m west of the scheme);
- The Grade II LBs post-medieval Church of Saint Peter (NHLE no. 1141481), Vicarage (NHLE no. 1328719) and Schoolroom (NHLE no. 1141482), all approximately 175m west of the scheme;
- One Grade II listed Lodge south-east of Chyverton House (NHLE no. 1136926, approximately 60m west of the scheme);
- One Grade II listed post-medieval guide stone (NHLE no. 1136693, approximately 250m north of the scheme); and
- Nine Grade II listed post-medieval milestones.

6.6.5 Within the outer 1km study area, 30 designated assets are recorded, six SMs (one also designated as Grade II listed), one Grade II* LB, one Grade II* listed structure, 14 Grade II LBs, seven Grade II listed structures and one Conservation Area (CA), which comprise:

- Four scheduled Bronze Age barrows;
- A scheduled Iron Age hillfort, 250m south west of Tresawsen (NHLE no. 1016445);
- A scheduled and Grade II listed medieval cross (NHLE no. 1016290/1136597);
- The Grade II* listed post-medieval Chyverton House (NHLE no. 1141551);
- The Grade II* listed post-medieval Bridge east of Chyverton House (NHLE no. 1328680);
- Ten Grade II listed post-medieval houses, farmhouses and associated farm buildings;
- A Grade II listed post-medieval Wesleyan Chapel (NHLE no. 1328705);
- The Grade II listed post-medieval Plume of Feathers Public House (NHLE no. 1141450);
- Two areas of mining activity - the Grade II listed post-medieval Batters Engine House (NHLE no. 1141578) and mine buildings 400m north-east (NHLE no, 1136747);
- One Grade II listed post-medieval guide post (NHLE no. 1141580);
- Six Grade II listed post-medieval milestones; and
- Mitchell CA (approximately 300m east of the scheme).

6.6.6 These designated heritage assets are shown on Figure 6-1 accompanying this PEIR. Further details of these assets will be provided in the ES.

Cornwall and West Devon Mining Landscape World Heritage Site

6.6.7 The Cornwall and West Devon Mining Landscape WHS was designated in 2006, recognising the international importance of the mining culture and the impact this

had on the development of the modern, global, mining economy, throughout the world today[2].

6.6.8 It is the largest WHS in the UK, comprising 10 areas comprising each of which features distinctive patterns of buildings, monuments and sites. Together these form a unified, coherent cultural landscape and share a common identity as part of the overall exploitation of ore-bearing minerals here from the 18th to 20th centuries.

- Area 1: St Just Mining District;
- Area 2: The Port of Hayle;
- Area 3: Tregonning and Gwinear Mining Districts with Trewavas;
- Area 4: Wendron Mining District;
- Area 5: Camborne and Redruth Mining District with Wheal Peevor and Portreath Harbour;
- Area 6: Gwennap Mining District with Devoran and Perran and Kennall Vale;
- Area 7: St Agnes Mining District;
- Area 8: The Luxulyan Valley and Charlestown;
- Area 9: Caradon Mining District; and
- Area 10: Tamar Valley Mining District with Tavistock.

6.6.9 The scheme lies adjacent to 'Area 6: Gwennap Mining District with Devoran and Perran and Kennall Vale' area of the WHS. This rural mining district produced a major proportion of the world's supply of copper during the 18th and first half of the 19th centuries. Mining villages, important Methodist sites and the houses and estates of industrial entrepreneurs are included, together with major ancillary industrial sites, important early railway networks and the remains of an early 19th century mining port.

6.6.10 Gwennap was once described as the "richest square mile in the Old World". The widespread and devastating landscape impact of copper mining may be seen together with remains of the network of railways that linked the mines to the ports.

6.6.11 The desolate, largely heathland landscape, considerably modified by mining, is carpeted with waste rock (deads), dotted with islands of consolidated building remains, and with shafts surrounded by distinctive Cornish mine hedges. The central and northern sections of this area are notable for their well-preserved landscape of smallholdings, interspersed with small mining settlements together with the mines, which they served. St Day, Carharrack and Chacewater are particularly fine examples of mining villages. Scorrier House, Tregullow and Burncoose are examples of the grand houses and estates built by mining industrialists.

Known Non-designated Heritage Assets

6.6.12 Six non-designated heritage assets and one findspot are recorded within the footprint of the scheme, ranging from the Mesolithic to the 20th century, with one of unknown date. These comprise:

- A large scatter of Mesolithic material, including a scraper, flint flakes and an arrowhead (HER no. MCO1858);

[2] Cornwall and West Devon Mining Landscape World Heritage Site Management Plan 2013–2018. Cornish Mining World Heritage

- A possible dyke dating from the Iron Age to the medieval periods (HER no. 25228);
- The site of a medieval cross (HER no. MCO5575);
- A trackway dating from the medieval to post-medieval periods (HER no. MCO31937);
- The settlement of Henver, occupied from the medieval to present (HER no. MCO14868);
- The site of a 20th century observation post (HER no. MCO42673); and
- A line of five small pits of unknown date (HER no. MCO32376).

6.6.13 Although not within the footprint of the scheme, one non-designated heritage asset is noted within close proximity (<10m) – a possible Iron Age to Romano-British round (HER no. MCO34825), approximately 3m from the scheme.

6.6.14 Within the inner 300m study area, 58 non-designated assets are recorded, along with seven findspots, ranging from the Mesolithic to modern periods, which include Bronze Age barrows, Iron Age to Romano-British enclosures, settlements dating to the early medieval and medieval periods and post-medieval mining activity.

6.6.15 These non-designated heritage assets are shown on Figure 6-2 of this PEIR. Further details of these assets will be provided in ES.

Historical Background

6.6.16 In Cornwall, early prehistoric activity from hunter-gatherer groups is frequently evidenced by numerous surface collections of lithic scatters, especially on areas of uplands[3]. During the later prehistoric period, Cornwall was a widely populated area and many hilltops were transformed with the construction of enclosures and funerary monuments known as round barrows.

6.6.17 The scheme is located within an area that was controlled by the Dumnonii tribe during the Iron Age. The Dumnonii occupied one of the largest regions of Britain, occupying Cornwall, Devon and parts of southern Somerset; their capital was at Isca Dumnoniorum, now modern day Exeter[4].

6.6.18 By the Romano-British period, the extraction of tin and lead in the South-West became a significant element of the economy, which was exported to the rest of Britain and beyond[4].

6.6.19 During the medieval period, a wide range of metal ores continued to be extracted, which has influenced the appearance of the landscape and character of the area. By the 1860s, however, the mining economy collapsed and the burden of unemployment saw a mass emigration from the area. The following years threw the local economy into a deep slump, and by the 20th century, the landscape had become predominantly rural in character, supporting a mixed farming regime and tourist industry**Error! Bookmark not defined.**.

[3] Hosfield, R., Straker, V. and Gardiner, P. Palaeolithic and Mesolithic, 23-62 in Webster, C.J. (ed.) 2008, The Archaeology of South West England, South West Archaeological Research Framework Resource Assessment and Research Agenda. Somerset Heritage Service

[4] Holbrook, N. (ed) Roman, 151-161, in Webster, C.J. (ed) The Archaeology of South West England, South West Archaeological Research Framework Resource Assessment and Research Agenda. Somerset Heritage Service, 2008

6.6.20 The development and form of Cornwall's roads was hugely affected by the county's unique topography and landscape[5]. From the 17th century, turnpike trusts were set up by Acts of Parliament[6], with three turnpike routes noted in Cornwall. A large section of the A30 follows the course of the 17th century 'Land's End coaching road'[7], which later became one of the longest A-roads in the UK[8].

Archaeological Background

6.6.21 Within the study area, archaeological evidence is noted from the prehistoric to modern periods; with the exception of the Romano-British period, of which none have been recorded.

6.6.22 Earliest prehistoric activity is recorded from finds dating to the Mesolithic period, followed by later Neolithic finds. The Bronze Age period is defined by the abundance of barrows, some termed as ‘barrow cemeteries’ within the area. Place-name evidence, a hillfort near Tresawsen and enclosure cropmarks, confirm activity from the Iron Age period. A pillar, together with Warren’s Barrow being used as a beacon, represents early medieval activity. Medieval settlement is recorded throughout the study area, along with Christian crosses. Numerous milestones, settlement, ecclesiastical and mining activity dating to the post-medieval period is recorded. 20th century Cold War evidence is noted near to Carland Cross.

Map Summary

6.6.23 From the late 19th century, the study area roughly followed the route of a lane extending south-east from a crossroads 'Three Burrows'. Three Burrows was shown as a settlement featuring a church, school and public house, with at least three tumuli and a number of standing stones in the vicinity.

6.6.24 Eastwards from Three Burrows, the lane traversed through enclosed post-medieval field systems containing significant numbers of tumuli, concentrated close to the route. Post-medieval quarries also peppered the landscape, along with intersecting lanes crossing areas of farmland. Two manor houses, Higher Ventogimps and Nancarrow, were depicted in the central part of the study area with their curtilages intact, surrounded by farmland. Larger settlements were infrequent and concentrated around the lane and its intersections, with Zelah being the most prominent. Immediately north of Zelah, a number of small settlements such as Polstain, Henver and Cralsa are recorded.

6.6.25 At the north-eastern end of the study area, a dense concentration of tumuli cluster in fields close to the Carland Cross Junction and former mine shafts are recorded. North of the study, the remains of Cargoll Mine and the extant West Chiverton Mine, are evidence of past and current mining.

6.6.26 Little change was recorded in the study area until the mid-20th century, when the route from the Three Burrows to Carland Cross was formalised as the A30 and

[5] An introduction history of transport in Cornwall, http://www.cornwallheritagetrust.org/discover/history-of-transport/ (accessed 11 October 2017)

[6] Turnpike Roads in England, http://www.turnpikes.org.uk/The%20Turnpike%20Roads.htm (accessed 12 October 2017)

[7] 'Roads', in A History of the County of Wiltshire: Volume 4, ed. Elizabeth Crittall (London, 1959), pp. 254-271. British History Online http://www.british-history.ac.uk/vch/wilts/vol4/pp254-271 (accessed 12 October 2017)

[8] A30, http://www.cbrd.co.uk/motorway/a30 (accessed 12 October 2017)

recorded as a major trunk road. The course of the route remains unaltered and the landscape through which it passes it largely remains unchanged.

Heritage at Risk Asset

6.6.27 Within the study area, one heritage asset is recorded upon the Heritage at Risk register, Warren's Barrow (NHLE site no. 1016888). The barrow is a Scheduled Monument comprising a bell barrow situated on the tip of a south facing hill slope to the east of Newlyn Downs. Warren's Barrow is the most northerly barrow of a group of barrows that formed a prehistoric barrow cemetery at Carland Cross; the other barrows are designated under separate scheduling. Warren's Barrow is on the 'Heritage at Risk' register due to significant localised problems resulting from scrub/tree growth on the monument.

Previous Archaeological Investigations

6.6.28 Within the inner 300m study area, 45 archaeological investigations have been undertaken, ranging from desk-based studies to field evaluations and excavations. This assessment has focused on archaeological investigations within the footprint of the scheme, to provide an understanding of activities within this area only.

6.6.29 The footprint of the scheme has been subject to archaeological investigations from 1980 to 2014, which has included desk-based assessments, watching briefs, geophysical surveys, management plans, walkover surveys and scheduled monument recording and repairs. Results of these found Bronze Age barrows at Chiverton Cross and Carland Cross, and evidence of prehistoric, medieval and post-medieval agricultural activity across the scheme. However, historic deep ploughing over some areas was found to have destroyed any potential below ground archaeology.

Archaeological Investigations for the scheme

6.6.30 In June 2017, a non-intrusive geophysical survey was undertaken by SUMO Survey[9], within 69 areas along the scheme corridor. Further geophysical survey is ongoing for compound areas.

6.6.31 The 2017 survey identified numerous anomalies of probable and possible archaeological interest, scattered along the length of the survey corridor but with concentrations to the south of Newlyn Downs (areas 8-10), approximately 1.4km north-east of Zelah (areas 14-15), directly south of Zelah (areas 23-24) and approximately 850m south-west of Chyverton Park (areas 26-32). By far the most common features identified were linear anomalies, which may represent enclosures or field systems. Possible ring ditches were also detected. Elsewhere, occasional lengths of linear anomalies and isolated pit-like anomalies were recorded. Pipes and anomalies of natural origin were also identified and past agriculture was visible throughout the survey area.

[9] Gater, J. and Tanner, J. Geophysical Survey Report, A30 Carland to Chiverton, Cornwall, 2017

6.6.32 Cornwall Archaeological (CAU) are currently undertaking evaluation trenches along 8.7 miles of the scheme corridor, which are being informed by the geophysical results and previous geotechnical test pitting[10].

6.7 Consultation

6.7.1 Consultation has been undertaken with Historic England to inform the scheme design, and engagement is ongoing as part of the detailed design and ES process. A Scoping Opinion has also been received from Historic England and from the Planning Inspectorate.

6.8 Assessment Assumptions and Limitations

6.8.1 The following assumptions and limitations apply to this assessment:

- This assessment has been prepared based on the scheme design information available at the time of compilation of this assessment;
- It is assumed that all data acquired from the Cornwall and Scilly Historic Environment Record (CSHER) and Historic England digital datasets are the most recent available. The assessment does not take account of information that may have been added to these datasets after the baseline data gathering was completed;
- The assessments of setting impacts have been undertaken by means of views from publicly accessible locations only;
- While a geophysical survey has been undertaken to establish the nature of the archaeological resource within the vicinity of the scheme, the techniques used are not able to identify the total archaeological resource that may be affected by the scheme. Therefore, there remains the possibility that some sites remain undetected beneath the ground;
- Aerial photographic evidence is limited by seasonal, agricultural, meteorological and environmental factors which affect the extent to which either buried or upstanding archaeological features can be detected from the air. The visibility of archaeological features may differ from year to year, dependent on the type of crop or land use, prevailing weather and levels of moisture in the soil over the crop growing season.

6.9 Design, Mitigation and Enhancement Measures

Construction Mitigation

6.9.1 Mitigation of construction impacts would take the form of measures to ameliorate direct impacts (physical damage), and indirect impacts (changes to setting that affect the significance of the assets).

6.9.2 Mitigation of direct impacts would take the form of ‘preservation by record’, that is, the investigation of archaeological remains prior to construction, and the analysis of artefacts and publication of results following the construction of the scheme.

6.9.3 Direct impact on the scheduled barrow (NHLE 1017050) will be avoided by the construction of a retaining structure.

[10] Cornwall Archaeological Unit. A30 Carland Cross to Chiverton Roundabout, Cornwall. Written scheme of Investigations for archaeological evaluation trenching, 2017

6.9.4 Preservation by record can involve a number of levels of detail, commensurate with the significance of the assets being impacted directly by the scheme. As the significance of assets requiring completion becomes clearer, the type and location of mitigation required will be agreed with the Cornwall Council Archaeological Officer.

Operation Mitigation

During operation, it is expected that no mitigation will be required as all potentially significant effects will have occurred during the construction phase.

6.10 Assessment of Effects

6.10.1 The following assessment takes into account the construction and operation of the scheme, including any proposed landscape, noise and ecology mitigation.

Construction Effects

Designated heritage assets

6.10.2 The assessment has examined the potential construction impacts on the setting of designated heritage assets in the study area. A number of designated heritage assets were noted to have no impacts from the construction of the scheme, as a result of their location, and/or localised topography, and/or nearby mature/dense landscaping.

6.10.3 The assessment identified no impacts on the following:

- Six scheduled barrows;
- One scheduled and Grade II listed cross - Trevalsa Cross;
- One Grade II* listed building - Chyverton House;
- One Grade II* listed structure – Bridge east of Chyverton House;
- Mitchell Conservation Area;
- 18 Grade II listed buildings – Zelah Chapel, Chyverton Home Farmhouse, Rose Cottage, Shirley Farmhouse, Wellesley House, Primrose Farmhouse, Mitchell Farmhouse, Plume of Feathers Public House, Lower Ventongimps Farmhouse, Higher Ventongimps, Ventongimps Villa, Highlands, Tresawen Farmhouse, Welseyan Chapel, Batters Engine House, Mine Buildings, Cartshed and stables; and
- 17 Grade II listed structures – two boundary stones, a guide post, a guide stone and 13 milestones.

Cornwall and West Devon Mining Landscape World Heritage Site (NHLE no. 1000105)

6.10.4 The WHS comprises ten discrete but in the main, inter-visible landscapes, of which all encompass significant components. One of these landscapes, Area 6: Gwennap Mining District with Devoran and Perran and Kennall Vale, lies adjacent the scheme. This rural mining district produced a major proportion of the world's supply of copper during the 18th and first half of the 19th centuries. Mining villages, important Methodist sites and the houses and estates of industrial entrepreneurs are included, together with major ancillary industrial sites, important early railway networks and the remains of an early 19th century mining port. Gwennap was once described as the "richest square mile in the Old World".

6.10.5 The Gwennap Mining District boundary is located at the western extent of the scheme and is abutted by the A30 and the A390 with Chiverton roundabout being located at the northerly point of the boundary. The northern section of this area is noted for its well-preserved landscape of smallholdings, interspersed with small mining settlements together with the mines, which they served.

6.10.6 The land of the WHS falls steeply to the west and south with little intervisibility to the area of the scheme. The majority of key views from the WHS are southwards, with the ridge on which Chiverton roundabout is located preventing most views to the north. Although much of the Cornish landscape contributes to the setting of the WHS, it is noted areas located outside of the WHS boundary generally have an insufficient survival of coherent mining landscape to be included.

6.10.7 Construction impacts – the scheme will remove the existing Chiverton roundabout and associated lighting, and an on/off slip road will replace it. This slip road will be constructed a short distance south-east of the existing junction. It is considered the new slip road would have a negligible impact upon the significance of the WHS. The removal of existing lighting at the Chiverton roundabout would result in a slight beneficial impact on the significance of the WHS during the hours of darkness. Overall, the permanent construction effect of the scheme upon the WHS is considered to be **Slight Beneficial**.

6.10.8 Temporary setting impacts - during construction, the field to the east of the WHS will be utilized as a main construction compound (Western Compound), in which proposed activities include: main office buildings and welfare facilities, car parking, material storage, satellite offices, fuel storage, washout pits for concrete and sweepers, waste segregation area and topsoil/subsoil storage. Although these works would be temporary and of limited duration, there would possibly be a minor adverse impact on the setting of the WHS, especially during the winter months with the loss of deciduous vegetation. This would result in a temporary **Slight Adverse** effect on the significance of the asset.

Church of Saint Peter (NHLE no. 1141481), Schoolroom immediately east of Church of St Peter (NHLE no. 1141482) and Vicarage (NHLE no. 1328719)

6.10.9 This group of assets are all Grade II listed and date to the post-medieval period. They comprise the Church of Saint Peter, the former vicarage, which is now a private residence (both built in the Gothic style) and the school room/church hall. All were built in the mid-19th century, with William White designing the church and vicarage, and may possibly have designed the accompanying school room/church hall. The listed buildings form a cohesive group of buildings related to the Church of Saint Peter, which was constructed to serve the ecclesiastical district of Mithian.

6.10.10 Located at the peak of a ridge, the church tower forms a prominent landmark that can be noted from much of the surrounding area. The buildings screened from the wider landscape by mature vegetation and occasional residential developments. Views to the north of the church are of open countryside, with other views from the asset group as a whole consisting of occasional glimpsed views through to pasture fields. The local topography descends gently to the north and east, rising again to the location of the current road network. The current A30 and A3075 are currently well screened at their closest point to the church. However, the movement of vehicles along the roads can be noted in the middle distance. Despite the proximity of the road network, the A30 is located less than 250m of the church, the assets enjoy a largely rural outlook. The experience of

the approach to the church and its setting from the road to the immediate west is that of a narrow country lane within rolling farmland. The setting of the assets make a moderate contribution to their significance

6.10.11 Construction impacts – the scheme will remove the existing Chiverton roundabout and associated lighting, and an on/off slip road will replace it. This slip road will be constructed a short distance north-east of the existing junction, as part of the new Chiverton Grade separated junction approximately 560m east of the assets. The removal of the Chiverton roundabout will possibly result in a slight beneficial impact on the assets due to the removal of noise associated with the existing junction. Therefore, the construction effect of the scheme upon the listed buildings is considered to be **Slight Beneficial**.

6.10.12 Temporary setting impacts - during construction, two construction compounds are proposed within the wider setting of the listed buildings:

- Western Compound (approximately 200m south of the listed buildings) - proposed activities include: main office buildings and welfare facilities, car parking, material storage, satellite offices, fuel storage, washout pits for concrete and sweepers, waste segregation area and topsoil/subsoil storage; and
- Chiverton Junction Compound (approximately 350m north-east of the listed buildings) - proposed activities include: welfare facilities, storage for piling, formwork and reinforcement materials, fabrication area for bridge beams, plant lay down area and topsoil/subsoil storage.

6.10.13 Although these works would be temporary and of limited duration, there would possibly be a minor adverse impact on the wider setting of the assets, especially during the winter months with the loss of deciduous vegetation. This would result in a temporary **Slight Adverse** effect on the significance of the assets.

The Three Burrows (NHLE no. 1016056)

6.10.14 The Three Burrows is a Scheduled Monument that includes a group of three Bronze Age barrows that have been ploughed and so reduced in height, they are located just east of Chiverton Cross and South East of St Peter's Church at Chiverton Cross. The three barrows are similar in diameter (20-22m) and in height (1-1.5m); only one of the barrows has any trace of a surrounding ditch. They are located within an open field; two barrows are located adjacent to a work yard and covered reservoir to the east. The presence of this reservoir within the setting of the barrows is considered to detract from their significance. The third barrow is located centrally within the field, approximately 100m south from the current A30.

6.10.15 The barrows were possibly part of a cohesive group, along with the scheduled bowl barrow 125m south of St Peter’s Church, located on a plateau at the top of a ridge. These barrows form part of a wider visible Bronze Age monument landscape of symbolic value and meaning. The broad setting of the barrows consists of predominantly rural views, and this aspect of their settings is considered to contribute to their significance. Although the construction of the existing A30, Chiverton roundabout and A3075 has partially fragmented that setting, especially with the intrusion from lighting that is visible from the barrows at night.

6.10.16 Construction impacts – the scheme will remove the existing Chiverton roundabout and associated lighting, and an on/off slip road will replace it. This slip road will be constructed a short distance south-east of the existing junction, which would then run along the northern edge of the barrow field, approximately 10m closer to the barrows than the current A30. The A30 itself will be diverted to the north of its current alignment rising on embankment north-east of the barrows at a distance of 500m. It is considered the new slip road would have a negligible impact upon the significance of the barrows. The removal of lighting at the existing Chiverton roundabout would result in a slight beneficial impact on the significance of the barrows during the hours of darkness. The presence of the scheme on embankment north-east of the barrows is considered to constitute a minor adverse impact upon the significance of the barrows. Overall, the permanent construction effect of the scheme upon the barrow group is considered to be **Slight Adverse**.

6.10.17 Temporary setting impacts - during construction, the field to the west of the barrows will be utilized as a main construction compound (Western Compound), in which proposed activities include: main office buildings and welfare facilities, car parking, material storage, satellite offices, fuel storage, washout pits for concrete and sweepers, waste segregation area and topsoil/subsoil storage. The assets would be demarcated and protected during construction, however the site compound and associated activities within the setting of the barrows are considered to constitute a major adverse temporary impact upon their significance. This would result in a **Large Adverse** effect. Following construction, the field would be returned to agricultural use, and this temporary effect would cease.

Bowl barrow 125m south of St Peter's Church at Three Burrows (NHLE no. 1016057)

6.10.18 The scheduled bowl barrow 125m south of St Peter's Church is a large Bronze Age bowl barrow (3m in height and 18m in diameter), which is enclosed within a garden plot of a house adjacent to the Grade II listed Church of Saint Peter (NHLE no. 1141481).

6.10.19 This barrow was possibly part of a cohesive group, along with the scheduled Three Burrows, located on a plateau at the top of a ridge. These barrows form part of a wider visible Bronze Age monument landscape of symbolic value and meaning.

6.10.20 Construction impacts – this bowl barrow is located behind and screened by dense mature vegetation and there would be no views through the vegetation towards or from the scheme. There would be no change to the setting of the asset due to the construction of the scheme; therefore, the effect on this asset would be **Neutral**.

6.10.21 Temporary setting impacts – during construction, construction activity associated with the movement of plant, temporary lighting and resulting increased noise levels, would take place within the wider setting of the barrow. Although these works would be temporary and of limited duration, there would possibly be a minor adverse impact on the setting of the asset, especially during the winter months with the loss of deciduous vegetation. This would result in a temporary **Slight Adverse** effect on the significance of the asset.

The Four Burrows (NHLE no. 1016054)

6.10.22 The Fours Burrows is a Scheduled Monument that includes a group of four Bronze Age barrows situated on a commanding hilltop at Four Burrows and fall into three separate areas. The barrows are situated between the parish boundary of Kenwyn and Perranzabuloe, with two barrows on each side. The four barrows are varying in height (2.5-3.9m) and diameter (16-24m), and two barrows have circular depressions in the centre, indicating possible antiquarian excavations. It is possible that the barrows are the surviving remnants of a Bronze Age barrow cemetery. These barrows form part of a wider visible Bronze Age monument landscape of symbolic value and meaning.

6.10.23 The northernmost of the barrows is currently divided from the rest of the group by the existing A30, however to the north, east and west the views from the barrow are rural in character. This rural setting contributes to the significance of the northern barrow, whilst the presence of the A30 detracts from this significance. The barrows to the south of the A30 are divided by a lane that runs north-south. The single barrow to the west of this lane has views to the west and south, but this view is dominated by a solar farm located 30m from the barrow at its closest point. This modern feature within the setting of the barrow detracts from its significance, as does the A30 immediately to the north.

6.10.24 The twin barrows to the east of the lane have unobstructed rural views to the east and south, although the Carland Cross wind turbines are visible at a distance to the east. The rural views are considered to contribute to the significance of the barrows, although the presence of the A30 detracts from their significance.

6.10.25 Construction impacts – the scheme would realign the A30 as a dual carriageway approximately 50m north of the northernmost barrow of the group. This would remove the rural setting of this barrow, leading to a permanent moderate adverse impact on its significance; this would result in a **Moderate Adverse** effect. The existing A30 would remain in situ as a local route, and therefore the current division of the barrow group would continue. This would constitute no change to the setting of the three barrows to the south of the A30, resulting in a **Neutral** effect.

6.10.26 Temporary setting impacts – during construction, construction activity associated with the movement of plant, temporary lighting and resulting increased noise levels, would take place within the wider setting of the barrow group. Although these works would be temporary and of limited duration, there would possibly be a minor adverse impact on the setting of these assets, especially the northernmost barrow. This would result in a temporary **Slight Adverse** effect on the significance of the barrows.

Milestone at SW 771486 NE (NHLE no. 1140923)

6.10.27 This Grade II listed milestone is a tall slender painted dressed granite monolith square-on-plan with a pyramidal head. This milestone is an original 18th century turnpike road milestone; however, it is suggested to have been re-sited, as the mileage shown is not in correct sequence with the mileage of a stone to the east.

6.10.28 The presence of the A30 and its function as a traversable route creates the setting of the milestone and contributes to its significance of a historical marker.

6.10.29 Construction impacts – the scheme would realign the A30 as a dual carriageway approximately 6m north of the milestone, so the asset will be removed and re-

located next to the realigned A30. The construction of the scheme will result in a major adverse impact on the removal of the milestone; however, the asset will be relocated next to the realigned road. Whilst it will be moved from its existing location adjacent to the former turnpike road, this was not its original position, as it had previously been moved. Therefore, the overall construction impact on the milestone will be minor adverse resulting in a **Slight Adverse** effect on the significance of the asset.

6.10.30 Temporary setting impacts – during construction, the milestone will be removed from its current location, this will have a temporary major adverse impact on the asset resulting in **Large Adverse** effect. Following construction, the milestone will be re-sited and this temporary effect would cease.

Bowl barrow 100m south-west of Callestick Vean (NHLE no. 1016103)

6.10.31 This scheduled asset comprises a bowl barrow located 100m south-west of Callestick Vean and just north of the A30. The barrow survives as a low-lying mound, which is the result of ploughing, yet the barrow is still 0.5m in height and 20m in diameter. This barrow forms part of a wider visible Bronze Age monument landscape of symbolic value and meaning.

6.10.32 The barrow is partially screened from views of the A30 to the south and east by a dry stone wall, and intermittent hedgerow. A local overhead electricity transmission line runs north-south to the west of the barrow. Views from the barrow to the west and north are rural in nature; however, the northern view is interrupted by the B3284. The rural views to the west are considered to contribute to the significance of the asset, views to the north make a negligible contribution to its significance and the views to the south detract from the significance of the asset.

6.10.33 Construction impacts – the scheme would realign the A30 as a dual carriageway northwards at-grade, bringing it within approximately 5m of the barrow. Other aspects of the barrow's setting would be unaltered. This change to the setting of the barrow would result in a permanent major adverse effect upon the significance of the barrow, leading to a **Large Adverse** effect.

6.10.34 Temporary setting impacts – the asset would be demarcated and protected during construction, however construction activity associated with the movement of plant, temporary lighting and resulting increased noise levels, would have a major adverse temporary impact upon its significance. Although these works would be temporary and of limited duration, these impacts would result in a **Large Adverse** effect.

Hillfort 250m south-west of Tresawsen (NHLE no. 1016445)

6.10.35 The scheduled Iron Age fort is situated on a gentle north-facing hill slope approximately 500m west of a springhead. The internal area of 3.8ha was defended by a rampart, which survives with a height of 2m along its eastern circuit. The inner rampart was fronted by a ditch, which can be seen as a depression to the eastern side of the fort. An outer, near concentric enclosure formed of defences went around the inner sections of the hill fort although these are no longer visible on the ground.

6.10.36 The asset's current setting is rural in nature, with uninterrupted views across the valley to the north. As the hillfort is located on the north-facing slope, it is considered these views are its principal setting that contribute substantially to its

significance. The existing A30 is 300m to the south of the hillfort, on the crest of the hill. This view is not considered to be a key part of the asset's setting, and the A30 makes a neutral contribution to the asset's significance.

6.10.37 Construction impacts – the scheme would be aligned 150m further south than the current A30, although the existing road will remain in place for local access. It is considered that the impact of this change would be negligible, resulting in a **Slight Adverse** effect.

6.10.38 Temporary setting impacts – during construction, construction activity will be 150m further south than the current A30. Whilst the hillfort is located on the north-facing slope, activity associated with the movement of plant, temporary lighting and resulting increased noise levels, would take place within the wider setting of the asset. Although these works would be temporary and of limited duration, there would possibly be a minor adverse impact on the setting of the asset. This would result in a temporary **Slight Adverse** effect on the significance of the asset.

Nancarrow Farmhouse, and attached Wall (NHLE no. 1136610)

6.10.39 This early 19th century farmhouse is a Grade II Listed Building positioned on the site of an earlier mansion, approximately 130m south-east of the A30. The farmhouse is set within a narrow river valley within a mixed arable and pasture landscape and is still in use as a working farm. It also operates as a wedding/holiday/event venue with accommodation.

6.10.40 The farmhouse is well enclosed by the surrounding topography and mature vegetation, with the land rising steeply to the north-east and south-west. The primary views from and to the asset is to the east and south-east, away from the A30. The landscape is of rolling countryside and surrounding farmland with minimal views of other development and no direct views of the road. Despite the presence of the road and background traffic noise, the setting of the farmhouse is picturesque and relatively tranquil with a low degree of dynamism, which contributes to its significance.

6.10.41 Construction impacts – the scheme would realign the A30 as a dual carriageway approximately 85m south-east closer to the farmhouse, with an east-bound lay-by and west-bound lay-by located at this point. The proximity of the scheme to the asset would result in a minor adverse impact upon its significance. The access road from the A30 will be removed and be replaced by a new access road that will join the realigned A30 approximately 650m south-east of the asset. This will result in a lengthened and new access to the farmhouse from the realigned A30, compared to its original historic route, thereby resulting in a moderate adverse impact upon its significance. Approximately 135m south-west of the farmhouse, an attenuation pond is proposed, to be located behind mature dense vegetation. Although the vegetation may experience a small deciduous loss during the winter months, it is considered that the construction of the pond would constitute no change to the setting of the farmhouse, resulting in a neutral effect. Overall, the permanent construction effect of the scheme upon the farmhouse is considered to be **Moderate Adverse.**

6.10.42 Temporary setting impacts – during construction, construction activity associated with the movement of plant, temporary lighting and resulting increased noise levels, would take place within the wider setting of the farmhouse. Although these works would be temporary and of limited duration, there would possibly be a

minor adverse impact on the setting of this asset. This would result in a temporary **Slight Adverse** effect on the significance of the farmhouse.

Chyverton Park (NHLE no. 1000512) and Lodge at approximately 700m east-south-east of Chyverton House, including associated and adjoining walls and gate-piers (NHLE no. 1136926)

6.10.43 Chyverton Park is a Grade II Registered Park and Garden dating from the late 18th century, located on an earlier site that is now in divided ownership, of which part is an equestrian centre. The site comprises:

- Chiverton House (Grade II* Listed Building, NHLE no. 1141551);
- a Bridge at approximately 150m east of Chyverton House (Grade II* Listed Structure, NHLE no. 1328680);
- Stables at approximately 30m south west of Chyverton House (Grade II Listed Structure, NHLE no. 1312561);
- Chyverton Home Farmhouse (Grade II Listed Building, NHLE no. 1141552);
- a Lodge at approximately 700m east-south-east of Chyverton House, including associated and adjoining walls and gate-piers (Grade II Listed Building, NHLE no. 1136926).;
- gardens and pleasure grounds that lie north-east of the house, including a wooded area of ornamental trees (planted 1870s then enhanced in 1920s);
- a late 18th century park that is today an area of mixed plantations; and
- a kitchen garden enclosed by stone walls 3m in height.

6.10.44 The parkland that forms Chyverton Park is apparent as an area of dense mature trees with an embanked boundary in a more open setting. There is little evidence of a formal boundary; however, estate style fencing is present around the area of the Lodge, which was once the formal entrance, suggests that it may once have been present. The road network largely creates the boundary to the parkland; the majority of which have embanked sides that prevent views and create a sense of privacy and enclosure. The local road network to the east of the park is single track and relatively quiet, with little in the way of passing traffic. The A30, which lies approximately 65m south of the edge of the park, allows for only traffic leaving the eastbound carriageway to pass adjacent to the park, thereby creating a lack of dynamism in the immediate vicinity. The traffic is both visible and audibly present at this location.

6.10.45 Chyverton Park has a primarily historic and aesthetic value as an important 18th century parkland, with important elements that reflect its high status residential site. Its sense of privacy and enclosure contributes to the park's significance, along with the north-eastern views from the asset towards Chyverton Castle; albeit now obscured. Functioning as the formal entrance to the park, the significance of the Lodge is its intrinsic interest and group value with the associated and adjoining walls and gate-piers, and that it forms a visible boundary to the park. The asset is well preserved and part of an intact group. The Lodge's setting makes some contribution to its significance, although the views from the asset make little or no contribution to its significance.

6.10.46 Construction impacts – the scheme will realign the existing Zelah side road so that east-bound traffic can re-join with the A30 Zelah Bypass. The construction of the scheme will not affect the setting of the Lodge, therefore it is considered the scheme will have a no change impact on the asset, thereby resulting in a **Neutral** effect on the significance of the asset.

6.10.47 Temporary setting impacts – the Lodge would be demarcated and protected during construction, however construction activity associated with the movement of plant, temporary lighting and resulting increased noise levels, would have a major adverse temporary impact upon its significance. Construction activity will also have a temporary moderate adverse impact upon the significance of Chyverton Park, especially during the winter months with the loss of deciduous vegetation. Although these works would be temporary and of limited duration, these impacts would result in a **Large Adverse** effect on the Lodge and a **Moderate Adverse** effect on Chyverton Park.

Bowl barrow 130m south east of Penglaze (NHLE no. 1016887)

6.10.48 This asset includes a bowl barrow situated at the southern end of Newlyn Downs. The barrow survives as a low lying mound due to cultivation and ploughing. The barrow is still 0.5m in height and has a diameter of 23m despite the ploughing.

6.10.49 The barrow lies approximately 40m to the north of the A30, and views to the south form the barrow are impacted by this and the traffic upon it. The views to the west are foreshortened by the presence of a hedgerow, whilst to the east the barrow has views along the A30 towards Carland Cross, though rural aspects of the landscape still predominate. To the north, the view is largely rural, though punctuated by wind turbines at a distance of approximately 600m. The overall rural setting is considered to make a positive contribution to the significance of the barrow, while the presence of the A30 to the south detracts from its significance.

6.10.50 Construction impacts –The construction of the scheme would move the alignment of the A30 to the south at a distance of approximately 190m from the barrow; the existing A30 would remain in place as a local access road.

6.10.51 The distance of the scheme from this asset would result in a negligible change to its setting, resulting in a **Slight Adverse** effect upon the significance of the asset.

6.10.52 Temporary setting impacts – during construction, construction activity associated with the movement of plant, temporary lighting and resulting increased noise levels, would take place within the wider setting of the barrow. Although these works would be temporary and of limited duration, there would possibly be a minor adverse impact on the setting of this asset. This would result in a temporary **Slight Adverse** effect on the significance of the barrow.

Bowl barrow 500m north-west of Higher Ennis Farm (NHLE no. 1017049)

6.10.53 This Scheduled Monument comprises part of a Bronze Age barrow located on the western edge of a ridge south-west of Carland Cross. The southern part of the barrow has previously been partially segmented by the construction of the A30. The mound is approximately 0.7m in height and 22m in diameter, with a slight 2m wide depression on the ground, thought to represent the barrow's surrounding ditch. The barrow was possibly part of a cohesive group in the area, which may have formed a round barrow cemetery.

6.10.54 The barrow has open rural views to the north, which make a positive contribution to its significance; however, the presence of the A30 within the setting of the barrow slightly detracts from the significance of the asset.

6.10.55 Construction impacts – the scheme would realign the A30 approximately 115m southwards from the barrow, resulting in a minor beneficial impact on the significance of the asset. However, the existing A30 would remain as a

declassified road for local traffic. The construction impact of the scheme is therefore considered to be negligible, resulting in a **Slight Adverse** effect.

6.10.56 Temporary setting impacts – during construction, construction activity associated with the movement of plant, temporary lighting and resulting increased noise levels, would take place within the wider setting of the barrow. Although these works would be temporary and of limited duration, there would possibly be a minor adverse impact on the setting of this asset. This would result in a temporary **Slight Adverse** effect on the significance of the barrow.

Two bowl barrows 290m and 375m north of Higher Ennis Farm (NHLE no. 1017050)

6.10.57 The Scheduled Monument includes two Bronze Age bowl barrows, situated on the summit of a ridge south-west of Carland Cross. The scheduling is divided into two separate areas of protection. The northern barrow has a mound 9m in diameter and 0.7m high, with an irregular profile: the south and west sides have been cut into, and the top is uneven, possibly due to stone robbing. The mound of the southern barrow is 21.5m in diameter and 1m high, with an irregular rounded profile and a flattened but uneven top. A depression 2m-3m wide, to the north west of the mound, is considered to be the remains of an outer ditch.

6.10.58 Both barrows are located within an area of heathland and bracken, and due to this vegetation are not visible on the ground. This heathland area is enclosed by Cornish hedge approximately 1m high to the east and south of the barrows, and is bounded by the A30 to the north. The Cornish hedge acts as a barrier between the barrows and the contemporary barrow cemetery at Carland Cross to the east; this diminishes the relationship between these barrows, but not to the extent that the relationship cannot be understood. This relationship contributes to the significance of the assets. The northernmost of the barrows has clear views over the landscape, though interrupted by the A30; the southern barrow has views across the landscape to the south. These views also contribute to the significance of the assets.

6.10.59 Construction impacts – the scheme would pass in cutting immediately to the north of the northernmost barrow, which would be retained in place by means of a retaining wall. The setting of the barrows to the east and south would not be affected by the scheme. Views to the north would be interrupted by the immediate proximity of the scheme, as well as new views along the scheme to the north-east and south-west. This would constitute a permanent major adverse impact upon an asset of high importance. The resultant effect would be **Large Adverse**.

6.10.60 Temporary setting impacts – the barrows would be demarcated and protected during construction, however construction activity associated with the movement of plant, temporary lighting and resulting increased noise levels, would have a major adverse temporary impact upon their significance. Although these works would be temporary and of limited duration, these impacts would result in a **Large Adverse** effect.

Round barrow cemetery 420m north-east of Higher Ennis Farm (NHLE no. 1020758)

6.10.61 This scheduled round barrow cemetery contains five barrows of bowl, bell and platform type. All the mounds are substantially intact despite modern ploughing on a four of the five and evidence for disturbance at two. The northern most

barrow has the remains of the enclosed ditch as well as Killigrew Barrow, which is a prominent bell barrow in the cemetery with a mound of 17m in diameter and 2.5m in height, and the enclosed ditch shown by a 3m wide depression in the ground.

6.10.62 This group of barrows lie on a hilltop within a field of improved pasture, bounded by the A30 to the north, the A39 to the east and by Cornish hedge to the west and south. The group has uninterrupted rural views to the south, with the view to the west foreshortened by the crest of the hill. Views to the north and east are currently impacted by a wind farm, by the A30, and by the A39. The A30 is also considered to constitute a physical barrier between the cemetery and one of its outlying barrows, Warren's Barrow (NHLE no. 1016888), directly north. The rural views to the south and west are considered to be the elements of setting that make a contribution to the significance of the cemetery. The A30, A39 and the wind farm are elements within the cemetery's setting that are considered to detract from the significance of the Bronze Age cemetery.

6.10.63 Construction impacts – the scheme would realign the A30 approximately 100m further to the north, remove the existing A30 and replace this with a greened access track, which will re-establish the physical and visual connection between the cemetery and Warren's Barrow (NHLE no. 1016888). However, the realigned A30 would remain visible to the north, though at a greater distance than at present, and the A39, lit Carland Cross roundabout and wind farm that currently detract from the significance of the cemetery, would remain in place. Overall, it considered that the removal of the existing A30 and the re-establishment of the connection with Warren's Barrow (NHLE no.1016888) would constitute a minor beneficial impact, resulting in a **Slight Beneficial** effect.

6.10.64 Temporary setting impacts – the cemetery would be demarcated and protected during construction, however construction activity associated with the movement of plant, temporary lighting and resulting increased noise levels, would have a major adverse temporary impact upon its significance. Although these works would be temporary and of limited duration, these impacts would result in a **Large Adverse** effect.

Milestone approx. 253m south-west of Carland Cross (NHLE no. 1394843)

6.10.65 This Grade II listed milestone is approximately 1m in height and comprises square on plan with a pyramidal head, made from granite stone and painted white. The milestone erected in the late 18th century and was one of a number of milestones altered in the late 19th century to add extra inscriptions when the construction of new roads was implemented by the local council.

6.10.66 The presence of the A30 and its function as a traversable route creates the setting of the milestone and contributes to its significance of a historical marker.

6.10.67 Construction impacts – the scheme would remove the A30 from its current location, and realign the A30 on embankment to the north of the milestone, so the asset will be removed and re-located next to the realigned A30. The construction of the scheme will result in a major adverse impact on the removal of the milestone; however, the asset will be relocated next to the realigned road. The overall construction impact on the milestone will be minor adverse resulting in a **Slight Adverse** effect on the significance of the asset.

6.10.68 Temporary setting impacts – during construction, the milestone will be removed from its current location, this will have a temporary major adverse impact on the asset resulting in a **Large Adverse** effect. Following construction, the milestone will be re-sited and this temporary effect would cease, and revert to **Neutral**.

Warren's Barrow (NHLE no. 1016888)

6.10.69 The scheduled Warren's Barrow is the most northerly barrow of the scheduled barrow cemetery 420m north-east of Higher Ennis Farm (NHLE no. 1020758), located to the south. The barrow has a stepped appearance with a central mound about 10m in diameter and contains a large central depression thought to be the cause of an antiquarian excavation. The whole barrow stands at a maximum height of 3.6m and is 36m in diameter in total, with a possible surviving ditch underneath the ground surrounding the barrow. The barrow currently has modern material over the top of the barrow due to a temporary track.

6.10.70 The barrow is currently bound to the south by the A30, screened from traffic by a low earth bund and a mature mixed hedgerow. To the east of the barrow lies the A30/A39 Carland Cross roundabout, which is lit at night. Views towards the roundabout are also screened by vegetation, although this does not prevent light pollution intruding into the setting of the barrow during the hours of darkness. The presence of the roundabout, as well as the A30, within the setting of the barrow is considered to detract from the significance of this asset.

6.10.71 To the north of the barrow lies an access track to the nearby wind farm, which is unlit and used irregularly for servicing, however the overall outlook to the north is rural. From the barrow, there are clear views west and north-west towards Newlyn Downs, although this is interrupted by the presence of wind turbines. These rural views to the north, and particularly to the west, are considered to enhance the significance of the barrow.

6.10.72 Construction impacts – the scheme would remove the A30 from its current location, and realign the A30 on embankment to the north and west of Warren's Barrow, joining the northern roundabout of a new 'dumbbell interchange' (Carland Cross Grade Separated Junction) to the east of the barrow. The existing A30/A39 Carland Cross roundabout would be retained as the southern roundabout for this junction. The removal of the A30 would reunite the barrow with the cemetery to the south, and would reopen views in that direction. However, the realigned A30 would block the existing rural views to the north and west, with the new westbound 'on-slip' being located on a new embankment immediately to the east of the barrow. The overall scale of the scheme at this location would be greater than existing situation. While the reuniting of Warrens Barrow with the barrow cemetery to the south is a beneficial impact, it is considered that this is outweighed by substantial changes within the setting of the barrow to the west, north and east. These elements would detract from the significance of the barrow, a permanent moderate adverse impact, which would result in **Moderate Adverse** effect.

6.10.73 Temporary setting impacts – during construction, two construction compounds (Barrows Junction Underbridge Compound) are proposed within the wider setting of the barrow. Located approximately 70m north-east and 130m north, the two areas of compounds have proposed activities that include welfare facilities, a site office, storage for piling, formwork and reinforcement materials, fabrication area for bridge beams and a plant lay down area. The asset would be demarcated and protected during construction, however the site compounds and associated

activities within the setting of the barrow is considered to constitute a major adverse temporary impact upon its significance. This would result in a **Large Adverse** effect.

Prehistoric long barrow and four round barrows 580m and 750m south west of Mitchell Farm (NHLE no. 1017350)

6.10.74 This Scheduled Monument includes a long barrow and four round barrows within two areas of protection. Together they form the western part of a prehistoric ridge top barrow cemetery located high above the east of Carland Cross. Three of the four round barrows are situated close together, whereas the last barrow is around 150m to their west. They all however share a similar size (15-16m in diameter, 0.2-0.3m in height). The long barrow is located north-west of the western round barrow, the long barrow measures approximately 22m long, 13m across and 0.4m in height. The barrows are no longer visible above the ground.

6.10.75 The setting of all barrows within the group is largely rural, with open fields to the south and east. The A30 is located in a shallow cutting to the north and screened from the barrows by hedgerow. A service station and car dealership lie to the west, however these are considered to be at a sufficient distance not to detract from the overall setting of the barrows.

6.10.76 Construction impacts – the existing cutting for the A30 would be widened southwards (approximately 30m) as part of the scheme. It is considered this would have a minor permanent impact on the significance of the barrows, resulting in a **Slight Adverse** effect.

6.10.77 Temporary setting impacts – during construction, the field containing the long barrow and western round barrow will be utilized as a main construction compound (Eastern Compound), in which proposed activities include: main office buildings and welfare facilities, car parking, material storage, satellite offices, fuel storage, washout pits for concrete and sweepers, waste segregation area and topsoil/subsoil storage. The assets would be demarcated and protected during construction; however, the site compound and associated activities within the setting of the barrows are considered to constitute a major adverse temporary impact upon their significance. This would result in a **Very Large Adverse** effect. Following construction, the field would be returned to agricultural use, and this temporary effect would cease, and the effect would revert to **Neutral**.

Non-designated heritage assets

6.10.78 The scheme is located close alongside the existing A30 and at other locations within areas of fields. Where the scheme lies alongside the A30, disturbance related to the construction of the existing road, is likely to have reduced the potential for the presence of as-yet unknown archaeological remains. However, where the scheme requires excavation below the existing ground surface within previously undeveloped fields, including compound areas, there is a higher likelihood that archaeological remains may exist and direct impacts to these possible below ground features will occur; these impacts are likely to be major adverse. Such remains are likely to be of medium value, and it is considered therefore, the impact of the construction of the scheme would be moderate adverse.

6.10.79 The geophysical survey has identified areas of possible archaeological interest along the scheme, in areas south of Newlyn Downs, north-east and south of

Zelah, and south-west of Chyverton Park. Evaluation trenches are currently being undertaken to characterize the nature and value of the archaeological remains present in these areas. The information arising from this further study will be reported in the ES accompanying the DCO.

Operation Effects

6.10.80 Awaiting noise and traffic data in order to assess the operational impact of the scheme. This will be included in the ES.

6.11 Monitoring

6.11.1 Monitoring will be required during construction to ensure that mitigation measures are applied as agreed with the consultees. No monitoring will be required during operation.

6.12 Summary

6.12.1 The preliminary assessment of impacts of the scheme on the historic environment has identified a range of effects upon heritage assets (see Table 6-5). Direct impacts would occur on buried archaeological deposits resulting in a likely moderate adverse effect. No designated assets would experience direct impacts, however the scheme would lead to some adverse effects upon their settings; in particular, construction compounds at the eastern and western ends of the scheme would result is significant adverse effects upon the scheduled barrow groups. The scheme would also result in beneficial effects such as reuniting Warrens Barrow with the barrow cemetery to the south, assets that are currently separated by the existing A30. Where appropriate, listed milestones along the route will be removed and stored safely during construction, and replaced as close to their original locations as possible.

Table 6-5 Summary Table

Receptor	Range of Impact
Construction Effects	
Scheduled Monuments	Impacts upon the setting of Bonze Age round barrows within the study area, of which some are beneficial and some adverse. The cohesiveness of the Carland Cross barrow cemetery would be restored through the removal of the existing A30.
Listed Buildings	The majority of listed buildings within the study area are expected to experience negligible impacts as a result of the Proposed Scheme. Listed milestones that would potentially experience direct impacts would be carefully removed, stored and replaced close to their original locations upon completion of construction. Where impacts upon the setting of listed buildings would occur these would be mitigated through appropriate screening.
Buried archaeological remains	Buried archaeological remains within the footprint of the scheme and construction compounds would experience direct impacts that would be mitigated through a programme of archaeological recording (preservation by record)

Further Work

6.12.2 This preliminary assessment is based on the 2017 scheme design, as described in Chapter 2. Further EIA work is being undertaken to confirm the scale and significance of predicted historic environment impacts arising from the scheme design. The final EIA work will be reported within the ES, which will accompany the DCO application to be made in Summer 2018.

6.12.3 To inform the preparation of the final assessment for cultural heritage, further work will be undertaken which may include site inspections, archaeological fieldwork and specialist input to the detailed design of the proposed scheme.

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Chapter 7 Landscape

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7 Landscape

7.1 Introduction

7.1.1 This PEIR chapter on Landscape and Visual Assessment (LVIA) sets out the assessment of the likely significant effects of the scheme on the character of the landscape and on the visual amenity of people at viewpoints from which they would be able to see the scheme.

7.1.2 Effects on landscape and visual receptors are closely related but separately assessed, the former relating specifically to the landscape as a resource and its overall character and the latter relating to views and the visual amenity of people.

7.1.3 The landscape baseline identifies landscape receptors within the study area including component characteristics of the receiving landscape as well as its overall character. The character of designated landscapes are assessed as separate receptors.

7.1.4 The visual baseline identifies existing views to, across or from the scheme, and identifies the visual receptors, such as nearby residents, users of Public Rights of Way (PRoWs), transport routes and publicly accessible heritage assets, whose visual amenity might be affected by the scheme.

7.1.5 The baseline landscape and visual environment have been surveyed and characterised to inform this PEIR, then potential receptors identified and assessed to determine their sensitivity to changes of the type proposed.

7.1.6 Through understanding the scheme in its context, the magnitude of change that would be experienced by each receptor has been assessed.

7.1.7 Through applying professional judgement, the sensitivity and magnitude of change for each receptor has been combined to give a level of effect and a conclusion has been drawn in each case as to whether the effects are significant or not.

7.1.8 Finally, where possible, landscape mitigation has been designed to reduce adverse effects or enhance beneficial effects. The long term residual effects have been assessed with mitigation in place.

7.2 Legislative and policy framework

European Landscape Convention

7.2.1 The following paragraphs regarding the European Landscape Convention [1] are quoted from IEMA and the Landscape Institute's Guidance on Landscape and Visual Impact Assessment, 3rd Edition (2013) [2]:

'The UK has signed and ratified the European Landscape Convention (ELC) since 2002, when the last edition of this guidance was published. The recognition that government has thus given to landscape matters raises the profile of this important area and emphasises the role that landscape can play as an integrating framework for many areas of policy. The ELC is designed to achieve improved

approaches to the planning, management and protection of landscapes throughout Europe and to put people at the heart of this process.'

National Policy

7.2.2 A framework of national and local legislation and planning policy guidance exists to protect and conserve the landscape [3][1].

7.2.3 Within the National Planning Policy Framework (NPPF) there are three dimensions to sustainable development: economic, social and environmental. Of particular relevance to the assessment of landscape and visual effects is the 'environmental role' – "contributing to protecting and enhancing our natural, built and historic environment; and, as part of this, helping to improve biodiversity, use natural resources prudently, minimise waste and pollution, and mitigate and adapt to climate change including moving to a low carbon economy."

7.2.4 Paragraph 17 of the Framework sets out the twelve Core Planning Principles, those specific to landscape issues include:

- "*Always seek to secure high quality design and a good standard of amenity for all existing and future occupants of the land and buildings;*
- *Take account of the different roles and character of different areas, promoting the vitality of our main urban areas, protecting Green Belts around them, recognising the intrinsic character and beauty of the countryside and supporting thriving rural communities within it; and*
- *Contribute to the conserving and enhancing of the natural environment and reducing pollutions*."

7.2.5 At Section 7 'Requiring good design' the Framework states in paragraph 58 that planning policies and decisions should aim to ensure that developments:

- "*Will function well and add to the overall quality of the area, not just for the short term but over the lifetime of the development;*
- *Respond to local character and history, and reflect the identity of local and surrounding materials, while not preventing or discouraging appropriate innovation; and*
- *Are visually attractive as a result of good architecture and appropriate landscaping.*"

7.2.6 At Section 11 'Conserving and enhancing the natural environment' the Framework in paragraph 109 states that the planning system should contribute to and enhance the natural and local environment by "Protecting and enhancing valued landscapes, geological conservation interests and soils". It also seeks to recognise the wider benefits of ecosystem servicing including planning for biodiversity at a landscape-scale across local authority boundaries (para 117).

7.2.7 The National Policy Statement for National Networks provides direction on the treatment of Landscape and Visual impacts within transport projects (para 5.143 –

[1] Department for Communities and Local Government, National Planning Policy Framework, March 2012

5.148) [4][2]. All developments subject to EIA should consider potential significant landscape and visual impacts, during both construction and operational phases. Where it is likely that National Park or Areas of Outstanding Natural Beauty (AONB) landscapes will be affected, the following acts will need to be attended to:

- National Parks and Access to Countryside Act 1949 (Section 11A); and
- Countryside and Rights of Way Act 2000 (Section 85).

Local Policy and Guidance

Cornwall Local Plan (2016)

7.2.8 A review of the relevant planning policy has been undertaken in the context of LVIA. Local planning policies are set out in the Cornwall Local Plan (2016) [5].

7.2.9 Policies considered in this assessment are set out below and where appropriate relevant extracts have been included for ease of reference.

7.2.10 Policy 3: Role and function of places

7.2.11 4. Within the AONB or its setting, development will be supported where it is in accordance with the other policies of this Plan and can demonstrate that it conserves and enhances the landscape character and natural beauty of the AONB.

7.2.12 Policy 23: Natural Environment

7.2.13 2. Cornish Landscapes: Development should be of an appropriate scale, mass and design that recognises and respects landscape character of both designated and un-designated landscapes. Development must take into account and respect the sensitivity and capacity of the landscape asset, considering cumulative impact and the wish to maintain dark skies and tranquillity in areas that are relatively undisturbed, using guidance from the Cornwall Landscape Character Assessment and supported by the descriptions of Areas of Great Landscape Value.

7.2.14 4. Avoidance, mitigation and compensation for landscape, biodiversity and geodiversity impacts: Development should avoid adverse impact on existing features as a first principle and enable net gains by designing in landscape and biodiversity features and enhancements, and opportunities for geological conservation alongside new development. Where adverse impacts are unavoidable they must be adequately and proportionately mitigated. If full mitigation cannot be provided, compensation will be required as a last resort.

7.2.15 Further relevant Local Plan policies include:

- Policy 12 Design;
- Policy 16 Health and wellbeing;
- Policy 21 Best use of land and existing buildings;

[2] Department for Transport, National Policy Statement for National Networks, December 2014

- Policy 23 Natural environment. See also:
  - Cornwall's Natural and Historic Environment 2.132-2.136, 2.146-2.147;
  - AONB 2.150;
  - Heritage Coast 2.151;
  - Landscape Character 2.152;
  - AGLV 2.153;
  - International, National, and Local Designated sites: 2.162 – 2.165;
  - Ancient Woodland 2.168-2.169;
- Policy 24 Historic environment;
- Policy 25 Green infrastructure;
- Policy 27 Transport and accessibility; and
- Policy 28 Infrastructure.

7.2.16 Design and environmental guidance documents produced by Cornwall Council listed below, provide development advice on working with regionally-appropriate building materials, landscape features and systems, and plant species. The Cornwall AONB Management Plan, provides detail on the landscape character of the designation, and details policies regarding its management.

Supplementary guidance

- Cornwall Council, Cornwall Design Guide, (July 2017) [6]
- Cornwall Council, a Green Infrastructure Strategy for Cornwall – A strategic framework, April 2012 [7]
- Cornwall Council, Cornwall's Environmental Growth Strategy (2015-2065) [8]
- Cornwall Council. Cornwall AONB Management Plan 2016 – 2021 [9]
- Diacono Associates in conjunction with White Consultants, Cornwall & Isles of Scilly Landscape Character Study (May 2007) [10]

7.3 Study Area and Extent of Visibility

7.3.1 The Zone of Theoretical Visibility (ZTV) has informed the assessment Study Area.

7.3.2 This has been based on a preliminary ZTV from Stage 2 of the project. In due course and following a final fix to the scheme design the ZTV will be refined further for inclusion within the ES accompanying the DCO. This will be based on 5m Digital Terrain Map (DTM) data, to identify areas from which the scheme would theoretically be visible.

7.3.3 The DTM data reflects the 'bare earth' condition with heights data on a 5m grid and does not allow for minor undulations in topography. In order to get a more accurate representation of the visibility of the scheme, existing substantial built form and woodland, taken from the Ordnance Survey Vector Map, were added to the terrain and have been extruded to the following conservative estimates of average heights above ground level.

- Built form – 8m high representing the average 2 storey residential buildings
- Substantial areas of structural vegetation – 8m high representing a semi-mature deciduous woodland.

7.3.4 The ZTV was generated by computer software which places 6m-high columns on the highest proposed points at either end and every 50m along the scheme. Six metres is estimated to represent a worst-case scenario for any vehicle or object likely to be using the scheme. At the three main junctions Chiverton Cross, Chybucca and Carland Cross, 12m lighting columns are proposed. This data is presented on a map at Figure 7-1 showing the ZTV and viewpoints representing visual receptors whose views are considered likely to be affected.

7.3.5 Small individual buildings, hedgerows and individual trees are not included in the model, but in reality, would provide additional screening. Therefore, the ZTV shows a worst-case scenario in terms of the predicted extent of visibility.

7.3.6 Initially, the Study Area assessed at desk based level was set at 5km from the scheme to take account of any particularly sensitive receptors that might receive effects from the scheme. This identified areas of higher ground (represented by VP 26) up to 5km to the northwest at St Agnes which is subject to several landscape and heritage designations including Area of Outstanding Natural Beauty (AONB), World Heritage Site, Heritage Coast, Scheduled Monuments, and Open Access Land. For completeness, receptors in this area have been included in the assessment.

7.3.7 Next, an enhanced Desktop Study was undertaken, focused in on a 2km buffer around the scheme. There are a few sensitive receptors between 1 and 2km from the scheme. These include St Clement Area of Great Landscape Value (AGLV) and Open Access Land within Newlyn Downs. For completeness, a Wider Study Area of up to 2km is included to pick up these receptors considered sensitive enough to potentially receive effects from the scheme.

7.3.8 Following field work and a detailed analysis of visibility within the surrounding landscape, it was found that the vast majority of receptors with the potential to receive significant effects lie within 1km of the scheme. The Core Study Area for this assessment has therefore been set at 1km.

7.3.9 Figure 7-1 shows the Core 1km Study Area and the Wider 2km Study Areas as well as a buffer containing the outlying group of receptors approximately 5km to the northwest of the scheme.

7.3.10 Using the ZTV, supported by field work, a selection of representative viewpoints have been chosen for assessment. The locations of the selected representative viewpoints are shown on Figure 7-1.

7.3.11 Figure 7-5 includes the corresponding viewpoint photographs.

7.4 Potential Impacts

7.4.1 This PEIR chapter identifies landscape and visual receptors within the Study Area, which may be affected by the scheme. The types of receptors assessed are described below:

Landscape receptors

7.4.2 The European Landscape Convention (ELC) [1] definition of “landscape” is:

"... an area, as perceived by people, whose character is the result of the action and interaction of natural and / or human factors."

For this assessment, effects on the landscape as a resource have been assessed and reported in terms of landscape Character Areas (CAs). The CAs are defined using the Cornwall and Isles of Scilly Landscape Character Assessment (CISLCA). These are mapped on Figure 7-3.

7.4.3 Effects on the Landscape may arise where the character of the area is modified by development. It is important to place the scheme in its context.

7.4.4 Aspects of the landscape considered in the assessment that may be affected by the scheme include:

- Landscape elements include physical features such as trees and hedgerows, topography, water courses, landforms, boundaries, transport corridors and recreation routes. Effects on these elements may arise where valued features are lost, gained or substantially modified as a result of the scheme;
- Aesthetic and perceptual characteristics of the landscape such as scale, texture and complexity, openness, tranquillity and remoteness; historic and cultural aspects and darkness at night;
- The overall character of the landscape and settlements made up of the components and characteristics above; and
- The character and settings of any areas designated specifically for their landscape or townscape value.

7.4.5 The loss or depletion of important landscape features can adversely affect the condition, and quality of the landscape as a resource in its own right as well as its overall character. Conversely, the addition of significant beneficial features can constitute an improvement to the landscape and its overall character.

7.4.6 For this assessment, landscape receptors are defined as the character of potentially affected landscape Character Areas (CAs) and designated landscapes. However, in reaching judgements about effects, the assessment also describes and considers physical changes to constituent elements of the landscape as a result of the scheme and changes to the perceptual characteristics of the landscape within the Core study area as described in 7.4.8.

7.4.7 CA receptors have been determined using a combination of desktop study, information available from Cornwall and Isles of Scilly Landscape Character Study (CISLCS) [10] and from field work carried out by landscape architects.

7.4.8 The CA receptors have been grouped into two categories:

- direct and indirect effects on physical components, characteristics and overall character of the local CAs and designated landscapes, within the Core Study Area; and
- indirect effects on the characteristics and overall character of the CAs and designated landscapes within the Wider Study Area from which the scheme may be visible or otherwise perceived as part of the wider setting.

Visual receptors

7.4.9 Visual receptors are people enjoying views from locations from which it is possible to obtain views of the scheme. Such locations include:

- private viewpoints, such as views from domestic residences or places of work; and
- public viewpoints such as roads or railway lines, Public Rights of Way (PRoW) or other footpaths and areas of open space or recreational places with public access.

7.4.10 These views may be partial or full, glimpsed or direct. Impacts on the visual amenity of a particular receptor may arise where features intrude into or obstruct views, or where there is some other qualitative change to the view.

7.4.11 Types of viewpoints that can be selected for LVIA include:

- Representative viewpoints, which represent the experience of different types of visual receptors;
- Specific viewpoints, chosen because they are key, promoted viewpoints within the landscape; and
- Illustrative viewpoints, to demonstrate a specific visual issue.

7.4.12 For this assessment, the majority of viewpoints are representative viewpoints representing, for example, views from several houses and a PRoW. It also includes specific viewpoints for views available from St Agnes Head for example.

7.4.13 The visual receptors included in this assessment are described in the Baseline Section below at paragraphs 7.6.61 to7.6.75. The viewpoints selected to represent these are mapped on a plan in Figure 7-1 and the corresponding photographs are presented on the Photo sheets in Figure 7-5.

7.4.14 It is notable that there is no right in planning law to a private view. This has been accepted by various appeal decisions determined by the Planning Inspectorate.

7.4.15 Nevertheless, private views are commonly considered as receptors of visual effects as part of LVIA. This assessment does include the visual amenity of private residential properties as receptors, but only from lower floors and gardens, and professional judgement has been made on the significance of such effects based on criteria that will be included within the ES and made without prejudice to the planning issues above. This criteria within the ES will accompany the DCO application to be made in Summer 2018. It is for the competent Authority (in this case the Secretary of State supported by the Planning Inspectorate) to judge whether or not the predicted effects on visual amenity of private receptors is a material consideration in determining a planning application.

7.5 Assessment Methodology

Guidance and Desk Study

7.5.1 This assessment has followed guidance set out in the following documents:

- Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA3). The Landscape Institute / Institute of Environmental Management and Assessment (IEMA). (2013) [2];
- The DMRB Volume 11: Section 2, Part 5, Assessment and Management of Environment Effects. Highways Agency. (August 2008) [11];
- The DMRB Volume 11: Section 3, Part 5, Landscape Effects. Highways Agency. (June 1993/updated August 1994) [12];
- IAN 135/10 Landscape and Visual Effects Assessment. Highways Agency. (2010) [13];
- IAN 125/15 Environmental Assessment Update. Highways Agency. (2015) [14];
- Photography and Photomontage in Landscape and Visual Impact Assessment, Landscape Institute Advice Note 01/11. The Landscape Institute. (2011) [15];
- Visual representation of wind farms: good practice guidance: Scottish Natural Heritage. Version 2. (2014) [16];
- Institute of Lighting Professionals Guidance Notes for the Reduction of Obtrusive Light GN01:2011. Institution of Lighting Professionals. (2011) [17].

7.5.2 A desk study review of possible sources of information to establish the baseline conditions of the study area has been undertaken. These include land use data and policies detailed in relevant documents, sources cited above and the additional sources listed below:

- Cornwall and Isles of Scilly Landscape Character Study [10];
- Cornwall Council interactive mapping website [18];
- Ordnance Survey – 1:50,000 and 1:25,000 scale maps;
- Google Earth Pro and Street View;
- Bing Maps [19];
- GIS designation data sets.

7.5.3 A preliminary desktop study area was based on a study of the potential receptors, relevant policy areas and designations using a basic 3D wireframe model of the scheme in Google Earth and Google Street View.

Approach to Identification of Baseline Conditions

7.5.4 The following baseline studies have been carried out in order to inform the LVIA:

- Desk study and computer based visual analysis (ZTV as detailed above);
- Field work to familiarise with the landscape and its character and to select a set of representative viewpoints; This was undertaken during the day and night and during the summer and winter seasons, over several days during August, September, and December 2017;
- Verified baseline photography was undertaken in line with best practice and current guidance (GLVIA, 2013 and LI Advice Note 1/11); and
- Preparation of figures including:
  - Figure 7-1 Visibility and Viewpoints;
  - Figure 7-2 Landscape Designations;

- Figure 7-3 Landscape Character;
- Figure 7-4 Landscape Elements and Topography;
- Figure 7-5 Photo Sheets; and
- Figure 7-6 Environmental Masterplans.

Assessment Criteria and Assignment of Significance

7.5.5 Typical criteria used in the assessment of receptors and effects is in accordance with IAN 135/10 Landscape and Visual Effects Assessment [13].

7.5.6 For each receptor, the baseline (existing condition) is described and its value assessed in terms of how valuable the receptor is (high, medium or low) and to what extent it is valued (individual, local community, local authority, national, international).

7.5.7 The baseline is then reviewed alongside the description of the scheme incorporating any embedded or primary mitigation measures. The susceptibility of each receptor to the proposed changes is then assessed. Combining judgements on the value of the receptor and its susceptibility to the type of change proposed, gives its overall sensitivity to change (high medium or low).

7.5.8 For each receptor, the changes arising from the scheme are described and quantified to give a magnitude of change (major, moderate, minor, negligible or no change).

7.5.9 Next, the judgements on sensitivity and magnitude of change are combined to give an overall assessment of level of the effect (very large, large, moderate, slight or neutral).

7.5.10 Once the level of effects are understood, secondary mitigation measures are incorporated where possible to reduce the predicted effects.

7.5.11 Finally, an assessment of the residual effects is made by reassessing the magnitude of change to each receptor once mitigation measures are in place.

7.5.12 The assessment determines the level or degree of effect that is likely to occur. The assessor then makes a judgement as to whether that effect should be considered a significant or material factor in respect of the planning application.

7.5.13 Any effect assessed as having a level of moderate or greater is usually considered to be significant. Any effect assessed to have a level of effect less than moderate is normally considered not to be significant.

Temporal Scope

7.5.14 The landscape and visual effects of the scheme would vary through time. The assessment therefore considers the effects on landscape character and visual amenity arising over the life of the project, through its construction and operation.

- Short-term temporary construction effects during the 3 year construction phase, 2020 – 2023 (including any standard construction mitigation measures);

- Medium-term operational effects which would occur between completion in the winter of the first year of operation (2023) until the fifteenth year of operation (2038) before landscape mitigation would have established (without mitigation, but taking into account measures designed into the scheme to reduce effects at source); and
- Long-term residual effects with mitigation from the 15th year after opening (2038), in accordance with IAN135/10 [13]. This allows the assessment to take account of the mitigating effect of the proposed landscape mitigation once established).

7.5.15 The assessment also takes into consideration how views and the perception of landscape changes through the seasons and during the course of a day. Baseline photography has been carried out during the day for most viewpoints, but where lighting is considered likely to be the source of night time effects, it was agreed with Cornwall Council that in the vicinity of the scheme's three main junctions, night time photography and an assessment of these effects has also been included.

7.5.16 Field work and the first photographic survey work was undertaken in August 2017 at a time when the deciduous trees were in leaf. The screening effect of vegetation is most effective at this time of the year. Visibility across the landscape is greater in winter. Field work and photography was also undertaken in December 2017 during winter whilst vegetation was out of leaf and visibility was at its greatest.

7.5.17 The assessment is based on a worst-case scenario in terms of visibility, but also considers the more visually contained landscape during summer months.

Photography and imaging

7.5.18 Photographic survey work is ongoing. Verified winter photography is planned in early January 2018. Once this photography is complete and a full and final set of images chose to represent views, this section will be updated in the final ES.

7.5.19 For this PEIR, working summer viewpoint photography has been undertaken by the authors and is presented as draft viewpoint photographs on photo sheets at Figure 7-5.

7.5.20 The photographic surveys were carried out by qualified landscape architects who are well versed with the methods and best practice required to produce verifiable photographs to be used in TVIA and visual representations.

7.5.21 Photographs illustrating views from each viewpoint were taken with a full frame Nikon D610 digital camera using a fixed lens with a 50 mm focal length. Each frame was taken in landscape format, and up to four frames have been stitched together using the 'Rotating Motion' setting in Microsoft Image Composite Editor software. This provides a panoramic image stitched in planar projection and should be viewed flat.

7.5.22 The wide panoramic views are intended to give an understanding of the visual context. Theoretically, when printed at the correct size on an un-scaled A3 page and viewed at a distance of 400mm using one eye, the photographs closely

represent the view experienced from each viewpoint by the viewer's naked eye. However, in practice it is difficult to view the photographs at the exact viewing distance.

7.5.23 The choice of an A3 format is for ease of handling and reproduction. The images should be viewed with the paper flat and at a comfortable distance with the viewer's arms bent to around 90° (approximately 400mm).

7.5.24 The photographs provide a tool for assessment that can be compared with an actual view in the field; they should never be considered as a substitute to visiting a viewpoint in the field.

Visualisations

7.5.25 The method for preparing photomontages accords with the guidance contained in the Landscape Institute Advice Note 01/11 (Photography and Photomontage in Landscape and Visual Impact Assessment) [17]. Consideration has also been given to guidance included in 'Visual representation of wind farms: good practice guidance: Scottish Natural Heritage (Version 2, 2014) [16].

7.5.26 A three-dimensional (3D) model of the scheme is built in computer aided design software (CAD) with material finishes being assigned to the scheme. The camera positions and surveyed reference points are also modelled in CAD. The virtual camera is located at equivalent co-ordinates and height, and with the same 'lens', orientation and settings as used in the photograph at each viewpoint. The virtual 'reference points' such as built form and boundary features are set at the same heights and co-ordinates as those used as reference points in the photographs.

7.5.27 Virtual photographs of the model are taken or 'rendered' with virtual cameras in the 3D CAD software (3ds Max Design) in positions equivalent to the locations from which the actual photographs were taken at each representative viewpoint. Each virtual view is rendered twice; once with associated reference points and another without.

7.5.28 The virtual photograph of the model is matched to the equivalent baseline photograph from the representative viewpoint, with particular emphasis on ensuring the correct alignment of the 'reference points' to align the model correctly in the image. Once the alignment is made using Adobe Photoshop software, the virtual photograph of the model is superimposed onto the photograph. The parts of the model that would be behind land, trees, buildings or other structures has been removed, so that the visualisation only shows parts of the model that would in reality be visible.

7.5.29 Presentation of photomontages includes a baseline photograph displayed above the relevant photomontage/s for each viewpoint where practicable. Viewpoint OS grid coordinates and viewpoint height above ordnance datum (AOD) are noted on the photomontage figure. Additional information on the photomontage figure (or elsewhere in this chapter including the Section above on Photography and Imaging) includes details of the camera, the lens focal length, the horizontal field of view, the orientation of the view, and the distance of the viewpoint.

7.6 Baseline Conditions

Landscape Receptors

7.6.1 The following paragraphs and tables describe the baseline and justify the judgement on the value of each landscape receptor including landscape Character Areas (CA's) and designated landscapes. Refer to Figure 7-2 for a plan showing landscape designations and Figure 7-3 for a plan mapping the CAs.

7.6.2 The application site and its landscape context are located wholly within National Character Area (NCA) 152: Cornish Killas [20].

7.6.3 The 2007 Cornwall and Isles of Scilly Landscape Character Study (CISLCS) [10] is the most recent character assessment at a local scale for Cornwall. The majority of the application site falls within CA 14 Newlyn Downs, while the south-western portion of the scheme near to Chiverton Cross lies within CA 11 Redruth, Camborne and Gwennap. The assessment covers direct and indirect effects on these CAs.

7.6.4 The wider study area also incorporates CA 12 St Agnes and CA 13 Fal Ria, Truro and Falmouth. The assessment covers indirect effects on these character areas.

National Character Area: NCA 152 Cornish Killas

7.6.5 This description of the NCA is included for context. The assessment of landscape character is carried out at a local scale in a proportional level of detail, as set out below in paragraphs (7.6.8 to 7.6.36).

7.6.6 Key relevant characteristics (as defined by the Natural England National Character Area Profile and confirmed by field work) are:

"An undulating shillet (shale) plateau, with open vistas and a characteristic network of stone-faced earthen banks (Cornish hedgebanks), many enclosing fields in use since medieval times. From higher ground there are long views across a rather uniform landscape of mixed farming, with small villages and market towns." (Natural England, 2014) [20]

7.6.7 In the profile for each NCA, Natural England sets out Statements of Environmental Opportunity. These help to bring together relevant information and offer suggestions where action can be best targeted to conserve and improve the natural environment. Statements of Environmental Opportunity for NCA 152 are:

- **SEO 1:** Manage, restore, link and enhance the area's rich mosaic of wildlife habitats, expanding their quality, extent and range where appropriate. This needs to be achieved alongside sustainable agricultural practices, which contribute to soil and water quality as well as providing habitat management. This benefits the local economy, minimises soil erosion and flooding and provides increased recreational opportunities.
- **SEO 2:** Conserve, manage and increase understanding of the area's rich historic environment and its valuable interlinked geological and cultural heritage – including the mining legacy, the prehistoric and later settlements and ritual remains, and the unique Cornish hedges and field patterns – which combine to bring a unique historical and cultural identity to Cornwall.

- **SEO 3:** Sustainably manage the visitor pressure associated with this distinctive landscape to ensure that the numerous recreational opportunities, such as the South West Coast Path and high-quality beaches, continue to be enjoyed sustainably by the local community and visitors. Develop volunteering opportunities both for local residents and for visitors, and endeavour to better connect people with places and natural assets. [20]

Local Landscape Character

7.6.8 The character of Cornwall has been appraised in the Cornwall and Isles of Scilly Landscape Character Study (CISLCS) [10] (2007) which identified 40 character areas, referred to below as landscape Character Areas (CAs). The scheme is sited within two CA's:

- CA 11 Redruth, Camborne and Gwennap; and
- CA 14 Newlyn Downs.

7.6.9 These are the only CA's which would receive direct effects on their constituent elements and overall character. The following CA's would only receive indirect effects on their settings as a result of the scheme:

- CA 12 St Agnes;
- CA 13 Fal Ria, Truro and Falmouth; and
- CA 15 Newquay and Perranporth Coast.

7.6.10 In order to keep the assessment proportionate, the description here sets out and assesses potential effects on those CAs which are likely to receive any significant effect on their settings. Due to the proximity and the number and importance of views available from the CAs of the scheme site, these include:

- CA 11 Redruth, Camborne and Gwennap;
- CA 12 St Agnes;
- CA 13 Fal Ria, Truro and Falmouth; and
- CA 14 Newlyn Downs.

7.6.11 The settings of the remaining CA's have no noticeable visible or otherwise perceived connection with the scheme and have thus been scoped out of this assessment.

CA 11 Redruth, Camborne and Gwennap

7.6.12 For reference, Viewpoints 1 and 2 are within this CA.

7.6.13 Predominantly pastoral landscape, with trees and shrubs found in the valleys and punctuating agricultural patterns, including farm buildings, hedges, fields, and narrow lanes. Field structures are strong, with fields on the upper plateau being generally larger and with the even form of more recent enclosure. The enclosed land on hillsides and in the valleys is of ancient origin and tends to be irregular and smaller in size. This farmland is a mixture of improved and rough grazing, in addition to considerable rough land. Evidence of historic industrial mining activities is common and is particularly concentrated in the CWDM WHS A6i Gwennap Mining District, most of which is within this CA. Most noticeable are the legacy mining buildings, such as old engine houses, while the spoil heaps are

now often sites of regenerating heathland. At the coast, the landscape becomes more open and the lowland heathland habitat gives way to bracken and scrub. In this post-industrial landscape, the evidence of human intervention through time is quite apparent. A portion of this is of historic origin and lends an atmospheric quality to the landscape, however, in combination with the more modern interventions, the landscape has developed a cluttered appearance.

7.6.14 Further key relevant characteristics (as defined by the Cornwall and Isles of Scilly Landscape Character Study and confirmed by field work) are:

- *Pastoral landscape of improved and rough grazing with extensive areas of rough land.*
- *Valleys which are shallow and narrow, containing small streams.*
- *A well populated landscape containing Cornwall's largest built-up area.* [10]

Value

7.6.15 Overall Value is **high** with a considerable portion of the area designated of **national** Importance.

Susceptibility

7.6.16 The quality and condition of the landscape is good. Post-industrial sites lack management and many of the historic character areas are vulnerable to change, particularly the Upland Rough Ground. Vegetation along field boundaries require strengthening and some farmland is reverting to scrub. The quality of newer development at the edges of settlements detracts from the overall character and sense of place. Susceptibility to change of the type proposed is **medium**.

Sensitivity

7.6.17 Combining this receptor's high value with its medium susceptibility to change, its setting is assessed as having a **high** sensitivity to change.

CA 12 St Agnes

7.6.18 For reference, Viewpoint 29 is within this CA.

7.6.19 Open and exposed granite intrusion with little vegetation other than sprawling heath, scrub and bracken. Some arable pasture is found on the plateau where the field pattern is strongly rectilinear. Built remnants of the mining industry including, engine houses and mining tracks and found frequently, particularly within the CWDM WHS – A7 St Agnes Mining District. Settlements are largely of village size and are grouped on terraces within valleys.

7.6.20 Key relevant characteristics (as defined by the Cornwall and Isles of Scilly Landscape Character Study and confirmed by field work) are:

- *Coastal plateau of slate killas with granite intrusion, rising to St Agnes Beacon.*
- *High slate cliffs form a dramatic and varied coastline with sandy coves at the mouth of streams and sandy low tide beaches.*
- *Open and exposed landscape with almost no tree cover on plateau and hill top.*

- *Extensive evidence of past mining of tin and copper with derelict sites, bare ground and features such as engine houses, a harbour and mining tracks.*
- *Extensive areas of Lowland Heathland and unenclosed rough ground of scrub and bracken on coastal cliffs and valleys, often associated with mine sites.*
- *A mainly recent enclosure pattern of small to medium fields of improved permanent pasture and rough grazing with more recent farming over former miner's smallholdings.*
- *Villages cluster as terraces on the steep valley sides at the coast with scattered former mining cottages and new farms on the plateau.* [10]

Value

7.6.21 Overall Value is **high** and large proportion of the area is of **national** importance.

Susceptibility

7.6.22 The quality and condition of the landscape are deteriorating. Development is encroaching on high ground towards St Agnes plateau and there is a loss of tranquillity from an increase in movement by people and traffic. At the coast this movement is resulting in erosion. Susceptibility to change of the type proposed is **medium**.

Sensitivity

7.6.23 Combining this receptor's medium-to-high value with its medium susceptibility to change, its setting is assessed as having a **moderate-to-high** sensitivity to change.

CA 13 Fal Ria, Truro and Falmouth

7.6.24 There is little intervisibility between the scheme and this CA, however it lies only 200m from the scheme boundaries. Furthermore, the host CA's 11 and 12 provide the wider setting for the upper slopes of the valleys within CA 13.

7.6.25 CA13 is comprised of a series of deeply incised valleys that form a catchment feeding into the River Fal and Fal Estuary. The topography is therefore formed of steep valley sides running from the plateau of CA 11 Redruth, Camborne, and Gwennap and CA 14 Newlyn Downs, down to the rivers and creeks in the valley floor. The valley sides are frequently wooded, some of which is Ancient Woodland or semi-natural.

7.6.26 The portion of this CA within the study area tends towards a larger scale mosaic of regular fields, while a more irregular smaller-scale mosaic with enclosures of ancient origin are found commonly in the rest of the CA.

7.6.27 Key relevant characteristics (as defined by the Cornwall and Isles of Scilly Landscape Character Study and confirmed by field work) are:

- *An interlocking and winding ria (drowned river valley) system of small creeks and river valleys that drain into the River Fal that broadens to form the Fal Estuary.*
- *Muddy creeks with brackish open water and wet grassland, merging with Coastal Saltmarsh close to tidal limits.*

- *Semi-natural woodland and Ancient Woodland on steep slopes, with ornamental and conifer estate planting inland on the undulating plateau with Monterey Pines a feature. Where woodland does not dominate the slopes there are pasture fields usually with scrub vegetation down to the water's edge.*
- *Extensive forestry north of Ladock and west of Tresillian.*
- *Farmland is a mix of pasture and arable with some areas of upland rough ground with a small field pattern of anciently enclosed land with more regular larger fields indicating areas of more recent enclosure. Fields are bounded by Cornish Hedges with extensive tree cover on these boundaries, adding to the wooded feel.*
- *Creeks that are dominated by former ports in small villages, with an industrial, water-related character of small quays and landing stages.*
- *Harbours and defence fortifications at the mouth of the estuary. Quays and tide mills at the heads of creeks.*
- *A coastal zone of low rocky cliffs backed by farmland interspersed with discrete woodlands.*
- *Transition between coastal and tidal river waterscapes, with many boats and ships emphasizing the marine character.*
- *Medieval settlements at the heads of creeks with strong vernacular of slate with render, painted pink, cream or white with frequent medieval churches. Linear villages occur along main transport routes on the valley floors with some larger urban and industrial areas.*
- *Tree lines linking villages, farms and cottages and forming tunnels.*
- *A busy landscape with much movement of people between the urban centres and lots of river traffic.* [10]

Value

7.6.28 Overall Value is **medium** of **local** importance

Susceptibility

7.6.29 The quality and condition of the landscape is generally good, but is increasingly subject to pressures from urban development, industrial farming practices, and higher transport volumes. Susceptibility to change of the type proposed is **medium**.

Sensitivity

7.6.30 Combining this receptor’s medium value with its medium susceptibility to change, its setting is assessed as having a **moderate** sensitivity to change.

CA 14 Newlyn Downs

7.6.31 For reference, Viewpoints 3 - 28 are within this CA.

7.6.32 A plateau forming a ‘spine’ along the length of much of Cornwall, with an open aspect and gently undulating topography. The higher ground results in an open and exposed landscape where there are few mature trees and while there are many low Cornish hedges and hedgerows, which have been closely flailed. The views are elongated and extend outwards to the coast and to the north. The A30,

a key route since prehistory, follows the ridge of higher ground, running roughly east to west. Settlement is patterned into small nucleated villages, scattered individual farms, including some estate farms. Tumuli are prominent, there is a significant area of Lowland Heathland at Newlyn Downs, and windfarms are prominent at Carland Cross and Four Burrows. At the southern end of the CA, the landscape transitions into the river valleys of CA 13 Fal Ria, Truro, and Falmouth.

7.6.33 Key relevant characteristics (as defined by the Cornwall and Isles of Scilly Landscape Character Study and confirmed by field work) are:

- *Open, gently undulating plateau with shallow valleys, incised with minor river valleys. In the north, these reach the coast.*
- *Medium to large-scale broadly rectilinear fields of pasture or arable.*
- *Low Cornish hedges and hedgerows.*
- *Significant area of Lowland Heathland at Newlyn Downs and along the coast between Perranporth and St Agnes.*
- *Woodland cover more prevalent in valleys, mainly broadleaved with Wet Woodland with limited mixed plantations.*
- *Dispersed settlement clusters with estate farms. Some nucleated settlements around enlarged medieval churchtowns.*
- *Prominent barrows on higher ground, numerous late prehistoric defended / enclosed farmsteads (rounds) and mining remains in the west.*
- *A30 along the higher ground with associated development (roadside settlements).*
- *Windfarms at two sites along the ridgeline.*
- *Long views to the north and the coast.* [10]

Value

7.6.34 Overall, the value of this CA is judged to be **medium** and of **local** importance

Susceptibility

7.6.35 The quality and condition of the landscape are generally good. The quality of newer developments in and around villages is frequently poor and detracts from the character and sense of place. A higher level of management of woodland is needed. Human intervention is highly evident in the landscape, particularly through the energy and transport infrastructure along the central ridge. Susceptibility to change of the type proposed is **medium**.

Sensitivity

7.6.36 Combining this receptor's medium-to-high value with its medium susceptibility to change, its setting is assessed as having a **moderate** sensitivity to change.

Landscape Designations

7.6.37 There are a number of designations within the 5km study area. Two areas of the Cornwall and West Devon World Heritage Site (CWD WHS): one directly adjacent to the scheme. At the St Agnes coast, the second CWD WHS site is found, as well as the St Agnes section of the Cornwall AONB, and the 7 St Agnes section of

the Heritage Coast. To the southeast of the scheme lies the St Clement Area of Great Landscape Value (AGLV). Near the centre and just to the north of the scheme is Chyverton Park, a Grade II Registered Park and Garden (RPG).

7.6.38 These designations largely reflect the industrial and mining history of the region, the coast's natural beauty and less common estate features.

Cornwall and West Devon World Heritage Site

7.6.39 The CWD WHS comprises a number of distinct areas over the two counties. The landscape character generally reflects the pattern of small-scale mine workings, with small fields, dense hedgerows, and narrow, winding lanes. This is particularly true for component area A6i Gwennap to the southwest of Chiverton Cross (see Figure 7-2). At the coast, and in the more open, southern areas of A6i Gwennap, a more desolate, exposed, and raw landscape is found, with large engine houses rising up as dramatic features.

7.6.40 The setting of the CWD WHS is unusual for a WHS:

'For many WHSs, the setting can be geographically demarcated as a formal buffer around the edge of the Site. However, the Nomination Document concluded that this approach was not appropriate for this site because of the diverse range of risks, its fragmented nature across ten areas, most of which are visible from one another, and the many individual monuments and other areas of mining landscape which lie outside the inscribed areas.' (Cornwall and West Devon Mining Landscape World Heritage Site Supplementary Planning Document, 2017, pp31) [21]

A6i Gwennap Mining District

7.6.41 The portion of the WHS which falls within the 1km study area is A6i Gwennap Mining District.

'Gwennap was once described as the 'richest square mile in the Old World'. The widespread and devastating landscape impact of copper mining may be seen together with remains of the network of railways that linked the mines to the ports.

The desolate, largely heathland landscape, considerably modified by mining, is carpeted with waste rock (deads), dotted with islands of consolidated building remains, and with shafts surrounded by distinctive Cornish mine hedges. The central and northern sections of this Area are notable for their well-preserved landscape of smallholdings, interspersed with small mining settlements together with the mines which they served.' (World Heritage Nomination Document, 2006, pp100) [22].

'This is another huge Area, whose boundaries are always too far distant for one to be able to get a feeling of the whole from within, and whose identity and boundaries are not readily distinguishable from outside it. There are many small valleys, narrow lanes bounded by high hedges and here and there the occasional patch of woodland, so views are often constrained and local, often along valleys.' (The Outstanding Universal Value (OUV) of the Cornwall and West Devon Mining Landscape World Heritage Site Area Descriptions (A1 to A10), n.d.,pp33) [23]

'An Area of contrasts, this, once the richest of Cornwall's mining districts and the site of some of its earliest beam engines, appears at first sight to have returned to post-industrial rural sleepiness. Its northern half, once the site of a huge expanse of downland but subsequently lain out as smallholdings, now feels mature, the boundaries of many of its tiny fields planted with oaks and hawthorns.' (ibid, pp35)

7.6.42 The value of the A6i Gwennap section of the CWD WHS is of high value with international importance. Although close to the scheme, the self-contained nature of the area, along with its restricted views result in a moderate level of susceptibility to changes of the type proposed in its setting. The designation is considered to have **high** sensitivity.

A7 St Agnes

7.6.43 A coastal mining area, with the use of some sites dating back to prehistory. Steep cliffs, some of which themselves were mined, now contain heathland, which has covered the scarring of the industrial activities, and engine houses rising dramatically upwards. Largely contiguous with the St Agnes Cornwall AONB. Refer to section below for a more general description of landscape.

7.6.44 The value of the A7 St Agnes section of the CWD WHS is of high value with international importance. The northward focus on the coastal landscape and seaward views, away from distant detracting infrastructure inland, result in the setting of this area having a medium level of susceptibility to change of the type proposed. The wider inland setting to the south of this designation is considered to have **moderate to high** sensitivity to change.

Cornwall Area of Outstanding Natural Beauty (AONB) – St Agnes

7.6.45 The St Agnes section of the Cornwall AONB comprises a narrow strip of land along the coast and is the smallest section of the AONB as a whole. The landscape is open and exposed with sparse vegetation and relatively expansive views from St Agnes Beacon. The existing A30 forms a part of the landscape features clustered along the ridge in the centre of the peninsula. The broad expanse of the view is the dominant characteristic of the view. The road is a relatively indistinct element within this panorama.

7.6.46 'The dominant feature of this area is large granite intrusion that forms the distinctive St Agnes Beacon, which rises from the surrounding undulating coastal plateau (formed of slate killas) to a height of approximately 90 metres above sea level.' (Cornwall Area of Outstanding Natural Beauty – Local, n.d., pp24) [24]

7.6.47 St Agnes Local Policy SA5.07: 'Seek protection of the setting of St Agnes Beacon by conserving the extent and character of the surrounding farmland for example between it and the existing settlement edge of St Agnes, Goonvrea and smaller groupings of dwellings, in order to protect the landscape integrity of this key landscape feature.' (Cornwall AONB Management Plan Local 2016 – 2021, 2016, pp27) [9]

7.6.48 The value of this portion of the Cornwall AONB is of high value with national importance. The northward focus on the coastal landscape and seaward views, away from distant detracting infrastructure inland, result the setting of this area

having a medium level of susceptibility to change of the type proposed. The wider inland setting to the south of this designation is considered to have **moderate to high** sensitivity to change.

Heritage Coast – 7 St Agnes

7.6.49 Eleven kilometres in length, 12km^2 and largely contiguous with the St Agnes section of the Cornwall AONB. Refer above for the description of the landscape.

7.6.50 The value of this portion of the Heritage Coast is of high value with national importance. The northward focus on the coastal landscape and seaward views, away from distant detracting infrastructure inland, result the setting of this area having a medium level of susceptibility to change of the type proposed. The wider inland setting to the south of this designation is considered to have moderate to high sensitivity to change.

Area of Great Landscape Value (AGLV)

7.6.51 Cornish hedges and narrow wooded valleys to the north and east of Truro. This landscape forms a contrast with the more open and sparsely treed surrounding landscape.

7.6.52 The value of this AGLV is of high value with regional importance. The distance from the site and the lack of outward visibility reduces the importance of the setting of this area result in a medium level of susceptibility to changes to its setting. The setting of the AGLV is considered to have **moderate to high** sensitivity to change.

Chyverton Registered Park and Garden (RPG) (List Entry: 1000512)

7.6.53 Grade II, approximately 58ha, bounded by unclassifed local roads. Historic entrance was from the south-east, by the mid - late 19th Century lodge. Current entrance is from the south-west. Not open to the public.

7.6.54 ‘A late C18 park developed as pleasure grounds from the mid C19, with a C20 woodland garden’. [25]

7.6.55 The value of this RPG is of high value with national importance. Although this is not a robust landscape, the inward focus of the RPG and the strong visual containment from dense woodland throughout and at its edges result in a low level of susceptibility to change to its setting. The setting of Chyverton Park RPG is considered to have **moderate to high** sensitivity.

Heritage Assets

7.6.56 The significance and settings of listed buildings and listed places has been considered in Chapter 6 ‘Cultural Heritage’ of this ES.

7.6.57 Heritage assets are valued landscape features. The extent to which Listed Buildings and Scheduled Monuments contribute to the cultural and historic aspects and overall character of the landscape is considered in the baseline assessment of sensitivity of the landscape character area receptors.

7.6.58 Landscape effects including those resulting from changes to the settings of heritage assets are considered under landscape character effects below.

7.6.59 The potential for effects on the visual amenity of people enjoying views from publicly accessible heritage assets has been considered in the visual assessment.

7.6.60 The listed buildings and scheduled monuments considered in this assessment are detailed within the description of Heritage Assets, Table 7-2.

Summary of Landscape Sensitivity

Table 7-1 Summary of Landscape Sensitivity

Receptor	Sensitivity
Direct Effects on CA's	
CA 11 – Redruth, Camborne, and Gwennap	High
CA 14 – Newlyn Downs	Moderate
Indirect Effects on settings of CA's	
CA 12 – St Agnes	Moderate-to-high
CA 13 – Fal Ria, Truro and Falmouth	Moderate
Indirect effects on settings of Landscape Designations	
CWD WHS – A6i Gwennap Mining District	High
CWD WHS – A7 St Agnes	Moderate-to-high
Cornwall AONB – St Agnes	Moderate-to-high
Heritage Coast – 7 St Agnes	Moderate-to-high
St Clement Area of Great Landscape Value (AGLV)	Moderate-to-high
Chyverton Registered Park and Garden (RPG)	Moderate-to-high

Visual Receptors

7.6.61 The undulating topography results in visibility of the scheme from the wider landscape being intermittent. Open views of the scheme are generally restricted to within 200m of the scheme, while the occasional distant view is available within 1km of the site.

7.6.62 The desk based study and site visit have identified the following visual receptors, which may be affected by the scheme.

Residential receptors

7.6.63 Nearby residents, in particular:

- Callestick Vean (south) (VP 6);
- Creegmeor Farm (VP 7);
- Nanteague Farm (VP 10);
- At Maranzavose (VP 12);
- Nancarrow Farmhouse (NFH) (VP 14);
- Chyverton Lodge (VP 16);
- Hill House (VP 17);

- Polstain Farm (VP 20);
- Zelah Hill Cottage, Mount Pleasant, and Tregorlands (VP 21);
- Penny-Come-Quick (VP 23); and
- At Journey's End, Racland House, and Four Winds (VP 24).

7.6.64 For this assessment, it has been assumed that views from these dwellings are of high individual or community value depending on whether the receptor is single dwelling or a small group of dwellings representing a community. The nature of these views is rural, but often impinged upon by infrastructure, such as the existing A30, wind turbines, and photovoltaic farms. These receptors are therefore considered moderately able to accommodate change and are therefore of medium to high susceptibility to change. The sensitivity of these receptors to changes in their views is assessed as **high**.

Recreational receptors

7.6.65 These include users of the public footpaths and open spaces, in the following locations:

- Pedestrians and equestrians using bridleways 301/10/1 & 301/10/3 (VP 1);
- Users of byway 314/66/1 (VP 5);
- Pedestrians and equestrian using bridleway 314/64/1 (VP 6);
- Pedestrians and equestrians using bridleway 309/3/1 (VP 9);
- Pedestrians using footpath 314/67/1 (VP 11);
- Pedestrians using footpath 319/16/1 (VP 15);
- Pedestrians and equestrians using bridleway 319/9/1 (VP 17);
- Pedestrians using footpath 319/8/1 (VP 18);
- Pedestrians using the undesignated footpath near Church Lane (VP 19);
- Cyclists using NCR 32 near Henver Lane (VP 20);
- Cyclists using NCR 32 near the B 3285 (VP 22);
- Pedestrians using footpath 324/10/1 (VP 25);
- Walkers and other recreational users of Newlyn Downs (VP 25 and 26);
- Pedestrians using footpath 318/63/2 and pedestrians and equestrians using bridleways 318/63/1 & 318/63/3 (VP 29); and
- People enjoying the Cornwall AONB (VP 29).

7.6.66 These receptors are located in rural or village contexts, and scenic enjoyment of the wider landscape is an important part of the recreational value. The value of their visual amenity is considered to be high and local in most cases, with the exception of NCR route 32 and people on routes within the AONB, which are of National Value. Due to their engagement with the landscape as a part of the recreational experience, these recreational receptors can accommodate a low level of change and are considered to have moderate susceptibility to change. The NCR 32 route and people on routes within the AONB are therefore assessed as having a **high** sensitivity to change. All other recreational receptors are assessed as having a **moderate** sensitivity to visual change.

Transport receptors

7.6.67 Receptors include users of the road network, in particular:

- Users of the Blackwater Bypass of the A30 (VP 1);
- Users of services at Chiverton Cross (VP 2);
- Users of the A3075 near Trevissome Business Park (VP 3);
- Users of the local road near Callestick Vean (south) (VP 6);
- Users of the B3284 near Chybucca (VP 8);
- Users of the existing A30 near Maranzavose (VP 12);
- Users of the local road near Chyverton Park (VP 16);
- Users of the existing A30 (VP 19);
- Users of High Road and Henver Lane (VP 20);
- Users of the existing A30 near Zelah Hill (VP 21);
- Users of the B3285 and the existing A30 (VP 22);
- Users of the existing A30 near Newlyn Downs (VP 24);
- Users of the local road near Cargoll Farm (VP 28); and
- Users of the typical minor rural lanes in the area

7.6.68 The attention of most of these receptors will be absorbed with navigating the narrow country lanes or busy A and B roads. The value of the visual amenity of these receptors is low, and their susceptibility to change is low. The visual amenity of these receptors is considered to have a **low** sensitivity to change.

Employment receptors

7.6.69 There are indoor employment receptors along the route such as workers in Trevissome Business Park (VP 3) and those at Town and Country Motors. While these are adjacent to the countryside, there immediate surroundings area already dominated by existing roads. Workers are unlikely to be focussed on enjoyment of views of the landscape. The value of their visual amenity is low and of individual or community importance and views are able to accommodate change. Their sensitivity to change in views is **Low**.

7.6.70 Outdoor employment receptors such as farms and small businesses are commonly found across the Study Area, for example at Hill View Farm (VP 8) and NFH (VP 15). These receptors are more likely to take in the views of the countryside. The value of their visual amenity is medium and views are less able to accommodate change, resulting in a medium susceptibility. Their sensitivity to change in views is **Moderate**.

Visitor accommodation

7.6.71 There are users of holiday accommodation in several locations within the study area. Those with the potential to receive visual effects are located at NFH, very near the existing A30. The visual focus of these receptors is likely to be internal to the grounds of the holiday accommodation sites. These receptors are of medium local value and their settings have a medium to high susceptibility to change in their views. Their sensitivity to change in views is **Moderate**.

Heritage assets

7.6.72 The visual amenity of people enjoying views to and from the following publicly accessible heritage assets is represented by viewpoints as set out in Table 7-2:

Table 7-2 Heritage Receptors Included in this Assessment

Heritage Asset	Representative Viewpoints
Cornwall and West Devon Mining World Heritage Site (CWDM WHS) – A6i Gwennap Mining District	VP 1
Scheduled Monument – Four Burrows Barrow Cemetery (List Entry: 1016054)	VP 4
Scheduled Monument – Bowl Barrow (List Entry: 1016105)	VP 5
Scheduled Monument – Bowl Barrow (List Entry: 1016103)	VP 6
Listed Building – Nancarrow Farmhouse and attached wall (Grade II) (List Entry: 1136610)	VP 14
Listed Building – Lodge and associated walls and gate posts at entrance to Chyverton House, Registered Park and Garden (Grade II) (List Entry: 1136926)	VP 16
Scheduled Monument – Barrow Cemetery at Carland Cross (List Entries: 1016888, 1017050, 1020758)	VP 26, VP 27
Scheduled Monument – Bowl Barrow (List Entry: 1016443)	VP 29
Cornwall and West Devon Mining World Heritage Site (CWDM WHS) – A7 St Agnes	VP 29
St Agnes Heritage Coast	VP 29

7.6.73 According to the DMRB criteria (set out in Chapter 6, Table 6-2 of this ES), the visual amenity of people enjoying views:

- to and from the Cornwall and West Devon Mining World Heritage Site (CWDM WHS) are considered to be of **high** international value;
- scheduled monuments to be of **high** national value; and
- Grade II listed buildings to be of **medium local** value.

7.6.74 Given the rural context and the presence of the existing A30 and other infrastructure, the visual amenity of all of these receptors is considered to be of **medium to high** susceptibility to change of the type proposed. Combining the respective values with medium susceptibility, the sensitivity to change of the receptors is assessed as follows:

- CWDM WHS and scheduled monuments as **high** sensitivity; and
- Grade II listed buildings as **moderate** sensitivity.

7.6.75 During field work, the Grade II Listed Church of St Peter (List Entry: 1141481), Vicarage (List Entry: 1328719), and Schoolroom (List Entry: 1141482) were visited and no views of the scheme were found to be available from within their curtilages.

Assessment Viewpoints

7.6.76 The following 29 viewpoints (VPs) have been selected to represent the visual receptors included in this assessment. For the location of the viewpoints refer to Figure 7-1, Visibility and Viewpoints.

Table 7-3 Baseline assessment of viewpoints

VP	Description and location	Existing view	Receptors represented	Sensitivity
1	View from overbridge south of Three Burrows, looking northeast along A30, 20m southwest of the scheme. SW 74410 46254	A partially enclosed medium distance view looking northeast along the A30 towards Chiverton Cross. The dual carriageway of the A30 through the middle of the frame, dominates the view. Embankments on either side of the road frame the view, while shrub and woodland vegetation on the bordering fields filter views of the surrounding area. Beyond the trees, glimpses of one and two storey buildings can be seen. In the distance, Carland Cross is discernable due to the cluster of street lighting. To the southeast, a wind turbine rises above the treetops.	Users of bridleways 301/10/1 & 301/10/3 enjoying the visual setting of the heritage asset – CWDM WHS A6i Gwennap Mining District	Views to and from the WHS is of very high value. However, the proximity to the A30, diminishes the sense of place and the connection with the landscape. This results in a medium susceptibility to change and therefore the visual amenity of these receptors is considered to be of **high** sensitivity to change.
			Transport receptors along the Blackwater Bypass of the A30	The visual amenity of users of the existing A30 is considered to be of medium value. While panoramic views of the surrounding countryside are available from the A30, the driver's attention is focussed on the task of driving. These receptors are assessed as having a low susceptibility to change, and therefore their visual amenity is considered to be of **low** sensitivity.
2	View from Starbucks at Chiverton Cross, looking east towards A30, 10m west of the scheme. SW 74697 46883	This is a filtered view looking east towards the Chiverton Cross roundabout along the A30. The foreground of the view is occupied by the edge of the Services' carpark, and the wooden pail fencing separating it from the A30. Amenity grass and shrub planting surrounds the entrance ramp leading up to the Starbucks. Starbucks itself is screen from view by a taller wooden pail fence with a brick footing. In the middle-distance, the view is dominated by road infrastructure, including signage, lighting, and traffic. In the middle of the frame, further views out to the surrounding countryside are screened by the roadside woodland within the roundabout. On the western side of the frame, the beginning of the A390 is visible.	Users of services at Chiverton Cross	The visual amenity of users of the Chiverton Cross Services is considered to be of medium value. Due to the highly built up nature of the complex and the location next to the A30, these receptors are assessed as having a low susceptibility to change. Therefore, their visual amenity is considered to be of **low** sensitivity.
3	View from Trevissome Business Park looking west, 60m southeast of the scheme. SW 75360 47766	An open view looking west from the entrance to Trevissome Business Park, along the A3075. An unmanaged hedgerow borders the north side of the A3075, filtering the view into the large field beyond. On the horizon, a number of small holdings, isolated trees and patches of hedgerows are visible A number of pylon and overhead power lines are intermingled with this other built form. To the west of the frame, St Peter's Church is visible as a prominent landmark.	Workers at Trevissome Business Park	The views from the business park are available to workers in westerly facing rooms and are of community value. The focus of these receptors is unlikely to be on enjoyment of views from the surrounding landscape. These are of low local value. There is a medium susceptibility to change and thus the visual receptors are of **low** sensitivity to change.
			Transport receptors using the A3075 near Trevissome Business Park	The visual amenity of users of the A3075 road is considered to be of medium value. Due to the limited number of viewing opportunities and the focus of the drivers' attention being on the task of navigating the busy roads, these receptors are assessed as having a low susceptibility to change. Therefore, their visual amenity is considered to be of **low** sensitivity to change.
4	View from Four Burrows, looking northwest, 130m south of the site. SW 76146 48249	A wide, partially screened view looking along the existing A30 towards open fields. In the foreground large barrows are prominent on either side of the road, while a low hedgerow partially filter views beyond. To the west, beyond the hedgerow the view is very open and wide and distant views are possible. Wind turbines are prominent in the middle distance, as is St Agnes Beacon on the north-western horizon.	People enjoying the views to and from nearby heritage asset – Four Burrows Barrow Cemetery (1016054)	The views to and from heritage assets are of high value. In the context of the surrounding infrastructure, these views have a medium susceptibility to change, and therefore a **high** sensitivity to change.
5	View from byway leading to Higher Callestick Farm, looking southeast towards A30, 800m north of the scheme.	An open view looking southeast across a mosaic of large fields. A wind turbine is prominent in the foreground, while in the middle distance, pylons stand on either side of the frame. Hedgerows and small copses of woodland border the fields. In the middle of the view,	Users of Byway 314/66/1	The views of users of the Byway have high local value. In the context of the rural setting with the proximity of the A30 and other infrastructure, these views have a medium susceptibility to change, and therefore a **moderate** sensitivity to change.

VP	Description and location	Existing view	Receptors represented	Sensitivity
	SW 76587 49411	the existing A30 can be seen. The upper portions of cars are partially visible, while high sided vehicles are more prominent. The road is screened by topography at either side of the frame. In the background, there are several wind turbines on the eastern side, visible above a block of woodland.	People enjoying the views to and from nearby heritage asset – Bowl Barrow (1016105)	The views to and from heritage assets are of high value. In the context of the surrounding infrastructure, these views have a medium susceptibility to change, and therefore a **high** sensitivity to change.
6	View from the junction of B3284 with the bridleway 314/64/1, adjacent to the dwelling at Callestick Vean (South), looking east, 5m north of the scheme. SW 77256 48792	An enclosed view looking east from a farm gateway, across a network of fields towards the A30. The view is framed by hedgerows at either side of the gateway. To the south, a very small portion of a road sign and the upper sections of a wind turbine are visible above the mature roadside hedgerow. The existing A30 is largely obscured from view by the mature roadside hedgerows, however HGV become clearly visible as the road reaches the ridgeline to the east.	Residential receptors at Callestick Vean (south)	Views from the private dwelling at Callestick Vean are of high value to residents. Views from within the property to the south and east, towards the B3284 and the A30, are screened by a thick hedgerow. The visual amenity of these residents has medium susceptibility to change and is thus of **high** sensitivity.
			Pedestrians and equestrians using bridleway 314/64/1	The views of pedestrians using the PRoW path have high local value. In the context of the rural setting with the proximity of the A30, these views have a medium susceptibility to change, and therefore a **moderate** sensitivity to change.
			People enjoying the views to and from nearby heritage asset – Bowl Barrow (1016103)	The views to and from heritage assets are of high value. In the context of the surrounding infrastructure, these views have a medium susceptibility to change, and therefore a **high** sensitivity to change
			Transport receptors using the B3284 near Callestick Vean (south)	The visual amenity of users of the B3284 road is considered to be of medium value. Due to the limited number of viewing opportunities and the focus of the drivers' attention being on the task of navigating the busy roads, these receptors are assessed as having a low susceptibility to change. Therefore their visual amenity is considered to be of **low** sensitivity.
7	View from PRoW, leading to Creegmeor Farm, looking southwest, 210m north-northwest from the scheme. SW 77814 49126	A wide view looking southwest across a field laid down to pasture. The land rises up very slightly to end at a ridge, on which a number of mature trees are skylined. To the east, a hedgerow parallel to the bridleway frames the view. In the centre of the view, a large agricultural building is prominent, as are five wind turbines spaced across the skyline. Views of the existing A30 are screened by planting and built form.	Residential receptors at Creegmeor Farm	Views from the private dwelling at Creegmeor Farm are of high value to residents. Views from within the property to the south and west, towards the A30 are screened by planting bordering the property. The visual amenity of these residents has medium susceptibility to change and is thus of **high** sensitivity.
			Pedestrians and equestrians using bridleway 314/65/1	The views of pedestrians using the PRoW path have high local value. In the context of the rural setting with the proximity of the A30, these views have a medium susceptibility to change, and therefore a **moderate** sensitivity to change.
8	View from the B3284, looking west,140m south of the scheme. SW 78177 48749	A wide, partially filtered view west along the B3284. The road is bordered on either side by low hedgerows. To the southwest, the fields bordered by low hedgerows rise up slightly to end in a ridgeline. To the north, the land rises also, but less sharply and ends at a hedgerow edging the horizon. One wind turbine is prominent in the middle distance, while a further three are spaced along the horizon. In the far distance, St Agnes Beacon is visible.	Transport receptors along the B3284	The visual amenity of users of the B3284 is considered to be of low value. While panoramic views of the surrounding countryside are occasionally available, the driver's attention is focussed on the task of driving. These receptors are assessed as having a low susceptibility to change, and therefore their visual amenity is considered to be of **low** sensitivity.
			Residential receptors at Hillview Farm	Views from the private dwelling at Hillview Farm are of high value to residents. Views from within the property to the west towards the B3284 and the A30, are partially filtered on the lower storey by a thick hedgerow. The visual amenity of these residents has high susceptibility to change and is thus of **high** sensitivity.

VP	Description and location	Existing view	Receptors represented	Sensitivity
			Representative of views of outdoor workers at Hill View Farm	The views of outdoor workers have moderate local value. In the context of the agricultural setting, these views have a medium susceptibility to change, and therefore a **moderate** sensitivity.
9	View from bridleway, near Hillview, looking northeast towards A30, 60m south of the scheme. SW 78697 49122	An open view, looking northwest across a field towards the existing A30. The view is framed to either side by hedgerows, which screen views out to the wider countryside. The land rises up slightly to form a ridge on the western side of the frame. The upper portions of higher sided vehicles become visible as the A30 emerges from behind this landform and dips down towards Tresawsen. In the center of the frame a wind turbine is visible on the distant skyline. On the eastern side of the frame, further ridges are staggered in the middle and far distances. The landscape in the distance forms a medium-scale mosaic of fields, hedgerows and sparse trees.	Pedestrians and equestrians using bridleway 309/3/1	The views of pedestrians using the PRoW path have high local value. In the context of the rural setting with the proximity of the A30, these views have a medium susceptibility to change, and therefore a **moderate** sensitivity to change.
10	View from outbuildings at Nanteague Farmhouse, looking southwest-west, 110m west of the scheme. SW 79260 49489	A wide and open view across fields laid down to pasture. In the foreground, the land lowers down to a hedgerow of small trees, before rising up on the far side to end at a further hedgerow on the ridgeline. An overhead powerline is skylined along this ridge. To the north, woodland obscures views of the existing A30.	Residential receptors at Nanteague Farm	Views from the private dwelling at Nanteague Farm are of high value to residents. Views to the north and west from the property to the A30 are screened by vegetation. The visual amenity of these residents has medium susceptibility to change and is thus of **high** sensitivity.
11	View from PRoW east of Lower Ventongimps, looking south-southeast, 320m northwest of the scheme. SW 79444 50214	An open view across fields towards the existing A30. The field boundaries and roadside are flanked by intact hedgerows. The upper portions of high sided vehicles can be intermittently glimpsed through the tree cover. The land rises slightly to the southwest, occluding further views in this direction. A block of deciduous woodland in the middle of the view is prominent on the horizon.	Pedestrians using footpath 314/67/1	The views of pedestrians using the PRoW path have high local value. In the context of the rural setting with the proximity of the A30, these views have a medium susceptibility to change, and therefore a **moderate** sensitivity to change.
12	View from Maranzavose, looking southwest along the A30, 40m west of the scheme. SW 79889 50329	A medium breadth view looking along the A30, enclosed to either side by high hedgerows and ornamental planting on the borders of properties. The dwellings at Maranzavose flank the north side of the A30, while a Cornish hedgerow bounds the south side of the road. Overhead power lines run along and across the length of the road. In the distance, the land rises up to a ridge, on which blocks of woodland and a large agricultural building are skylined.	Residents at Maranzavose	Views from the private dwellings at Maranzavose are of high value to residents. Views to the south from the properties face directly onto the existing A30. The visual amenity of these residents has high susceptibility to change and is thus of **high** sensitivity.
			Transport receptors along the existing A30 near Maranzavose	The visual amenity of users of the existing A30 is considered to be of medium value. While panoramic views of the surrounding countryside are available at times from the A30, the driver's attention is focussed on the task of driving. These receptors are assessed as having a low susceptibility to change, and therefore their visual amenity is considered to be of **low** sensitivity.
13	View from field within NFH, looking west towards A30, 100m southeast of the scheme. SW 80057 50269	A wide, partially filtered view from a small field, bordered by mature deciduous hedgerow trees. Beyond an open field is visible, with further woodland in the background.	Residential receptors at the bungalow at NFH	Views from the private dwelling at the bungalow at NFH are of high value to residents. Views out from the property are filtered by planting within and on the boundary of the property. The visual amenity of these residents has medium susceptibility to change and is thus of **high** sensitivity.
			Users of holiday accommodation at NFH	Views from holiday accommodation at NFH are of medium local value. Views out from the property are filtered by planting within and on the boundary of the property. The visual amenity of these residents has medium susceptibility to change and is thus of **moderate** sensitivity.
14		An enclosed view, framed to the north by high deciduous ornamental planting to the west of the frame, the view looks out on to open lawn	Residential receptors at NFH	Views from the private dwelling at NFH are of high value to residents. Views out from the property are filtered by planting

VP	Description and location	Existing view	Receptors represented	Sensitivity
	View from NFH, looking southwest from Rose Garden towards A30, 150m east of the scheme. SW 80110 50307	with shrubs and then mature trees filtering further views of the landscape.		within and on the boundary of the property. The visual amenity of these residents has medium susceptibility to change and is thus of **high** sensitivity.
			People enjoying views to and from NFH and attached wall Grade II listed buildings (1136610)	Views to and from these listed buildings are of high value. Although currently disturbed by the proximity to the A30, the setting is relatively tranquil. This results in a medium susceptibility to change and therefore the visual amenity of these receptors is considered to be of **moderate** sensitivity to change.
15	View from PRoW between A30 and NFH, looking southwest, 30m southeast of the scheme. SW 80046 50357	A wide view from a PRoW, looking west across an open field towards the existing A30. Hedgerows with mature trees filter views beyond to the wider landscape. An overhead power line with poles bisects the view.	Pedestrians using footpath 319/16/1	The views of pedestrians using the PRoW path have high local value. In the context of the agricultural setting, these views have a medium susceptibility to change, and therefore a **moderate** sensitivity.
			Representative of views of outdoor workers at NFH	The views of outdoor workers have moderate local value. In the context of the agricultural setting, these views have a medium susceptibility to change, and therefore a **moderate** sensitivity.
16	View from entrance to Chyverton Park, adjacent Chyverton Park Lodge, looking southeast, 40m northwest of the scheme. SW 80483 50915	A short view from Chyverton Park Lodge, looking southeast across the local road. The view is foreshortened by unmanaged roadside hedgerows and woodland, obscuring further views to the wider countryside or the A30.	People enjoying the views to and from Chyverton Park Lodge and associated walls and Gateposts Grade II listed buildings (1136926)	Views to and from these listed buildings are of high value. However, the proximity to the local road connecting the A30 and Zelah, diminishes the sense of place and connection between the building and the landscape. This results in a medium susceptibility to change and therefore the visual amenity of these receptors is considered to be of **moderate** sensitivity to change.
			Residential receptors at Chyverton Park Lodge	Views from the private dwelling at Chyverton Park Lodge are of high value to residents. Views to the southeast from within the property face directly onto the adjacent road. The visual amenity of these residents has medium susceptibility to change and is thus of **high** sensitivity.
			Transport receptors along the local road near Chyverton Park	The visual amenity of users of these local roads is considered to be of medium value. Due to the limited number of viewing opportunities and the focus of the drivers' attention being on the task of driving on narrow country roads with minimal passing bays, these receptors are assessed as having a low susceptibility to change. Therefore, their visual amenity is considered to be of **low** sensitivity.
17	View from Hill House looking northeast, 10m south of the scheme. SW 80797 50983	A partially filtered view looking towards the existing A30. The foreground of the view is framed by a low hedgerow, while the middle ground is filled with a field laid down to pasture. In the centre of the view an overhead power line and pole are prominent. A post-and-rail fence with a further hedgerow bisect the view from the west, into the distance in the east, where the land drops away. The existing A30 is screened by this hedgerow. In this current view, the mist obscures any further views of the surrounding landscape.	Residential receptors at Hill House	Views from the private dwelling at Hill House are of high value to residents. Views to the north from within the property are filtered by the hedgerow planting on the boundary of the A30 and some planting on the border of the property. The visual amenity of these residents has medium susceptibility to change and is thus of **high** sensitivity.
			Pedestrians and equestrians using bridleway 319/9/1	The views of pedestrians using the bridleway have high local value. In the context of the rural setting with the adjacent A30 and other infrastructure, these views have a medium susceptibility to change, and therefore a **moderate** sensitivity to change.
18	View from PRoW 319/8/1, near Trerice, looking northeast towards	A wide, open view looking northeast across a network of fields. The view is bisected by a low hedgerow, bordering the immediate arable field. The land slopes downwards towards the River Allen and the	Pedestrians using Footpath 319/3/1	The views of pedestrians using the footpath have high local value. In the context of the tranquil, rural setting, these views

VP	Description and location	Existing view	Receptors represented	Sensitivity
	A30, 750m southeast / 1.3km southwest of the scheme. SW 81881 51458	surrounding woodland. To the west, beyond the River, the land rises sharply up to a ridge. This land is covered in a mosaic of large fields laid down to pasture and bordered with orderly hedgerows and the occasional hedgerow tree. The buildings of Tolgroggan Farm and Hill House can be seen. In the background of the view to the east, a number of buildings in Zelah are visible. These are backclothed against woodland, much of it on the western side sited within Chyverton RPG. The existing A30 runs across the frame, to the fore of Zelah, however is not visible from this location.		have a medium susceptibility to change, and therefore a **high** sensitivity to change.
19	View from intersection of footpath near Church Lane, Zelah with existing A30, looking southwest along A30, 30m west of the scheme. SW 81300 51884	This is a narrow view looking northeast along the existing A30. The road is sited on an embankment, on a ridge in the landscape, and is flanked by roadside woodland. Views of the surrounding countryside are therefore entirely limited to a funnelled view to the southwest, where large hedgerow-lined fields rise up to a wooded ridgeline. Road infrastructure dominates the view.	Pedestrians using the footpath near Church Lane	The views of pedestrians using the definitive path have high local value. In the context of the existing infrastructure, these views have a low susceptibility to change, and therefore a **moderate** sensitivity to change.
			Transport receptors along the existing A30	The visual amenity of users of the existing A30 is considered to be of medium value. While panoramic views of the surrounding countryside are available from the A30, the driver's attention is focussed on the task of driving. These receptors are assessed as having a low susceptibility to change, and therefore their visual amenity is considered to be of **low** sensitivity.
20	View from the intersection of the High Road and Henver Lane, looking northeast, within the scheme. SW 81397 52181	A partially open view, looking east from the High Road, along Henver Lane. The view is framed to both the north and south by hedgerows with mature hedgerow trees. The middle of the view is occupied by a large traffic island with amenity grass to the fore and low scrub behind. Road infrastructure dominates the view.	Residential receptors at Polstain Farm	Views from the private dwelling at Polstain Farm are of high value to residents. Views to the south from within the property are filtered by the hedgerow and woodland planting on the boundary of the property. The visual amenity of these residents has medium susceptibility to change and is thus of **high** sensitivity.
			Cyclists using NCR 32 near Henver Lane	The visual amenity of users of NCR 32 is considered to be of high value. While the attention of cyclists is partially focussed on the surrounding traffic, the slower pace at which they move along the road network, affords opportunities to appreciate views. These receptors are assessed as having a medium susceptibility to change, and therefore their visual amenity is considered to be of **high** sensitivity.
			Transport receptors along High Road and Henver Lane	The visual amenity of users of these local roads is considered to be of medium value. Due to the limited number of viewing opportunities and the focus of the drivers' attention being on the task of driving on narrow country roads with minimal passing bays, these receptors are assessed as having a low susceptibility to change. Therefore, their visual amenity is considered to be of **low** sensitivity.
21	View from Tregorlands, looking southeast, 60m northwest of the scheme SW 81868 52667	A wide open view across a field, bordered by a low hedgerow. In the centre of the frame in the middle distance, scrubland and mixed coniferous and deciduous woodland are visible and act to filter further views. To the east three wind turbines are visible above the woodland. To the southeast, a series of ridges are visible, containing open fields with hedgerow boundaries. The ridgeline is marked with a series of woodland patches. In the far distance, the hills of the St Austell china clay area are visible.	Residential receptors at Tregorlands, Zelah Hill Cottage, and Mount Pleasant	Views from the private dwellings at Zelah Hill are of high value to residents. Views from the property are very open. The visual amenity of these residents has medium susceptibility to change and is thus of **high** sensitivity.
			Transport receptors on the existing A30 near Zelah Hill	The visual amenity of users of the existing A30 is considered to be of medium value. While panoramic views of the surrounding countryside are available from the A30, the driver's attention is focussed on the task of driving. These receptors are assessed as having a low susceptibility to change, and therefore their visual amenity is considered to be of **low** sensitivity.

VP	Description and location	Existing view	Receptors represented	Sensitivity
22	View from Honeycombe Farm, looking northeast, 50m south of the scheme. SW 82667 52713	A partially filtered view looking northeast towards the existing A30. The foreground of the view is occupied by an unmanaged hedgerow with a HGV sited behind. The land rises up from the hedgerow towards the northeast in a series of medium-sized fields, bordered by low hedgerows and intermittent larger stands of woodland. In the centre of the view in the distance, two wind turbines are clear rising above the ridgeline. The coniferous woodland at the disused quarry near Carland Cross is a prominent landmark on the horizon.	Cyclists using NCR 32 link on the unclassified local road	The visual amenity of users of NCR 32 is considered to be of high value. While the attention of cyclists is partially focussed on the surrounding traffic, the slower pace at which they move along the road network, affords opportunities to appreciate views. These receptors are assessed as having a medium susceptibility to change, and therefore their visual amenity is considered to be of **high** sensitivity.
			Residential receptors at Honeycombe Farm	Views from the private dwelling at Honeycombe Farm are of high value to residents. Views from the property are moderately open. The visual amenity of these residents has medium susceptibility to change and is thus of **high** sensitivity.
			Transport receptors on the unclassified local road near Honeycombe Farm	Due to the limited number of viewing opportunities and the focus of the drivers' attention being on the task of driving on narrow country roads with minimal passing bays, these receptors are assessed as having a low susceptibility to change. Therefore, their visual amenity is considered to be of **low** sensitivity.
23	View from Penny-Come-Quick, looking southeast, within the scheme. SW 82442 52969	A narrow enclosed view from the back entrance to Penny-come-quick, looking southeast along the unclassified local road. The view is framed by mature deciduous hedgerows either side of the road, which restrict and filter views east and west into the wider countryside. The dominant element in the centre of the frame is the unclassified local road.	Residential receptors at Penny-come-quick	Views from the private dwelling at Penny-Come-Quick are of high value to residents. Views from the property are partially filtered. The visual amenity of these residents has medium susceptibility to change and is thus of **high** sensitivity.
			Transport receptors along the unclassified local road near Penny-Come-Quick	The visual amenity of users of these local roads is considered to be of medium value. Due to the limited number of viewing opportunities and the focus of the drivers' attention being on the task of driving on narrow country roads with minimal passing bays, these receptors are assessed as having a low susceptibility to change. Therefore, their visual amenity is considered to be of **low** sensitivity.
24	View from Journey's End, looking southeast, 110m north-northwest of the scheme. SW 83509 53494	A panoramic, slightly filtered view looking southeast towards Carland Cross. In the centre of the foreground low scrub flanks either side of the existing A30, partially filtering views beyond. Overhead powerlines run from the dwelling at Journey's End and along the existing A30. Vehicles are only partially visible along the A30 as it is in a slight cutting. To the east, the land continues flat to the middle distance, where two further properties are sited. Beyond these it rises up towards a ridge, which screens views of Carland Cross. A block of coniferous woodland around the disused quarry is prominent on the skyline of this ridge. To the south, views of more distant ridges are available, containing blocks of woodland, open fields, and pylon lines.	Residential receptors at Journey's End, Racland House, and Four Winds	Views from the private dwelling at Journey's End are of high value to residents. Views from the property are very open. The visual amenity of these residents has high susceptibility to change and is thus of **high** sensitivity.
			Transport receptors along the existing A30 near Newlyn Downs	The visual amenity of users of the existing A30 is considered to be of medium value. While panoramic views of the surrounding countryside are available from the A30, the driver's attention is focussed on the task of driving. These receptors are assessed as having a low susceptibility to change, and therefore their visual amenity is considered to be of **low** sensitivity.
25	View from PRoW 324/10/1 within Newlyn Downs Open Access Land, looking southeast to southwest towards A30, 1km north of the scheme. SW 83398 54620	An open panoramic view across the heathland of Newlyn Downs. The view of open heathland with patches of scrub is framed to the east and south by ridges. To the base of the southern ridge, evidence of mine workings is just visible. The coniferous woodland at the open access land is prominent on the skyline, just to the east of the middle of the frame. Vehicles on the A30 on the southern ridge are visible, but distant, and therefore not very noticeable. The broad expanse of the landscape dominants the view, with the exception of the wind turbine to the east.	Representative of views of recreational users of Newlyn Downs (CRoW)	The long distance views from Newlyn Downs have a high local value in a recreational context. In the context of the existing infrastructure, these views have a low susceptibility to change, and therefore a **moderate** sensitivity to change.
			Pedestrians using footpath 324/10/1	The long distance views from Newlyn Downs have a high local value in a recreational context. In the context of the existing infrastructure, these views have a low susceptibility to change, and therefore a **moderate** sensitivity to change.

VP	Description and location	Existing view	Receptors represented	Sensitivity
26	View from base of turbine at southwest corner of Carland Cross Wind Farm, looking east, 120m northwest of the scheme. SW 84203 54029	An open view to the south towards the existing A30. In the foreground open fields are surrounded by scrubby vegetation. To the east if the frame, an area of hardstanding beneath the wind turbine is visible. The ground slopes sharply upwards towards a ridge, where a group of conifers at the centre of the open access land are prominent on the skyline. Traffic moving across the top of the ridge comes in and out view behind the vegetation. HGV's are particularly visible, due to their height above lower vegetation. Visibility of activity on the road is most prominent on the northeast side of the scene. At the south-western end of the conifer group, the road dips behind the ridge and disappears from view. Distant panoramic views to the southwest end at the ridge leading from the A30/B3285 junction north to Cargoll Road. The panoramic views are enclosed to the south by the ridge on which the existing A30 lies.	Representative of views of walkers and other recreational users of Newlyn Downs (CroW)	The long distance views from Newlyn Downs have a high local value in a recreational context. In the context of the existing infrastructure, these views have a low susceptibility to change, and therefore a **moderate** sensitivity to change.
27	View from Open Access heathland near the Carland Cross Barrow Cemetery, within the scheme boundary, looking northeast. SW 84142 53704	An open view, with heathland dominating the foreground. The A30, situated in a slight cutting, runs across the frame, from northeast to southwest, partially filtered by hedgerows. Beyond the A30, the land rises up by approximately 10m ending in a slight ridge delineated by a hedgerow. On this rising land, wind turbines are highly prominent. In the middle of the view in the middle distance, a telecommunications tower breaks the skyline with the hills of the St Austell china clay area visible beyond as a distant horizon.	People enjoying the views to and from nearby heritage assets – Barrow Cemetery at Carland Cross (1016888, 1017050, 1020758)	The views to and from heritage assets are of high value. In the context of the surrounding infrastructure, these views have a medium susceptibility to change, and therefore a **high** sensitivity to change.
			CRoW Land	Users of public access land have a high local value in a recreational context. In the context of the existing road and wind farm infrastructure, these views have a low susceptibility to change, and therefore a **moderate** sensitivity to change.
28	View from an unclassified local road, south of the intersection with Cargoll Road, looking, southeast, 3.7km northwest of the scheme. SW 81600 56440	An open view across a large field laid down to pasture. To the west, the field is bordered by a low hedgerow. The land rises up slightly to the east to a ridgeline which is just visible beyond the hedgerow. In the centre of the view, the hedgerow bordering the south of the field is skylined, with the blades of several wind turbines visible beyond. The coniferous woodland near the disused quarry is prominent on the horizon here. To the east of the frame, the ridgeline running from the quarry towards Carland Cross and Mitchell rises up against the skyline.	Transport receptors along the unclassified local road	The visual amenity of users of these local roads is considered to be of medium value. Due to the limited number of viewing opportunities and the focus of the drivers' attention being on the task of driving on narrow country roads with minimal passing bays, these receptors are assessed as having a low susceptibility to change. Therefore, their visual amenity is considered to be of **low** sensitivity.
29	View from St Agnes Beacon looking southeast, 5km northwest of the scheme. SW 71006 50215	A long distance panoramic view looking southeast towards Chiverton Cross. The view is from an elevated position, with the landscape below forming a small to medium scale mosaic. The towns of St Agnes and Goonbell spread into the frame from the west along the southwest side of the Trevellas Coombe River Valley. A network of hedgerows and woodland permeates the countryside to the eastern side of the frame, while the western side is more exposed with little tree cover. The ridgeline along which the existing A30 runs, is discernable by the wind turbine infrastructure located along its length. At the western end of the frame, the pale tower of St Peter's Church at Chiverton Cross is a prominent landmark.	Pedestrians using footpath 318/63/2 and pedestrians and equestrians using bridleways 318/63/1 & 318/63/3	The views of receptors using the PRoWs have high value. The context is relatively remote rural setting, however still has visual connection with built up areas. These views have a high susceptibility to change, and therefore a **high** sensitivity to change.
			People enjoying the views to and from nearby heritage assets – Bowl Barrow (1016443), CWDM WHS A7 St Agnes, and St Agnes Heritage Coast	Views to and from heritage assets are of high and very high value. This is a comparatively remote location in the region, however there are strong visual connections with built up areas. This results in a medium susceptibility to change and therefore the visual amenity of these receptors is considered to be of **high** sensitivity to change.
			People enjoying the Cornwall AONB	Views from the AONB are of high value. This is a comparatively remote location in the region, however there are strong visual connections with built up areas. This results in a medium susceptibility to change and therefore the visual amenity of these receptors is considered to be of **high** sensitivity to change.

7.7 Consultation

7.7.1 The scope of the landscape and visual assessment was set out in the Scoping Report[3] for which a Scoping Opinion was provided by the Planning Inspectorate.

7.7.2 The relevant officers at Cornwall Council and Natural England were engaged to agree the scope of the visual assessment, the study area and the approach for the landscape assessment. The details of these discussions are set out below.

Table 7-4 Consultation Record

Consultee	Date	Details	Response
Cornwall Council	11 July 2017	Phone calls and emails between Arup and Cornwall Council to initiate handover from WSP and arrange consultation meetings.	
Cornwall Council	9th August 2017	Methodology according to DMRB was considered to be appropriate.	
		It was agreed that assessing landscape character at the level of Landscape Character Areas (LCA's), rather than Landscape Character Units (LCU's), was appropriate.	
		The scope of viewpoints and receptors was considered to be thorough overall.	
		In the meeting and in subsequent email and telephone correspondence, Cornwall Council suggested additional viewpoints and photomontage locations.	The additional viewpoints and photomontage locations were visited, and two were subsequently included in the assessments.
		Cornwall also suggested that additional Summer photomontages should be provided from several locations.	Summer Baseline photography is included in the LVIA, but it is not considered proportionate to include summer as well as winter photomontages.
Natural England	07 and 13 November 2017	Natural England were asked to engage regarding the scope and method for the LVIA.	Natural England stated that engagement on this topic outside Nationally designated landscapes was beyond their remit.

[3] https://infrastructure.planninginspectorate.gov.uk/projects/south-west/a30-chiverton-to-carland-cross-scheme/

7.8 Assessment Assumptions and limitations

7.8.1 Field work has been carried out during daylight and darkness in summer and autumn, with trees in and out of leaf. The assessment has therefore been carried out with a robust understanding of the landscape through the seasons and at different times of the day. Viewpoint photography is still ongoing at the time of this PEIR and as such the photographs presented are a near complete set of summer views only. This will be supplemented by further photography and presented during consultation as it becomes available.

7.8.2 Photomontages have not been commenced yet. This is normal practice as several aspects of the scheme are still to be fixed. For example, the precise vertical or horizontal alignment of a side road, the feasibility of a section of proposed Cornish Hedgerow or the extent of a block of woodland screen planting. Photomontages also rely on a complete set of verified winter photography which is still in progress.

7.8.3 The Environmental Masterplans on Figure 7.6 showing the proposed landscape mitigation measures are a working draft and will be subject to changes through the consultation process and more detailed engineering and environmental design work.

7.8.4 The assessment of night time landscape and visual effects is ongoing. More detail is to be added to the baseline following further field work and subsequently the assessment will be updated. Lighting is also potentially subject to detailed design change. In brief, permanent road lighting is proposed at the three main junctions along the scheme, Chiverton Cross, Chybucca and Carland Cross. Chiverton and Carland already have lighting which would be replaced by improved lighting. This is unlikely to give rise to significant effects. New lighting at Chybucca would locally alter the night time character of the area and adversely affect a small number of views. Some of these effects may be significant without mitigation. Through further assessment and iterative mitigation design it is likely to be possible to reduce these effects.

7.8.5 The LVIA has been carried out to date using the outline tree survey and hedgerow survey from prior to the preferred route announcement. An in depth understanding of the landscape through field work and the use of Google Earth has enabled a robust assessment to be carried out on the effects on vegetation. A full Arboricultural survey and impact assessment is underway at the time of writing and will be completed. It will be used to inform assessments in due course and will be submitted with the DCO application.

7.8.6 The co-ordination between landscape and related disciplines such as noise, heritage and ecology is ongoing and iterative. This will likely lead to further minor design changes to the scheme and mitigation measures. Consequently, the assessments of effects in each topic area may change.

7.9 Design, Mitigation and enhancement Measures

7.9.1 The design and landscape mitigation measures relating to landscape and views, are shown on the Environmental Masterplans at Figure 7-6. These measures comprise the three different types described below.

Embedded Design Measures

7.9.2 Design measures are those built into the scheme through an iterative process of design and assessment. For example, the introduction of a Cornish hedge in place of a standard noise barrier. The Cornish hedge would provide noise mitigation, but also improve the aesthetic design of the scheme by referencing and better integrating it into the character of the receiving landscape. Another related example is where a Cornish hedge acting as noise barrier needs to be increased in height above 1.8m (considered to be a reasonable aesthetically pleasing maximum height of such a structure in this area), in order to achieve the necessary level of noise attenuation. Rather than propose a taller wall, the solution is to place it on a slight embankment or bund to give the additional height. The bund would have a steep inside slope and have the appearance of a slight road cutting, but the back of the bund would be a gently graded and tie back into the adjacent landscape.

Landscape Mitigation

7.9.3 A soft landscape scheme has been designed either side of the entire length of the route. This includes soft landscape features, which are considered essential to the scheme and would form its permanent soft estate. These measures have many and often multiple functions, which are described under Environmental Functions below.

7.9.4 The mitigating effect that the measures designed into the scheme have on the landscape and views will be described in detail in the assessment tables for construction and operational landscape and visual effects within the ES, which will accompany the DCO application to be made in Summer 2018.

7.9.5 The Environmental Masterplan drawings at Figure 7-6, have been prepared using the guidance set out in DMRB Volume 10, Section 1. DMRB uses a system of 'Functions' and 'Elements' to describe environmental features. The use of this system enables environmental data to be recorded and developed in a consistent manner, linked through all stages of the scheme, from initial design through to construction and management.

7.9.6 The landscape strategy has been prepared to address mitigation requirements for both ecology and landscape assets. The design rationale has focused on replacement of vegetation lost during construction, enhancing natural habitats and providing screening vegetation. Where planting is proposed, it would include native species reflecting those currently on site, and would be of local provenance, as described in the Forestry Commission’s Practice Note on Using Local Stock for Planting Native Trees and Shrubs. This design rationale also sits in line with the requirements of Cornwall Council’s Cornwall design Guide (2013)

where proposed landscaping should be based on locally sourced species native to Cornwall and appropriate to the specific locality.

7.9.7 Local native species would be introduced in areas where vegetation removal is required to accommodate construction. Swathes of native tree and shrub species would be punctuated with more mature standard trees giving instant height and impact, helping to settle the Scheme within the surrounding landscape. Over time, this vegetation would mature to offer effective integration and screening whilst also reinforcing the character of the local landscape. Hedgerows would also be incorporated to define new boundaries and tie into the existing field patterns. Cornish hedgerows are used where appropriate to the local character and to provide acoustic mitigation.

7.9.8 All areas of disturbed ground resulting from the construction of the scheme would be graded, cultivated and profiled to tie smoothly back into the surrounding fields.

Environmental Masterplans

7.9.9 Within the overall environment of the highway and its surroundings there are many elements that influence the design and maintenance. The elements are divided into broad classification types such as Landscape Elements (LE), Environmental Elements (EE) and Planning and Policy Elements (PE). These broad classifications are then sub-divided into more specific elements e.g. under the Landscape Elements, grassed areas can then be subdivided again according to their detailed design or management needs, in conjunction with the stated function.

7.9.10 Those elements which help to mitigate the adverse impacts of the scheme would require regular maintenance and inspection to achieve their long term objectives.

7.9.11 Landscape Elements: DMRB Volume 10 Environmental Design and Management, Section 0 Environmental Objectives, Part 3 Ha 88/01 Landscape Elements Summary describes the range of Landscape Elements (LEs) that form the major components of the Highway's soft estate. Landscape features found within the highway estate, which can encompass both hard landscape features (i.e. retaining walls, hard surfacing) and elements of the soft estate (i.e. grasslands and woodlands);

7.9.12 Environmental Elements: Non-landscape features of the highway estate that have environmental functions, i.e. noise attenuation measures, water quality controls, protected species, and legislated elements such as injurious weeds and pests; and

7.9.13 Planning Policy Features: Features pertaining to, or situated in close proximity to, the highway estate that have a specific designation or land use, i.e. Special Area of Conservation (SAC), Scheduled Ancient Monuments and National Park.

7.9.14 For this PEIR, the Environmental Masterplans have not been annotated in accordance with this system, but will be in due course for the ES.

Environmental Functions

7.9.15 Environmental Functions (EF) are defined as the intended purpose of proposed features within the highway estate in environmental terms.

7.9.16 A summary description of each of the Environmental Functions as given in DMRB Volume 10 and used within the Environmental Masterplan, Figure 7-6 is provided in the following paragraphs as follows:

- EFA Visual Screening;
- EFB Landscape Integration;
- EFC Enhancing the Built Environment;
- EFD Nature Conservation and Biodiversity;
- EFE Visual Amenity;
- EFF Heritage;
- EFH Water Quality;
- EFG Auditory Amenity;
- EFJ Agricultural/Highway Boundary; and
- EFK Access.

Long-term management

7.9.17 The Contractor would carry out environmental monitoring, aftercare and management for the two year Aftercare Period following completion of the works. This would be undertaken in accordance with the agreed Environmental, Landscape and Ecology, Management Plan which will be provided for consultation and will accompany the application.

7.9.18 During the Aftercare Period, the Contractor 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.

7.9.19 At the completion of this two year Aftercare Period, the management of the soft estate and environmental mitigation measures would be transferred to Highways England.

7.10 Assessment of Effects

Demolition and Construction Assessment

7.10.1 Construction and demolition activities associated with this development would take place over a period of approximately 3 years (2020-2023).

7.10.2 In order to avoid double counting of effects, the assessment of landscape and visual construction effects identifies and assesses only temporary adverse effects which arise as a result of activities and elements that are unique to the construction phase.

7.10.3 For example, the permanent removal of built form or vegetation is assessed as part of the operational phase, but the works, such as the disruption caused by construction plant used during demolition and site clearance are assessed as part

of the construction phase. A further example would be proposed landforms or building platforms, which are permanent features of the operational phase. Landscape and visual effects arising from their presence are assessed under operational effects, but the earthworks required to form them, including excavation, aggregate and earth movements, and stock piling during the construction works, are assessed as construction effects in this section.

7.10.4 As the scheme is gradually built throughout the construction phase, permanent effects would increasingly become part of the landscape and views. These effects are assessed as part of the operational phase. They include, for example, gradual introduction of transport infrastructure and the presence of the proposed built elements, such as the main structures up to completion.

7.10.5 Sources of construction effects on landscape and visual receptors include:

- temporary construction compounds with associated lighting and fencing;
- temporary haul roads;
- stockpiling and storage of materials;
- excavation and handling of materials;
- on- and off-site construction traffic; and
- on-site plant, such as:
  - chainsaws and excavators for site clearance;
  - demolition plant and excavators for site clearance;
  - articulated dump trucks, excavators up to 35T capacity, dozers and rollers for bulk earthworks;
  - cranes, telescopic boom lifts, piling rigs and telescopic forklifts for construction of structures; and
- night time security lighting year round; and
  - isolated task lighting would be provided intermittently where required during the winter months only.

7.10.6 Refer to Chapter 3 of this PEIR for a fuller description of the construction phase.

Landscape Construction Effects

7.10.7 The landscape is essentially rural, however a relatively high proportion of road and energy infrastructure is present along the ridgeline on which the scheme would lie. While construction activity is not an everyday occurrence in this landscape, other similar activities, such as agricultural activity, are a normal and necessary part of the rural environment.

7.10.8 The susceptibility and sensitivity of the landscape receptors to changes and disruption brought about by temporary construction works is considered to be similar to their sensitivity to the changes from operational developments of the type proposed. Sensitivity of landscape receptors is summarised in Table 7.10 above.

7.10.9 Construction activities would be limited to the scheme and its immediate surroundings. Construction Compounds and laydown areas would be located in a number of fields along the length of the scheme. At isolated stages during

construction, such as erection of foundation slabs for structures, taller plant and structures such as piling rigs, cranes and scaffolding would be visible from a wider area than the operational scheme would be. The construction phase would be short-term and temporary and would vary in intensity over three years. The effects of the construction phase from the sources described above would be entirely reversible.

7.10.10 Set within the context of a working rural environment, the magnitude of change to the landscape and visual environment, over and above that assessed for the operational development, would generally be limited in comparison to permanent and irreversible operational effects.

7.10.11 The summary of landscape construction effects is contained in Table 7-5 below. The full assessment will be reported within the ES, which will accompany the DCO application to be made in summer 2018.

Table 7-5 Summary of Landscape Construction Effects

Landscape Receptor	Sensitivity	Nature of Unmitigated Construction Changes	Significance of short-term effects / Effect during construction phase
Direct effects on the host Landscape Character Area receptor			
CA 11 – Redruth, Camborne, and Gwennap	High	**Negligible**	**Slight** adverse and insignificant
CA 14 – Newlyn Downs	Moderate	**Minor**	**Slight/Moderate** adverse and insignificant
Indirect effects on the settings of nearby Landscape Character Area receptors			
CA 12 – St Agnes	Medium-to-high	**No change**	**Neutral** and insignificant
CA 13 – Fal Ria, Truro and Falmouth	Moderate	**Negligible**	**Neutral/Slight** adverse and insignificant
Indirect effects on the settings of nearby Landscape Designation receptors			
Cornwall and West Devon World Heritage Site (CWD WHS) – A6i Gwennap Mining District	High	**Negligible**	**Slight** adverse and insignificant
Cornwall and West Devon World Heritage Site (CWD WHS) – A7 St Agnes	Moderate-to-high	**No change**	**Neutral** and insignificant
Cornwall Area of Outstanding Natural Beauty (AONB) – St Agnes	Moderate-to-high	**No change**	**Neutral** and insignificant
Heritage Coast – 7 St Agnes	Moderate-to-high	**No change**	**Neutral** and insignificant
St Clement Area of Great Landscape Value (AGLV)	Moderate-to-high	**Negligible**	**Slight** adverse and insignificant
Chyverton Registered Park and Garden (RPG) (List Entry: 1000512)	Moderate-to-high	**Negligible**	**Slight** adverse and insignificant

Visual Construction Effects

7.10.12 Visual construction effects are summarised in Table 7-6.

7.10.13 Viewpoint locations are shown on Figure 7.1. Viewpoint photographs and photomontages are presented in Figure 7.5

Table 7-6 Summary of Visual Construction Effects

VP	Receptors represented	Receptor Sensitivity	Nature of Changes to View During Construction	Effect at Winter during construction Year
1	Users of bridleways 301/10/1 & 301/10/3 enjoying the visual setting of the heritage asset – CWDM WHS A6i Gwennap Mining District	**High**	**Negligible adverse**	**Slight** adverse and insignificant
	Transport receptors along the Blackwater Bypass of the A30	**Low**		**Netural/Slight** adverse and insignificant
2	Users of services at Chiverton Cross	**Low**	**Minor adverse**	**Netural/Slight** adverse and insignificant
3	Workers at Trevissome Business Park	**Low**	**Moderate adverse**	**Slight** adverse and insignificant
	Transport receptors using the A3075 near Trevissome Business Park	**Low**		**Slight** adverse and insignificant
4	People enjoying the views to and from nearby heritage asset – Four Burrows Barrow Cemetery (1016054).	**High**	**Minor adverse**	**Slight/Moderate** adverse and insignificant
5	Users of Byway 314/66/1	**Moderate**	**Negligible adverse**	**Neutral/Slight** adverse and insignificant
	People enjoying the views to and from nearby heritage asset – Bowl Barrow (1016105).	**High**		**Slight** adverse and insignificant
6	Residential receptors at Callestick Vean (south)	**High**	**Minor-to-Moderate adverse**	**Moderate** adverse and significant
	Pedestrians and equestrians using bridleway 314/64/1	**Moderate**		**Slight/Moderate** adverse and insignificant
	People enjoying the views to and from nearby heritage asset – Bowl Barrow (1016103).	**High**		**Moderate** adverse and significant
	Transport receptors using the B3284 near Callestick Vean (south)	**Low**		**Slight** adverse and insignificant
7	Residential receptors at Creegmeor Farm	**High**	**Minor adverse**	**Slight/Moderate** adverse and insignificant
	Pedestrians and equestrians using bridleway 314/65/1	**Moderate**		**Slight** adverse and insignificant
8	Transport receptors along the B3284	**Low**	**Minor adverse**	**Neutral/Slight** adverse and insignificant
	Residential receptors at Hillview Farm	**High**		**Slight/Moderate** adverse and insignificant
	Representative of views of outdoor workers at Hill View Farm.	**Moderate**		**Slight** adverse and insignificant
9	Pedestrians and equestrians using bridleway 309/3/1	**Moderate**	**Minor-to-Moderate adverse**	**Slight/Moderate** adverse and insignificant
10	Residential receptors at Nanteague Farm	**High**	**Minor adverse**	**Slight/Moderate** adverse and insignificant
11	Pedestrians using footpath 314/67/1	**Moderate**	**Minor-to-Moderate adverse**	**Slight/Moderate** adverse and insignificant
12	Residents at Maranzavose	**High**	**Moderate adverse**	**Moderate/Large** adverse and significant
	Transport receptors along the existing A30 near Maranzavose	**Low**		**Slight** adverse and insignificant
13	Residential receptors at the bungalow at NFH	**High**	**Minor adverse**	**Slight/Moderate** adverse and insignificant
	Users of holiday accommodation at NFH	**Moderate**		**Slight** adverse and insignificant
14	Residential receptors at NFH	**High**	**Negligible adverse**	**Slight** adverse and insignificant
	People enjoying views to and from NFH and attached wall Grade II listed buildings (1136610).	**Moderate**		**Neutral/Slight** adverse and insignificant
15	Pedestrians using footpath 319/16/1	**Moderate**	**Moderate adverse**	**Moderate** adverse and significant
	Representative of views of outdoor workers at NFH.	**Moderate**		**Moderate** adverse and significant
16	People enjoying the views to and from Chyverton Park Lodge and associated walls and Gateposts Grade II listed buildings (1136926).	**Moderate**	**Minor adverse**	**Slight** adverse and insignificant
	Residential receptors at Chyverton Park Lodge	**High**		**Slight/Moderate** adverse and insignificant
	Transport receptors along the local road near Chyverton Park	**Low**		**Neutral/Slight** adverse and insignificant
17	Residential receptors at Hill House	**High**	**Moderate adverse**	**Moderate/Large** adverse and significant

VP	Receptors represented	Receptor Sensitivity	Nature of Changes to View During Construction	Effect at Winter during construction Year
	Pedestrians and equestrians using bridleway 319/9/1	**Moderate**		**Moderate** adverse and significant
18	Pedestrians using Footpath 319/3/1	**Moderate**	**Negligible adverse**	**Neutral/Slight** adverse and insignificant
19	Pedestrians using the footpath near Church Lane	**Moderate**	**Minor adverse**	**Slight** adverse and insignificant
	Transport receptors along the existing A30	**Low**		**Neutral/Slight** adverse and insignificant
20	Residential receptors at Polstain Farm	**High**	**Minor-to-Moderate adverse**	**Moderate** adverse and significant
	Cyclists using NCR 32 near Henver Lane	**High**		**Moderate** adverse and significant
	Transport receptors along High Road and Henver Lane	**Low**		**Slight** adverse and insignificant
21	Residential receptors at Zelah Hill Cottage and Mount Pleasant	**High**	**Minor adverse**	**Slight/Moderate** adverse and insignificant
	Transport receptors on the existing A30 near Zelah Hill	**Low**		**Neutral/Slight** adverse and insignificant
22	Cyclists using NCR 32 link on the unclassified local road	**High**	**Negligible adverse**	**Slight** adverse and insignificant
	Residential receptors at Honeycombe Farm	**High**		**Slight** adverse and insignificant
	Transport receptors on the unclassified local road near Honeycombe Farm	**Low**		**Neutral/Slight** adverse and insignificant
23	Residential receptors at Penny-come-quick	**High**	**Minor adverse**	**Moderate** adverse and significant
	Transport receptors along the unclassified local road near Penny-Come-Quick	**Low**	**Moderate adverse**	**Slight/Moderate** adverse and insignificant
24	Residential receptors at Journey's End, Racland House, and Four Winds	**High**	**Minor adverse**	**Slight/Moderate** adverse and insignificant
	Transport receptors along the existing A30 near Newlyn Downs	**Low**		**Neutral/Slight** adverse and insignificant
25	Representative of views of recreational users of Newlyn Downs	**Moderate**	**Negligible adverse**	**Neutral/Slight** adverse and insignificant
	Pedestrians using footpath 324/10/1	**Moderate**		**Neutral/Slight** adverse and insignificant
26	Representative of views of walkers and other recreational users of Newlyn Downs.	**Moderate**	**Moderate adverse**	**Moderate** adverse and significant
27	People enjoying the views to and from nearby heritage assets – Barrow Cemetery at Carland Cross (1016888, 1017050, 1020758).	**High**	**Moderate adverse**	**Moderate/Large** adverse and significant
	Open Access Land	**Moderate**		**Moderate/Large** adverse and significant
28	Transport receptors along the unclassified local road.	**Low**	**Negligible adverse**	**Neutral/Slight** adverse and insignificant
29	Pedestrians using footpath 318/63/2 and pedestrians and equestrians using bridleways 318/63/1 & 318/63/3.	**High**	**No change**	**Neutral** and insignificant
	People enjoying the views to and from nearby heritage assets – Bowl Barrow (1016443), CWDM WHS A7 St Agnes, and St Agnes Heritage Coast.	**High**		**Neutral** and insignificant
	People enjoying the Cornwall AONB.	**High**		**Neutral** and insignificant

Operational assessment

7.10.14 The scheme consists of a new dual carriageway along the A30 between Chiverton and Carland Cross. The length of the scheme is approximately 8.7 miles.

7.10.15 The new dual carriageway has a typical overall width of 49m. There would be three new grade-separated junctions at Chiverton Cross, Chybucca, and Carland Cross, as well as a number of under- and over-bridges including at: Tresawsen, Maranzavose, Two Barrows, Tolgroggan, Trevalso, and Penny-Come-Quick. Along the length of the route, the scheme would at times be constructed into cutting or onto embankment.

7.10.16 Throughout the iterative design process, interventions have been made and integrated into the scheme with the primary purpose of avoiding or reducing adverse effects at source and to make the scheme fit better into its landscape setting. These measures are considered integral to the scheme rather than as mitigation measures, and are described in more detail under Environmental Measures at Section 2.6 in paragraphs 2.6.52 – 2.6.56 of Chapter 2 of this PEIR.

7.10.17 Paragraphs 7.5.14-7.5.17sets out the temporal scope of this assessment.

7.10.18 This Chapter considers the medium-term effects, from the end of construction in 2023 onward to the fifteenth operational year in 2038, whilst the proposed landscape mitigation is being established.

7.10.19 Landscape mitigation has been proposed. This comprises soft landscape planting and Cornish Hedges and is shown on the Environmental Masterplans on Figure 7-6 and described at Section 7.9 above.

7.10.20 The assessment then takes account of the established mitigation and goes on to assess the long-term effects that would persist beyond year fifteen. These are referred to in this assessment as residual effects.

Landscape Operational Effects

7.10.21 The local landscape is characteristically rural with a number of nucleated settlements are scattered farmsteads throughout. Built form and infrastructure, such as solar farms, wind turbines, and pylons are an existing part of the landscape. The landscape is generally open and exposed, at times with long vistas out to the eastern and western coasts of the peninsula. The undulating topography causes some of these vistas to be interrupted, containing sense of expansiveness. In historic and more settled parts of the landscape, particularly those areas which reflect the history of mining small-holdings, the landscape becomes smaller scale, and more enclosed due to the tall, dense hedgerows and narrow winding lanes.

7.10.22 The value, susceptibility and sensitivity of the landscape receptors to changes brought about by development of the type proposed is assessed under baseline. The corresponding assessment of effects on each character area receptor is presented in Table 7-7 below.

Table 7-7 Summary of Landscape Operational Effects

Landscape receptor	Sensitivity	Magnitude of unmitigated operational change	Operational effects at winter of Year 1	Mitigating Effect of Landscape Scheme	Significance of residual effects at Year 15
Direct effects on the host Landscape Character Area receptor					
CA 11 – Redruth, Camborne, and Gwennap	High	**Negligible adverse**	**Slight adverse and insignificant**	The adverse magnitude of change would be reduced incrementally.	**Slight adverse and insignificant**
CA 14 – Newlyn Downs	Moderate	**Moderate adverse**	**Moderate adverse and significant**	The adverse magnitude of change would be reduced down to **minor** adverse.	**Slight adverse and insignificant**
Indirect effects on the settings of nearby Landscape Character Area receptors					
CA 12 – St Agnes	Moderate-to-high	**No change**	**Neutral and insignificant**	The adverse magnitude of change would be reduced incrementally.	**Neutral and insignificant**
CA 13 – Fal Ria, Truro and Falmouth	Moderate	**Negligible adverse**	**Neutral/Slight and insignificant**	The adverse magnitude of change would be reduced incrementally.	**Neutral/Slight and insignificant**
Indirect effects on the settings of nearby Landscape Designation receptors					
Cornwall and West Devon World Heritage Site (CWD WHS) – A6i Gwennap Mining District	High	**Negligible adverse**	**Slight beneficial and insignificant**	The adverse magnitude of change would be reduced incrementally.	**Slight beneficial and insignificant**
Cornwall and West Devon World Heritage Site (CWD WHS) – A7 St Agnes	Moderate-to-high	**No change**	**Neutral and insignificant**	The adverse magnitude of change would be reduced incrementally.	**Neutral and insignificant**
Cornwall Area of Outstanding Natural Beauty (AONB) – St Agnes	Moderate-to-high	**No change**	**Neutral and insignificant**	The adverse magnitude of change would be reduced incrementally.	**Neutral and insignificant**
Heritage Coast – 7 St Agnes	Moderate-to-high	**No change**	**Neutral and insignificant**	The adverse magnitude of change would be reduced incrementally.	**Neutral and insignificant**
St Clement Area of Great Landscape Value (AGLV)	Moderate-to-high	**No change**	**Neutral and insignificant**	The adverse magnitude of change would be reduced incrementally.	**Neutral and insignificant**
Chyverton Registered Park and Garden (RPG) (List Entry: 1000512)	Moderate-to-high	**Minor adverse**	**Slight/Moderate adverse and insignificant**	The adverse magnitude of change would be reduced down to **negligible**.	**Slight adverse and insignificant**

Visual Operational Effects

7.10.23 For a summary of the Visual operational effects predicted on receptors before mitigation, alongside residual effects predicted after mitigation has been established, please refer to Table 7-8.

7.10.24 The detailed visual assessment tables, will be included within the ES, which will accompany the DCO application to be made in Summer 2018.

7.10.25 Viewpoint locations are shown on Figure 7.1. Viewpoint photographs and photomontages are presented in Figure 7.5

Table 7-8 Summary of Residual Visual Operational Effects

VP	Visual Receptor	Receptor Sensitivity	Mitigation and Level of Change at Summer Year 15	Residual effect
1	Users of bridleways 301/10/1 & 301/10/3 enjoying the visual setting of the heritage asset – CWDM WHS A6i Gwennap Mining District	**High**	**Minor beneficial**	**Slight/Moderate** beneficial and insignificant
	Transport receptors along the Blackwater Bypass of the A30	**Low**		**Neutral/Slight** beneficial and insignificant
2	Users of services at Chiverton Cross	**Low**	**Minor beneficial**	**Neutral/Slight** beneficial and insignificant
3	Workers at Trevissome Business Park	**Low**	**Moderate adverse**	**Slight** adverse and insignificant
	Transport receptors using the A3075 near Trevissome Business Park	**Low**		**Slight** adverse and insignificant
4	People enjoying the views to and from nearby heritage asset – Four Burrows Barrow Cemetery (1016054).	**High**	**Minor adverse**	**Slight/Moderate** adverse and insignificant
5	Users of Byway 314/66/1	**Moderate**	**Negligible adverse**	**Neutral/Slight** adverse and insignificant
	People enjoying the views to and from nearby heritage asset – Bowl Barrow (1016105).	**High**		**Slight** adverse and insignificant
6	Residential receptors at Callestick Vean (south)	**High**	**Minor adverse**	**Slight/Moderate** adverse and insignificant
	Pedestrians and equestrians using bridleway 314/64/1	**Moderate**		**Slight** adverse and insignificant
	People enjoying the views to and from nearby heritage asset – Bowl Barrow (1016103).	**High**		**Slight/Moderate** adverse and insignificant
	Transport receptors using the B3284 near Callestick Vean (south)	**Low**		**Neutral/Slight** adverse and insignificant
7	Residential receptors at Creegmeor Farm	**High**	**Negligible adverse**	**Slight** adverse and insignificant
	Pedestrians and equestrians using bridleway 314/65/1	**Moderate**		**Neutral/Slight** adverse and insignificant
8	Transport receptors along the B3284	**Low**	**Minor adverse**	**Neutral/Slight** adverse and insignificant
	Residential receptors at Hillview Farm	**High**		**Slight/Moderate** adverse and insignificant
	Representative of views of outdoor workers at Hill View Farm	**Moderate**		**Slight** adverse and insignificant
9	Pedestrians and equestrians using bridleway 309/3/1	**Moderate**	**Minor adverse**	**Slight** adverse and insignificant
10	Residential receptors at Nanteague Farm	**High**	**Minor adverse**	**Slight/Moderate** adverse and insignificant
11	Pedestrians using footpath 314/67/1	**Moderate**	**Minor adverse**	**Slight** adverse and significant
12	Residents at Maranzavose	**High**	**Moderate adverse**	**Moderate/Large** adverse and significant
	Transport receptors along the existing A30 near Maranzavose	**Low**		**Slight** adverse and insignificant
13	Residential receptors at the bungalow at NFH	**High**	**Minor adverse**	**Slight/Moderate** adverse and insignificant
	Users of holiday accommodation at NFH	**Moderate**		
14	Residential receptors at NFH	**High**	**No change**	**Neutral** and insignificant
	People enjoying views to and from NFH and attached wall Grade II listed buildings (1136610).	**Moderate**		**Neutral** and insignificant
15	Pedestrians using footpath 319/16/1	**Moderate**	**Moderate adverse**	**Moderate** adverse and significant
	Representative of views of outdoor workers at NFH.	**Moderate**		**Moderate** adverse and significant
16	People enjoying the views to and from Chyverton Park Lodge and associated walls and Gateposts Grade II listed buildings (1136926).	**Moderate**	**Negligible adverse**	**Neutral/Slight** adverse and insignificant
	Residential receptors at Chyverton Park Lodge	**High**		**Slight** adverse and insignificant
	Transport receptors along the local road near Chyverton Park	**Low**		**Neutral/Slight** adverse and insignificant
17	Residential receptors at Hill House	**High**	**Moderate adverse**	**Moderate/Large** adverse and significant
	Pedestrians and equestrians using bridleway 319/9/1	**Moderate**		**Moderate** adverse and significant

VP	Visual Receptor	Receptor Sensitivity	Mitigation and Level of Change at Summer Year 15	Residual effect
18	Pedestrians using Footpath 319/3/1	**Moderate**	**Negligible adverse**	**Neutral/Slight** adverse and insignificant
19	Pedestrians using the footpath near Church Lane	**Moderate**	**Minor adverse**	**Slight** adverse and insignificant
	Transport receptors along the existing A30	**Low**		**Neutral/Slight** adverse and insignificant
20	Residential receptors at Polstain Farm	**High**	**Minor adverse**	**Slight/Moderate** adverse and insignificant
	Cyclists using NCR 32 near Henver Lane	**High**		**Slight/Moderate** adverse and significant
	Transport receptors along High Road and Henver Lane	**Low**		**Neutral/Slight** adverse and insignificant
21	Residential receptors at Zelah Hill Cottage, Mount Pleasant, and Tregorlands	**High**	**Moderate adverse**	**Moderate/Large** adverse and significant
	Transport receptors on the existing A30 near Zelah Hill	**Low**		**Slight** adverse and insignificant
22	Cyclists using NCR 32 link on the unclassified local road	**High**	**Minor adverse**	**Slight/Moderate** adverse and insignificant
	Residential receptors at Honeycombe Farm	**High**		**Slight/Moderate** adverse and insignificant
	Transport receptors on the unclassified local road near Honeycombe Farm	**Low**		**Neutral/Slight** adverse and insignificant
23	Residential receptors at Penny-come-quick	**High**	**Moderate adverse**	**Moderate/Large** adverse and significant
	Transport receptors along the unclassified local road near Penny-Come-Quick	**Low**		**Slight** adverse and insignificant
24	Residential receptors at Journey's End, Racland House, and Four Winds	**High**	**Moderate adverse**	**Moderate/Large** adverse and significant
	Transport receptors along the existing A30 near Newlyn Downs	**Low**		**Slight** adverse and insignificant
25	Representative of views of recreational users of Newlyn Downs.	**Moderate**	**Minor adverse**	**Slight** adverse and insignificant
	Pedestrians using footpath 324/10/1	**Moderate**		**Slight** adverse and insignificant
26	Representative of views of walkers and other recreational users of Newlyn Downs.	**Moderate**	**Major adverse**	**Moderate/Large** adverse and significant
27	People enjoying the views to and from nearby heritage assets – Barrow Cemetery at Carland Cross (1016888, 1017050, 1020758).	**High**	**Moderate adverse**	**Moderate/Large** adverse and significant
	CRoW Land	**Moderate**	**Major adverse**	**Moderate/Large** adverse and significant
28	Transport receptors along the unclassified local road.	**Low**	**Negligible adverse**	**Neutral/Slight** adverse and insignificant
29	Pedestrians using footpath 318/63/2 and pedestrians and equestrians using bridleways 318/63/1 & 318/63/3.	**High**	**No change**	**Neutral** and insignificant
	People enjoying the views to and from nearby heritage assets – Bowl Barrow (1016443), CWDM WHS A7 St Agnes, and St Agnes Heritage Coast.	**High**		**Neutral** and insignificant
	People enjoying the Cornwall AONB	**High**		**Neutral** and insignificant

7.11 Monitoring

7.11.1 Significant pre-mitigation operational effects are predicted on several visual receptors and the landscape character of the Newlyn Downs character area.

7.11.2 Landscape mitigation has been designed to address these effects where possible and its effectiveness relies on the planting measures thriving and growing to the extent that they become established and effective as mitigation over a period of around the first fifteen years following construction.

7.11.3 An Outline Landscape and Ecology Management plan has been developed to set out a framework in which the successful establishment of these measures can be managed and ensured.

7.11.4 Beyond the first two year contractor aftercare period, management responsibilities would fall to the relevant highways authority. Highways England would be responsible for highways land associated with the A30 trunk road and Cornwall Council would look after the soft estate associated with the non-trunk road sections of the scheme. Management of the soft estate in either case up until year 15 (2038) would be necessary to ensure that the planting does establish. Ongoing management activities and inspections during the first five years in particular would provide the opportunity to identify any further work or measures required to deliver the required level of mitigation.

7.12 Summary

Summary of Significant Effects

Construction Effects

Landscape

7.12.1 The host landscape character areas (CA 11 – Redruth, Camborne, and Gwennap and CA 14 – Newlyn Downs) would receive direct but insignificant slight and slight/moderate adverse, but temporary and reversible effects on the character of the local landscape.

7.12.2 The scheme is not predicted to give rise to any significant indirect effects on the character of the wider landscape including the Cornwall and West Devon World Heritage Site, Cornwall Area of Outstanding Natural Beauty, Heritage Coast, St Clement Area of Great Landscape Value and Chyverton Park Registered Park and Garden. Effects predicted on these landscape receptors vary in level from slight adverse to no change.

Visual

7.12.3 The following receptors are predicted to receive significant short term and reversible adverse visual effects as a result of the temporary construction phase.

- Residential receptors at Callestick Vean (south), Maranzavose, Polstain Farm and Penny-come-quick;

- Pedestrians and equestrians using bridleway 314/64/1, bridleway 319/9/1, footpath 319/16/1 and in Newlyn Downs Open Access Land;
- Cyclists using NCR 32 near Henver Lane;
- People enjoying the views to and from nearby heritage asset – Bowl Barrow (1016103) and the Barrow Cemetery at Carland Cross (1016888, 1017050, 1020758); and
- Outdoor workers at NFH.

Residual Operational Effects

Landscape

7.12.4 The host landscape character areas (CA 11 – Redruth, Camborne, and Gwennap and CA 14 – Newlyn Downs) would receive direct and significant short- and medium-term effects as a result of the scheme without mitigation. However, once mitigation is established over 15 years, these would be reduced to insignificant slight adverse residual effects on the character of the local landscape.

7.12.5 The scheme is not predicted to give rise to any significant indirect effects on the character of the wider landscape including the Cornwall and West Devon World Heritage Site, Cornwall Area of Outstanding Natural Beauty, Heritage Coast, St Clement Area of Great Landscape Value and Chyverton Park Registered Park and Garden. Residual effects predicted on these landscape receptors vary in level from slight adverse, through neutral to slight beneficial.

Visual

7.12.6 The following receptors are predicted to receive significant long-term and irreversible adverse residual visual effects as a result of the operation of the scheme.

- Residential receptors at Maranzavose, Hill House, Penny-come-quick, Journey's End, Racland House, Four Winds, Zelah Hill Cottage, Mount Pleasant, and Tregorlands
- Pedestrians and equestrians using footpath 319/16/1, bridleway 319/9/1 and in Newlyn Downs Open Access Land
- People enjoying the views to and from nearby heritage assets – Barrow Cemetery at Carland Cross (1016888, 1017050, 1020758).
- Outdoor workers at NFH.

Summary Impact Table

Table 7-9 Summary Impact Table

Receptor	Range of Impact
Construction Effects	
Landscape	
CA 11 – Redruth, Camborne, and Gwennap	Direct, temporary and reversible insignificant slight adverse effects.
CA 14 – Newlyn Downs	Direct, temporary and reversible insignificant slight/moderate adverse effects.
Visual	
Residential receptors at Callestick Vean (south), Maranzavose, Polstain Farm, and Penny-Come-Quick	Significant short-term and reversible moderate and moderate/large adverse effects.
Recreational receptors using bridleway 314/64/1, bridleway 319/9/1, footpath 319/16/1, Newlyn Downs Open Access Land, and NCR 32 near Henver Lane.	Significant short-term and reversible slight/moderate and moderate adverse effects.
People enjoying the views to and from heritage assets: Bowl Barrow (1016103), and the Barrow Cemetery at Carland Cross (1016888, 1017050, 1020758).	Significant short-term and reversible moderate and moderate/large adverse effects.
Outdoor workers at NFH.	Significant short-term and reversible moderate adverse effects.
Residual Effects	
Landscape	
CA 11 – Redruth, Camborne, and Gwennap	Direct insignificant slight adverse residual effects.
CA 14 – Newlyn Downs	
Visual	
Residential receptors at Maranzavose, Hill House, Penny-come-quick, Journey's End, Racland House, Four Winds, Zelah Hill Cottage, Mount Pleasant, and Tregorlands.	Significant long-term and irreversible moderate/large adverse residual effects.
Recreational receptors using footpath 319/16/1, bridleway 319/9/1, and Newlyn Downs Open Access Land.	Significant long-term and irreversible moderate to moderate/large adverse residual effects.
People enjoying the views to and from heritage asset: Barrow Cemetery at Carland Cross (1016888, 1017050, 1020758).	Significant long-term and irreversible moderate/large adverse residual effects.
Outdoor workers at NFH.	Significant long-term and irreversible moderate adverse residual effects.

7.12.7 For further details, please refer to Table 7-5 Summary of Landscape Construction Effects, Table 7-6 Summary of Visual Construction Effects, and Table 7-8 Summary of Residual Visual Operational Effects.

Further Work

7.12.8 The following work is still to be completed and will included in this assessment at a later date:

- Viewpoint photography for winter views;
- Photomontages;
- Environmental Masterplans;
- Assessment of night time landscape and visual effects, including effects from lighting;
- Full arboriculture survey.

7.12.9 For further details, please refer to Section 7.8.

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Preliminary Environmental Information Report

Chapter 8 Nature Conservation

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8 Ecology and Nature Conservation

8.1 Introduction

8.1.1 This chapter of the PEIR assesses the likely significant effects of the scheme on the ecological resources within the study area and surrounding environments.

8.1.2 This chapter documents survey work undertaken in relation to designated sites, habitats and species to date. The chapter documents measures to mitigate and compensate any ecological effects. Enhancement measures which go beyond mitigating effects are also identified. Within this chapter the value of receptors is reported and the residual effects arising from the construction and the operation of the scheme are assessed in turn.

8.1.3 The ecological resource of the study area was surveyed in detail over two years (2016 and 2017), with preliminary surveys being conducted in 2015, to ensure a comprehensive baseline for the assessment.

8.1.4 The detailed ecological baseline reports will be reported within the Technical Appendices of the ES, which will accompany the DCO application to be made in Summer 2018. The preliminary figures associated with the Technical Appendices have however been included for many of the ecological resources for information.

8.2 Legislative and policy framework

8.2.1 A framework of international, European, national and local legislation and planning policy guidance exists to protect and conserve wildlife and habitats. The following relevant legislation exists to protect habitats and species of nature conservation importance:

- The Conservation of Habitats and Species Regulations 2017 (the 'Habitat Regulations 2017') which transposes Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora ('the Habitats Directive') into UK law;
- The Birds Directive (Council Directive 2009/147/EC on the conservation of wild birds);
- Wildlife and Countryside Act (WCA)1 1981 (as amended);
- Natural Environment and Rural Communities (NERC) Act 2006;
- The Countryside and Rights of Way Act 2000;
- The Hedgerow Regulations 1997;
- Eels (England and Wales) Regulations 2009; and
- Protection of Badgers Act 1992.

8.2.2 These pieces of legislation include a number of offences relating to protected species and requirements for licences to allow construction works to proceed. In addition, the Habitats Regulations set out the requirement for the consideration of the potential effects of a project on European designated sites.

1 Act of Parliament, (1981). The Wildlife and Countryside Act 1981 (as amended), London: HMSO

8.2.3 The legislation and policy relating to specific species are further detailed within the ecological baseline reports, which will be provided in the full ES, and as such are not repeated here.

National Policy

8.2.1 Particular attention has been made to the planning policy and strategy documents listed below that are applicable to assessing the impacts to the ecological resources:

- National Networks National Policy Statement (NN NPS): Road and Rail Infrastructure;
- UK-Post 2010 Biodiversity Framework (replaced the previous UK Biodiversity Action Plan);
- Biodiversity 2020: A strategy for England's wildlife and ecosystem services (Natural England 2011).

8.2.2 The Government recognises that for development of the national road networks to be sustainable these should be designed to minimise environmental impacts and in delivering this, applicants are expected to avoid and mitigate environmental impacts in line with the principles set out in the National Planning Policy Framework (NPPF) and the Government's planning guidance. Applicants should also provide evidence that they have considered reasonable opportunities to deliver environmental benefits as part of schemes. The Government's detailed policy on environmental mitigations for developments is set out in Chapter 5 of NN NPS.

8.2.3 Biodiversity is the variety of life in all its forms and encompasses all species of plants and animals and the complex ecosystems of which they are a part. Government policy for the natural environment is set out in the Natural Environment White Paper (NEWP). The NEWP sets out a vision of moving progressively from net biodiversity loss to net gain, by supporting healthy, well-functioning ecosystems and establishing more coherent ecological networks that are more resilient to current and future pressures.

Local Policy

8.2.4 Relevant section and policies relating to biodiversity within the Cornwall Development Plan (notably the Cornwall Local Plan Strategic Polices 2010-2030) along with the following specific resources:

- Cornwall's Design Guide (2013);
- Cornwall's Biodiversity Volume 1: Audits and Priorities 1996;
- Cornwall's Biodiversity Volume 2: Action Plans 1996;
- Cornwall's Biodiversity Volume 3: Action Plans 2004;
- Biodiversity and Geological Conservation Planning Good Practice Guidance
- for Cornwall;
- Cornwall and Isles of Scilly Landscape Character Study 2007; and
- British native trees and shrubs and their status in Cornwall.

Guidance

8.2.5 A range of guidance documents are available for biodiversity but the principal assessment sources include:

- The ecological assessment will be undertaken using the Guidance for Ecological Impact Assessment in the United Kingdom Second Edition (CIEEM 2016) and;
- Highways England standards, including IAN Ecology and Nature Conservation: Criteria for Impact Assessment (IAN 130/10) which supplements the earlier Design Manual for Roads and Bridges (DMRB) chapter in Volume 11, Section 3, Part 4 (dated 1993).

8.2.6 Guidance for specific species, groups and other ecological features is discussed in individual relevant sections or will be provided in the ecological baseline reports which will be provided in the full ES.

8.3 Study area

8.3.1 The ecology of the scheme and surrounding area was surveyed primarily over three years (2015-2017), in which time the preferred route (Option 7A) was determined and announced in July 2017 (see Chapter 3 Consideration of Alternative). As such, the study areas for some receptors changed between 2015 and 2017, in response to the route selection. Furthermore, the study area varied for different species and ecological survey methods to ensure compliance with specific guidance for species, groups and habitats.

8.3.2 Study areas thus varied depending on time of survey and type of survey. Figures of study areas are provided within Appendices 8.1 to 8.20. Study areas are summarised in Table 8-1 below and described within 8.5 Assessment Methodology below.

8.3.3 The maximum extent of the study area was determined by guidance, Zone of Influence (ZOI)2 and consultation with statutory bodies. For example, badger (Meles meles) were surveyed within at least 250 metres from the scheme as per DMRB guidelines (Highway Agency 2001) [1] and otter (Lutra lutra) breeding places were surveyed within at least 500 metres of the scheme as per DMRB guidelines (Highways Agency, 1999 [2]). Where there were any deviations from guidance these are described and justified within the assessment and ecological baseline reports, which will be provided in the full ES.

8.3.4 Table 8-1 provides a summary of the study area distances applied for each ecological feature surveyed for the scheme; specific guidance's used and justifications for distances are provided in 8.5 Assessment Methodology.

2 'The 'zone of influence' for a project is the area over which ecological features may be subject to significant effects as a result of the proposed project and associated activities. This is likely to extend beyond the project site, for example where there are ecological or hydrological links beyond the site boundaries... the zone of influence will vary for different ecological features depending on their sensitivity to an environmental change. It may be appropriate to identify different zones of influence for different features.' [40]

Table 8-1: Summary of the study area distances for each ecological feature surveyed.

Survey	Study Area
Statutory and Non-Statutory Sites	At least 2 km, or 30 km for SACs where bats are a qualifying species from scheme
Phase 1 Habitat Survey	2015 study area - 500m (i.e. 250 m either side of each option) 2017 refined to 200 m (i.e. 100 m either side of proposed scheme)
Heathland and Woodland NVC Grassland NVC Hedgerows	200 m (i.e. 100 m either side of proposed scheme)
River Habitat Appraisal	500 m - All watercourses within 100 m of each option boundary at presented in 2016, with each being surveyed at least 500 m from the upstream extent
Terrestrial Invertebrates Freshwater Macroinvertebrates Fish Reptiles Breeding Birds Wintering Birds	200 m (i.e. 100 m either side of proposed scheme)
Dormice	1 km (i.e. 500 m either side of proposed scheme) scoping exercise to identify suitable woodlands and 200 m (i.e. 100 m either side of proposed scheme) for detailed surveys
Badger	500 m (i.e. 250 m either side of proposed scheme)
Otter	Breeding Sites – 1 km (i.e. 500 m either side of proposed scheme) Resting Sites - 500 m (i.e. 250 m either side of proposed scheme)
Nightjar	1 km (i.e. 500 m either side of proposed scheme) scoping exercise to identify suitable habitat and surveys in relevant locations
Barn Owl	3 km (i.e. 1.5 km either side of proposed scheme)
Bat Activity	500 m (i.e. up to 250 m either side of proposed scheme)
Bat Landscape Scale	2 km (i.e. 1 km either side of proposed scheme)
Bat Roosts	200 m (i.e. 100 m either side of proposed scheme) – building external and internal daytime surveys and emergence and re-entry surveys 100 m (i.e. 50 m either side of proposed scheme) - ground based tree assessments 40 m (i.e. at least 20m either side of proposed scheme) - aerial tree climbing surveys and emergence and re-entry surveys 200 m (i.e. at least 100 m either side of proposed scheme) – hibernation roost scoping surveys

8.4 Consultation

8.4.1 Statutory and Non-Statutory Consultations have been undertaken with the following:

- Natural England;
- Cornwall Council;
- Environment Agency – Cornwall;
- Cornwall Wildlife Trust;

- Highways England;
- Scottish Power (wrt Carland Cross Windfarm)

8.4.2 A detailed consultation was undertaken with Natural England via the Discretionary Advice Service (DAS) to discuss ecology survey methodologies, in particular regarding the methodologies for the different bat survey types. Following an initial consultation in June 2016 a number of issues were discussed and resolved. Initially, it was proposed not to carry out landscape scale effect transects [3], in addition to the standard walked activity transect methodology [4], however following consultation with Natural England it was agreed to undertake them due to their repeatability as monitoring surveys post-development and their development specifically for linear schemes.

8.4.3 Natural England were also consulted on a deviation from the standard Collins (2016) guidance for the number of emergence/dawn surveys carried out on building and tree roosts. Due to the number of roosts identified by August 2017, an increase in the number of tree climbing inspections in place of emergence / re-entry surveys of trees was suggested, and for buildings suggested only continuing with the standard number of survey visits (two for moderate, three for high) where the building was within the footprint or 20m radius of the scheme, to which Natural England agreed.

8.4.4 Further details on general consultation undertaken to date on the scheme are provided in Chapter 4 Approach to Environmental Impact Assessment. Full details on the ongoing consultation relating to Ecology and Nature Conservation will be provided in the Environmental Statement (ES) accompanying the Development Consent Order (DCO).

8.5 Assessment methodology

Scoped out surveys

Water vole (Arvicola amphibius)

8.5.1 It is considered that the species is absent from Cornwall [5] apart from within localised release sites in the north-west of the County near Bude [6]. Furthermore, no records were identified for water vole within the desk study search areas both in 2015 and 2017 (the 2015 Habitat Verification Survey Report, and the 2017 Phase 1 Habitat Update Report are currently in draft form and are therefore not included in this PEIR. These reports, along with full details of the 2015 and 2017 desk studies will be provided within the ES). As such, water vole are not considered further within this chapter.

Amphibians

8.5.2 Great crested newts (Triturus cristatus) are considered absent from Cornwall [7] and no records were returned within the 2015 or 2017 desk study areas. Therefore, great crested newts are not considered further within this chapter.

8.5.3 Twenty records were returned from the desk study for common frog (Rana temporaria) and the Section 41 Species of Principal Importance (SPI)3 listed common toad (Bufo bufo) from within two kilometres of the scheme. Common

3 Section 41 Species of Principal Importance (SPI) as listed under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006

toad have been included within the assessment under 'Other Species of Principal Importance' and as such, mitigation has been provided for all common species of amphibians that may be present within the construction footprint.

White clawed crayfish

8.5.4 It is considered that white-clawed crayfish (Austropotamobius pallipes) is absent from Cornwall [8]. Indeed, no records were identified for white-clawed crayfish within two kilometres of the scheme within the last ten years. As such this species is not considered further within this chapter.

Desk study

8.5.5 A desk study was undertaken in 2015 to collate and review records of designated sites, and protected and notable species within five kilometres of the existing A30 between Chiverton and Carland Cross. This search area was extended to 10 kilometres for records of bats and 30 kilometres for SACs where bats are a qualifying species. The desk study was refined in September 2017 to within 100 metres and two kilometres of the scheme, for all Section 41 Habitats of Principal Importance (HPIs)4 (taken from the Priority Habitats Inventory) and SPIs (obtained from the Environmental Record Centre for Cornwall and the Isles of Scilly (ERCCIS) desk study), respectively.

8.5.6 The following organisations and resources were consulted to compile the desk study:

- Environmental Records Centre for Cornwall and the Isles of Scilly (ERCCIS);
- Multi-Agency Geographic Information for the Countryside (MAGIC);
- Review of 2005 survey [9] reporting on earlier iterations of the scheme.

8.5.7 Road Traffic Collisions (RTC) records were also requested in October 2017 from ERCCIS for the existing A30 between Chiverton and Carland Cross.

Extended Phase 1 Habitat survey

8.5.8 An Extended Phase 1 Habitat Verification Survey was carried out in accordance with the standard Joint Nature Conservation Committee (JNCC) survey methodology [10] and CIEEM guidelines [11] over the course of three days in suitable conditions in August 2015. The Verification Survey was to verify the Phase 1 Habitat surveys carried out in 2005 [9].

8.5.9 The 2015 Verification Survey area extended 250 metres on either side of the proposed routes at the time of the survey (Figure 1 in Appendix 8.2).

8.5.10 A Phase 1 Habitat Update Survey was then undertaken between 21 and 25 August 2017, to ensure the refined study area of the preferred route (Option 7A) was fully surveyed and any existing gaps mapped. The survey recorded the habitats present along the length of the scheme and surrounding 100 metres area either side (Figure 8.2, and Figure 3 in Appendix 8.3). The evidence of or potential for any protected or notable habitats and species was recorded.

8.5.11 During the 2017 Phase 1 Update, consideration was given to the presence of invasive species listed on Schedule 9 of the WCA 1981 (as amended) and the

4 Section 41 Habitats of Principal Importance (HPI) as listed under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006

presence of any notable weeds including those covered under the Weed Act 19595 (where population is significant enough to be considered injurious).

8.5.12 The surveyors cross-referenced the survey findings with those obtained in 2015 to verify previous results and also completed the survey where gaps were found due to lack of access during the 2015 survey.

8.5.13 Where possible, species lists were made and the scientific names for plant species followed those in the New Flora of the British Isles [12]. Species lists were made for each broad habitat type across the scheme rather than for each block of habitat in discrete locations.

8.5.14 During the field survey, habitats were assessed for their potential to support protected species. Any incidental records or evidence found during this survey were also noted.

8.5.15 The conclusions of 2015 Phase 1 survey was that further detailed surveys for a number of habitats and species were required. These are detailed below.

River Habitat Appraisal

8.5.16 A river habitat appraisal was conducted to identify aquatic habitats within the study area, which included all route options being considered in November/December 2016 during PCF Stage 2. Notably those used by designated species, which informed the need for further fish, aquatic macroinvertebrate and pond surveys in the area.

8.5.17 The appraisal was carried out in November and December 2016, focussing on watercourses and still waters, which were within or connected to the proposed route options.

8.5.18 Up to 7.5 kilometres of watercourses were identified that were within or obviously connected to the study area. Of each watercourse identified at least 500 metres was taken forward to be surveyed from the upstream extent.

8.5.19 The habitat appraisal approach was tailored towards Annex II species6, including Atlantic salmon (Salmo salar), sea lamprey (Petromyzon marinus), brook lamprey (Lampetra planeri), river lamprey (Lampetra fluviatilis), and bullhead (Cottus gobio). These species generally share comparable habitat preferences for spawning which was considered when designing the methodology.

8.5.20 Habitat parcels were determined from recording habitat type and their relative position, water depth, water velocity, streambed substratum and cover within each watercourse, which in turn determined suitability for juvenile salmonids.

8.5.21 In addition, still waters were assessed for submerged and emergent macrophyte cover and potential for supporting fish populations, to inform the need for National Pond Surveys.

8.5.22 At the time of writing, the River Habitat Appraisal Report was in draft form and is therefore not included in this PEIR. Full details of the survey and assessment

5 Act of Parliament. (1959). The Weed Act 1959. London: HMSO
6 Listed on Annex 2 of the European Union Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC)

methodology used for the river habitat assessment will be provided in the ES. Figures 2.1 and 2.2 in Appendix 8.4 show the waterbodies surveyed.

National Vegetation Classification (NVC) survey

8.5.23 NVC surveys were undertaken for heathland in late August 2016, for woodland in early May/late August 2017, and for grassland in late June/early July 2017, following best practice guidelines and standard methodology from three sources [13] [14] [15].

8.5.24 Sites within 100 metres of the proposed options at the time of survey were scoped in for surveys based on their potential to support protected or notable plant communities, and particularly where they supported HPIs7. The areas surveyed are shown in Figure 2 in Appendix 8.5 and Figure 2 in Appendix 8.6.

8.5.25 Grasslands within a total of eight sites, woodlands with a total of six sites, and heathland within a total of two sites, considered to support habitat of sufficient quality to be subject to detailed NVC survey were shortlisted and prioritised for further survey.

8.5.26 Areas of homogenous stands were identified within the selected sites. Five quadrats were then placed in the 'typical'/representative vegetation in each stand. Quadrats were evenly spread across the homogenous area, with quadrat size being appropriate to the vegetation being surveyed. Within each quadrat, all plant species were recorded with an estimate of percentage cover/abundance using the Domin scale8.

8.5.27 Plant species were named in accordance with guidance [12] except for the naming of NVC communities, which is based on some now superseded scientific names for plant species [14].

8.5.28 Data was analysed to provide a 'best' approximation to a published NVC community type, through use of the keys [14] and the computer software MAVIS [16].

8.5.29 At the time of writing, the Heathland and Woodland NVC Report and the Grassland NVC Report were in draft form and are therefore not included in this PEIR. Full details of methodology of the heathland and woodland NVC and the grassland NVC will be provided within the ES. Grassland NVC survey locations are shown on Figures 1 and 2 in Appendix 8.6. Heathland NVC survey locations are shown on Figures 1 and 2 in Appendix 8.5.

Hedgerow survey

8.5.30 All hedgerows within 100 metres of the scheme were assessed within the optimal period between June and August 2017 for their importance following the wildlife criteria provided in Part II of Schedule 1 of the Hedgerows Regulations 19979.

8.5.31 Survey methodology followed that laid out in the Hedgerow Survey Handbook, 2007 [17] and the Hedgerow Regulations 19979.

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7 Section 41 of the Natural Environment and Rural Communities Act, 2006.
8 The Domin scale botanical survey technique is a 10 point non-linear scale used in estimating canopy cover [13].
9 The Hedgerow Regulations 1997. Statutory Instrument 1997 No. 1160 Crown Copyright (comply with the requirements of the "Wildlife and Landscape Criteria").

8.5.32 The aims of the hedgerow assessment were to:

- Identify hedgerows that are classified as 'important' under the ecological criteria of the Hedgerow Regulations 1997;
- Identify hedgerows that are classed as Nature Conservation Priority Hedges under The Hedgerow Evaluation and Grading System [18];
- Identify Cornish Hedgerows [19] applying distinguish features; and
- Identify hedgerows that, although not deemed 'important' under the ecological criteria of the Hedgerow Regulations 1997 have ecological value in terms of species diversity or as potential wildlife corridors.

8.5.33 At the time of writing, the Hedgerow Report was in draft form and is therefore not included in this PEIR. Full details of the survey and assessment methodology used for the hedgerow assessment will be provided within the ES. Hedgerows surveyed are shown on Figure 1 in Appendix 8.7.

Terrestrial Invertebrate survey

8.5.34 An entomological specialist was commissioned to carry out entomological surveys within at least 100 metres of the scheme.

8.5.35 At the time of writing this PEIR, the data and report was not available, as such, results and mitigation measures for terrestrial invertebrates are not considered further within the PEIR but will be fully detailed within the ES and consulted on with Natural England and Cornwall Council in advance of DCO submission.

Freshwater Macroinvertebrate survey

8.5.36 APEM was commissioned to undertake aquatic macroinvertebrate surveys in a defined study area.

8.5.37 As for terrestrial invertebrates, at the time of writing this data and report was not available, as such, freshwater macroinvertebrates are not considered further within the PEIR but will be fully detailed within the final ES and consulted on with Natural England and Cornwall Council in advance of DCO submission.

Fish survey

8.5.38 A geographical scope study was conducted to determine the watercourses of interest and the location of aquatic ecology (including fish) survey locations. Any watercourse located within 100 metres of the scheme was included and surveyed (walkover visual survey) for fish habitat for a minimum of 500 metres distance from the scheme.

8.5.39 Watercourses that could be directly or indirectly 'impacted' by the scheme were scoped into the geographical scope of this study.

8.5.40 Of the 14 potential 'indirectly impacted' watercourses, three were deemed very unlikely to be suitable for all fish and macroinvertebrate communities.

8.5.41 The targeted survey approach was specifically designed to provide a baseline dataset for freshwater fish, including Atlantic salmon, sea lamprey, brook lamprey, river lamprey and bullhead. Electrofishing surveys were undertaken in July 2017 using battery powered, backpack pulsed-DC current Electrofishing equipment at a total of 12 sites on the selected watercourses (Figure 1 in Appendix 8.10).

8.5.42 Stop nets were placed at the upstream and downstream limits of each site, where possible, to enable a population density to be quantified at each site. Where this was not feasible timed runs were performed over set areas in order to provide semi quantitative results for fish. All fish captured were identified, counted, and measured (fork length) to the nearest millimetre. After processing, all fish were returned alive to the watercourse from which they were captured.

8.5.43 In addition to a general description of the site, further characteristics were recorded including water quality parameters: conductivity (microsiemens [µs]), pH, oxygen (mg/l), oxygen (% saturation), temperature (oC) and salinity (parts per thousand [ppt]).

8.5.44 Lamprey surveys were also undertaken at 12 sites in July 2017, including both optimal and sub-optimal juvenile lamprey habitat where possible. The protocol for surveying lampreys followed Common Standards Monitoring (CSM) guidelines [20], which entails electric fishing within a less than one metre squared quadrat four times over each 100 metres survey stretch, positioned over the selected optimal lamprey habitat. Individual lamprey were identified, counted, and measured at each site.

8.5.45 At the time of writing, the Fish Population Report was in draft form and is therefore not included in this PEIR. Full details of these fish surveys will be provided within the ES. Figure 1 in Appendix 8.10 shows the waterbodies surveyed.

Reptile survey

8.5.46 Potential reptile habitat areas (including high, medium, low suitability areas) within 100 metres of the scheme were initially identified via aerial photography as well as existing desk study data and information from the Phase 1 Habitat Verification Survey (full details of which will be provided in the ES).

8.5.47 Twelve areas were subsequently identified to have moderate or high quality reptile habitat as shown in Figure 1 in Appendix 8.11. Ten of these areas were scoped in and surveyed further. Two moderate quality habitat areas were not surveyed further due to lack of safe access, and isolation of the habitat by the existing road network. Areas of low quality were scoped out and not included in the mapping or surveyed further.

8.5.48 A reptile survey was then carried out in May and June 2017, with the aim of determining the presence or likely absence of reptiles within each defined area. Survey methodology followed Froglife (1999) [21], and DMRB [22] with the placement of the artificial refugia at approximately 20 metre intervals around margins of the survey areas, at an average density of ten per hectare. 365 refugia tiles were used across ten locations. There were 30 days between the first and last survey visits and a minimum of two days between each visit, of which there were seven.

8.5.49 During each visit, each refuge was lifted carefully to search for reptile species and details of the reptile species recorded.

8.5.50 At the time of writing, the Reptile Report was in draft form and is therefore not included in this PEIR. Full details on the methodologies employed will be provided within the ES. Reptile scoping and survey areas are shown on Figures 1 and 2 in Appendix 8.11 respectively.

Bird survey

Breeding bird survey

8.5.51 Breeding bird surveys were carried out over four visits between April and June 2016 broadly following the Breeding Bird Methodology [23]. This involved walking six pre-determined transects, designed to cover all of the habitats present within the survey area with focus upon those that were likely to be directly affected by the route options (at time of survey design). During each survey, the bird species and behaviour were recorded using the standard British Trust for Ornithology (BTO) codes.

8.5.52 At the time of writing, final analysis of data is ongoing. Full details of the breeding bird surveys will be provided within the ES, with results and mitigation measures to be discussed with Natural England and Cornwall Council in advance of DCO submission.

Wintering birds survey

8.5.53 Wintering bird surveys were carried out on six occasions from October 2016 to March 2017 following the same six transects as the breeding bird surveys (as described above). Species that were of conservation importance were mapped to illustrate the 'hotspots' within the survey area for wintering species.

8.5.54 At the time of writing, the Wintering Bird Report was in draft form, and is therefore not included in this PEIR. Full details of the wintering bird surveys will be provided within the ES. The six transect routes are displayed on Figure 1 of Appendix 8.13.

Schedule 1 barn owl survey

8.5.55 Barn owl (Tyto alba) surveys were carried out in July and August 2017, using adapted methodology10 and best practice guidance from three sources [24] [25] [26].

8.5.56 Features of interest and landscapes broadly suitable to barn owls were identified using desk study data for up to five kilometres from the existing A30 (which was subsequently refined to up to two kilometres from the scheme), and a barn owl desk-based Stage 1 scoping exercise for up to 1.5 kilometres from the scheme. This process was also used to scope out areas that would not require further survey.

8.5.57 A Stage 2 and 3 investigative field survey and nest site verification survey within 1.5 kilometres of the scheme was carried out, where access was possible. Habitat mapping was classified based upon the apparent condition and likelihood of supporting voles and nest and roost identification followed standard methodology as above.

8.5.58 At the time of writing, the Barn Owl Report was in draft form and is therefore not included in this PEIR. Full details of the barn owl surveys will be provided within the ES as a confidential appendix.

10 Guidance advises that barn owl surveys are carried out up to three kilometres from the proposed works. However, in this case surveys were only carried out up to 1.5 kilometres from the scheme, with a focus on 500 metres from the scheme.

Nightjar survey

8.5.59 In accordance with best practice guidance [23], two nightjar (Caprimulgus europaeus) surveys were carried out in the first two weeks of July 2017, with the aim of detecting the presence of churring males.

8.5.60 All suitable habitats within 500 metres of the proposed alignments were considered, resulting in three survey areas. Surveys were carried out 20 minutes after sunset by walking transects designed to be within 100 metres of all potential breeding areas of these habitat areas, and mapping churring males using standard coding.

8.5.61 At the time of writing, the Nightjar Report was in draft form and is therefore not included in this PEIR. Full details on methodology will be provided within the ES. The survey areas and transect routes are displayed on Figure 1 of Appendix 8.15.

Otter survey

8.5.62 Surveys for otter were carried out in May and July 2017. The aim was to determine presence of otter signs, resting, and breeding sites, categorise valuable habitat, and identify potential locations where otters may cross the new road.

8.5.63 All streams and waterbodies within the study area were assumed to be actively used by otters based on the otters now use all types of watercourses and wetland in the South West [27].

8.5.64 Using methodology and best practice guidance from four sources [28] [29] [2] [30], searches for resting and breeding sites were confined to watercourses, lakes and ponds within at least 500 metres of scheme and resting sites within at least 250 metres of the scheme. The small size of streams within 500 metres of the scheme suggested that fish are not likely to be numerous.

8.5.65 Breeding sites were categorised for their potential to support breeding using guidance criteria [30]. These are criteria such as presence of otter signs, extent of available concealing cover, presence/impact of livestock, level of human disturbance, food availability, and canopy cover. These factors were taken into consideration when assigning a subjective score reflecting the probability of a pond being a breeding site. A score of one indicates a very low probability and five a very high probability. Ponds that were close together (less than 100 metres apart) were aggregated in assigning these scores.

8.5.66 Crossing points and culverts were also assessed through mapping, aerial photography and desk study data on RTCs, followed by a site visit to these locations.

8.5.67 At the time of writing, the Otter Report was in draft form and is therefore not included in this PEIR. Full details of the otter surveys will be described within the ES. Survey sites are displayed on Figures 1-5 in Appendix 8.16.

Badger survey

8.5.68 A full badger survey in line with best practice guidelines [31] [1] was carried out during April, May and August 2017. The survey area consisted of a 250 metre buffer around the scheme.

8.5.69 Field boundaries within the study area were surveyed for evidence of badger activity including sett entrances, latrines, snuffle holes, and mammal tracks. Setts were classified in accordance with standard methodology and best practice guidelines [31] [32].

8.5.70 At the time of writing the Badger Report was in draft form, and is therefore not included within this PEIR. Full details on the methodology and classification and categories of signs and setts will be provided within the ES as a confidential appendix.

Dormouse survey

8.5.71 During the survey scoping phase all areas of potential dormouse (Muscardinus avellanarius) habitat were identified within approximately 500m of the scheme. The connectivity of these habitats to the wider landscape, and large hedgerows within connectivity belts between woodlands were considered.

8.5.72 A nest tube survey following standard methodologies [33] [34] was then undertaken in suitable habitat in 2016 and 2017 to the determine presence or likely absence, and extent of dormice.

8.5.73 A total of 710 nest tubes were set up in eight distinct areas in 2016 and a total of 475 nest tubes were set up in nine distinct areas in 2017, as shown on Figures 2 and 3 in Appendix 8.18.

8.5.74 Tubes were set up in April both in 2016 and 2017 and surveys were carried out within the optimal survey period in 2016 and 2017 following standard methodology and best practice guidelines.

8.5.75 At the time of writing the Dormouse Report was in draft form, and is therefore not included in this PEIR. Full details on the methodology will be provided within the ES. Dormouse survey and scoping areas are shown on Figures 1 and 2 of Appendix 8.18 respectively.

Bat surveys

8.5.76 The survey methodology follows current best practice guidance [4], and relevant sections of the DMRB [35, 36]. The survey methodologies were broadly in line with the new best practice methodology for surveying linear infrastructure [3] , except where deviations were considered appropriate. Consultation was undertaken with Natural England to agree the survey methodology (see Section 8.5 Consultation above).

Ground Level Tree Assessments

8.5.77 All trees within 50 metres of the 2016 scheme options were subject to ground level tree assessments in April 2016 or April 2017. The surveys were undertaken in accordance with guidance [4]. Close focusing binoculars, endoscopes and a high powered torch were used to search for and categorise potential roosting features (PRFs).

8.5.78 PRFs were categorised as negligible, low, moderate or high suitability for roosting bats, or as confirmed roosts. Those categorised as having low, moderate or high potential to support roosting bats and confirmed roosts were mapped.

8.5.79 At the time of writing, the Bat Roost Report was in draft form, and is therefore not included in this PEIR. Full details regarding the methodology will be provided within the ES.

Aerial Tree Climbing Surveys

8.5.80 Following the ground level tree assessments, all trees categorised as having moderate suitability to support roosting bats or higher, and which were located within the footprint of the scheme or within 20 metres were subject to aerial tree climbing surveys. The surveys were carried out in accordance with best practice guidance [4] by licenced bat workers using a rope access system, torches and endoscopes. The surveys were undertaken over three occasions in April, August and September 2017.

8.5.81 If during the climbing inspection features were assessed as less or more suitable than they appeared from the ground level assessment, the tree category was downgraded or upgraded respectively. If the overall suitability of the tree was moderate, a total of two climbing inspections were undertaken, if the tree was high suitability, a total of three climbing inspections were undertaken respectively in order to determine likely absence of roosting bats. If evidence of roosting was found, a minimum three tree climbing surveys were carried out to characterise the roost.

8.5.82 Where it was not possible to thoroughly inspect a PRF using the climbing survey methodology due to the nature of the feature / health and safety reasons (T56, T94, T96, T124), further surveys were carried out as follows:

- Trees considered to have moderate suitability PRFs which could not be exhaustively searched were subject to two further separate survey visits (consisting of a repeat aerial tree climbing inspection plus a dusk emergence /dawn re-entry survey);
- Trees with high suitability PRFs, were subject to three further separate survey visits (consisting of two repeat aerial tree climbing inspections plus at least one dusk emergence /dawn re-entry survey, depending on the PRFs present and the confidence in the aerial tree climbing inspections).

8.5.83 At the time of writing, the Bat Roost Report was in draft form, and is therefore not included in this PEIR. Full details regarding the methodology will be provided within the ES.

Dusk Emergence and Dawn Re-Entry Surveys – Trees

8.5.84 As detailed above, dusk emergence /dawn re-entry surveys were undertaken on a total of four individual trees. Emergence surveys commenced 15 minutes prior to sunset and lasted a minimum of two hours. Re-entry surveys commenced one hour 45 minutes prior to sunrise and lasted up to two hours (a minimum of one hour 45 minutes).

8.5.85 A combination of full spectrum Echo Meter 3, Echo Meter Touch, and Batlogger M were used in combination with thermal imagers (where necessary as a visual aid). Surveyors were positioned around the tree to ensure that all PRFs were visible. All bats recorded to be emerging and re-entering the features were recorded, along with the flight line and timings. Additionally, notes were made on incidental bat activity recorded during the surveys.

8.5.86 At the time of writing, the Bat Roost Report was in draft form, and is therefore not included in this PEIR. Full details regarding the methodology will be provided within the ES.

Internal and External Built-Structure Assessments

8.5.87 All built-structures within 100 metres of the scheme were subject to an internal and external assessment, where access was possible. The surveys were undertaken by experienced Natural England licensed bat workers throughout 2017.

8.5.88 The surveys were carried out in accordance with standard best practice guidelines [4] and involved a detailed search of the interior and exterior of the built structure using high powered torches and close focusing binoculars, to look for bats or evidence of bats. The suitability of the built structures were categorised as negligible, low, moderate or high suitability for roosting bats, or as confirmed roosts.

8.5.89 At the time of writing, the Bat Roost Report was in draft form, and is therefore not included in this PEIR. Full details regarding the methodology will be provided within the ES.

Emergence and Re-Entry Surveys - Buildings

8.5.90 Following the internal and external built-structure assessments, dusk emergence and /or dawn re-entry surveys were undertaken of 48 structures within the survey area found to have low, moderate or high suitability for roosting bats or confirmed roosts. All surveys were undertaken in accordance with standard best practice guidelines [4] in suitable weather conditions in 2017.

8.5.91 Emergence surveys commenced 15 minutes prior to sunset and lasted a minimum of two hours. Re-entry surveys commenced one hour 45 minutes prior to sunrise and lasted up to two hours (minimum of one hour 45 minutes). A combination of full spectrum Echo Meter Touch, Batlogger M, and Echo Meter 3 were used in combination with thermal imagers (to complement the survey as a visual aid). Surveyors were positioned around the structure, to ensure that all PRFs were visible. All bats observed emerging and re-entering the structures were recorded, along with timings. Additionally, notes were made on incidental bat activity observed throughout the surveys.

8.5.92 At the time of writing, the Bat Roost Report was in draft form, and is therefore not included in this PEIR. Full details regarding the methodology will be provided within the ES.

Hibernation Scoping Surveys

8.5.93 Historical and aerial maps were examined to identify potential hibernation sites for bats such as underground cave or mine sites within 100m of the scheme. Any potential hibernation sites identified were subject to a walkover survey to assess their suitability for roosting bats on 26 July 2017.

8.5.94 At the time of writing, the Bat Roost Report was in draft form, and is therefore not included in this PEIR. Full details regarding the methodology will be provided within the ES.

Bat Activity Transect Surveys

8.5.95 Five bat activity transects were surveyed once a month in appropriate weather conditions between May and September 2016. All transect surveys were dusk surveys with pre-dawn surveys also carried out within the same 24-hour period in July and August. The dusk transects started at sunset and continued for up to 200 minutes after sunset and the pre-dawn surveys commenced approximately 200 minutes before sunrise and finished at sunrise.

8.5.96 Each of the transects was between 5.5 and six kilometres and incorporated up to ten, five-minute point count locations (Figure 2 in Appendix 8.20). Each transect was walked once per survey visit, with the direction walked varied throughout the year to reduce any sampling bias associated with change in bat activity patterns throughout the night. The transects were designed to sample a range of habitat types throughout the survey area, focusing on those likely to be the most favourable to bats as well as those areas most likely to be impacted by the scheme.

8.5.97 Surveyors were equipped with Echo-Meter 3 and Echo-Meter Touch full spectrum detectors to identify and record bat activity. The bat activity registered and recorded by the detectors was later analysed using AnalookW v0.4.1.2.

8.5.98 At the time of writing, the Bat Activity Report was in draft form and is therefore not included in this PEIR. Full details regarding methodology and analysis will be provided within the ES.

Automated Detector Survey

8.5.99 Automated static bat detectors were used to supplement the bat activity transect survey data and provide long-term quantitative monitoring data. A total of 15 static detectors, equating to three per transect, were deployed throughout the survey area for five consecutive nights each month between May and October 2016. The automated detector locations (Figure 3 in Appendix 8.20) were selected to sample the representative habitats throughout the survey area, focusing on linear features likely to be bisected by the scheme.

8.5.100 Song Meter 2 (SM2) automated detectors were used at each location and were programmed to commence recording 30 minutes before sunset and cease recording 30 minutes after sunrise. Bat activity recorded was later analysed using AnalookW v0.4.1.2. Bat activity was defined as the number of bat passes recorded per hour (pph).

8.5.101 At the time of writing, the Bat Activity Report was in draft form and is therefore not included in this PEIR. Full details regarding methodology and analysis will be provided within the ES. Static detector locations are shown on Figure 3 in Appendix 8.20.

Crossing Point Surveys

8.5.102 The crossing point surveys were carried out in accordance with best practice guidance and methodology [3]. A total of 14 crossing point survey locations were surveyed along the scheme; some of which were later scoped out of the survey due to change in scheme alignment and recording less than ten bats on previous surveys. The locations selected were considered important linear habitat features providing connectivity to areas within the wider landscape expected to be directly bisected by the scheme. Data gathered from the bat activity transect

surveys, automated static detector surveys, desk study information and aerial photography were used to inform the survey locations.

8.5.103 A total of six survey visits was undertaken at each crossing point location between June and September during the 2016 and 2017 survey periods; for the most this was two survey visits in 2016 and four in 2017. The surveys commenced at sunset and continued until two hours after sunset. Two surveyors monitored each crossing point (one surveyor located either side of the proposed route where possible on opposite sides of the feature).

8.5.104 The surveyors were equipped with full spectrum bat detectors (Echo-Meter 3, Batlogger or Echo-Meter Touch detectors) to aid in the observation of bats and record their calls. All bat passes were recorded, along with the behaviour, distance from feature (at its closest point) flight path and height of flight (where observed). For those bats that altered their flight height during crossing, the lowest flight height was recorded.

8.5.105 Thermal imaging cameras were used at ten of the crossing point locations, where ambient light levels were particularly low due to dense vegetation. The cameras were used as a visual aid to help determine if bats were crossing the crossing point.

8.5.106 At the time of writing, the Bat Activity Report was in draft form and is therefore not included in this PEIR. Full details regarding methodology and analysis will be provided within the ES. Crossing point locations are shown on Figure 3 in Appendix 8.20.

Landscape Scale Transects

8.5.107 The landscape scale transect surveys were undertaken in accordance with best practice guidance and methodology [3]. They were carried out in July 2017, in appropriate weather conditions (temperature less than 7°C, wind less than 20 kilometres/hour, and no rain). Ten different transect routes were chosen approximately perpendicular to the scheme and measuring one kilometres in length. Each transect was situated at least 500 metres apart and large areas of water or human habitation were avoided.

8.5.108 Each transect had a total of 11 spot checks (0, 100, 200, 300, 400, 500, 600, 700, 800, 900 and 1000 metres from the scheme), where surveyors recorded bat activity for exactly ten minutes. The surveyors then walked briskly (approximately six kilometres/hour) onto the next spot check.

8.5.109 Weather variables (temperature and wind speed) and habitat grade were recorded for each spot check. Surveys commenced 30 minutes after sunset and were completed within approximately two hours. Seven of the transects were walked away from the scheme (Transects 1, 4, 5, 6, 7, 8 and 10) and three were walked towards the scheme (Transects 2, 4 and 9). Transect 4 was walked both towards and away from the scheme to make a total of ten transects, as Transect 3 could not be surveyed due to health and safety reasons.

8.5.110 At the time of writing, the Bat Activity Report was in draft form and is therefore not included in this PEIR. Full details regarding methodology and analysis will be provided within the ES. Transects are shown on Figure 4 in Appendix 8.20.

Data Analysis

8.5.111 Wildlife Acoustic (WAC) recordings from the SM2s, SM4s and Echo Meter 3 used for the bat activity transect, automated static detector, and certain crossing point surveys were converted into ZCA and WAV format using Kaleidoscope 3.1.8 Software. During the conversion, a filter was applied to filter out noise files. The settings used during the filter process and how these are subsequently analysed and will be provided within the ES.

8.5.112 The converted files were analysed using AnalookW v0.4.1.2 Anabat data analysis software. Where the recordings were unclear the corresponding WAV file was analysed using Batsound v 4.2.111.

8.5.113 WAV recordings from the batloggers were auto-analysed using the BatClassify software, with a pass threshold of 0.8.

8.5.114 Where possible, bat calls were identified to species level. However, species of the genus Myotis were grouped together in most cases as their calls are similar in structure and have overlapping call parameters, making species identification problematic [37]. Further categories of calls for overlapping call charateristics was also made for Pipistrellus species and noctule (Nyctalus noctula), Leisler's bat (Nyctalus leisleri) and serotine (Eptesicus serotinus), further details of which will be provided within the ES.

Other Section 41 Species of Principal Importance (SPI)

8.5.115 Species specific surveys were not undertaken for the remaining SPIs. However, suitable habitat to support SPIs and the species themselves were looked for during the Phase 1 Habitat surveys and during all other ecological surveys.

8.5.116 This habitat level assessment for SPI is considered sufficient to assess any effects from the scheme. Further details will be provided within the ES.

Assessment methodology and significance criteria

Introduction

8.5.117 This assessment methodology is based on that set out in the Highways Agency's DMRB Interim Advice Note (IAN) 130/10 Ecology and Nature Conservation: Criteria for Impact Assessment [38]. This advice note is supplementary to the advice provided in DMRB Volume 11, Section 3 Part 4 'Ecology and Nature Conservation' [39], which continues to provide the framework for assessment of potential impacts of roads projects on nature conservation resources.

8.5.118 IAN 130/10 sets out a process for the valuation of resources, characterisation of predicted project impacts before and after mitigation and the subsequent assessment of significance of effects.

8.5.119 The assessment methodology for ecological resources is supplemented where appropriate with guidance from the CIEEM Guidelines for Ecological Impact Assessment [40].

8.5.120 The assessment process has also relied on professional judgement by individuals with sufficient relevant expertise, recognising project specific

11 Pettersson Eletronik AB, Uppsala, Sweden, 2002.

circumstances and decisions have been made through consultation with stakeholders including Natural England.

Valuation of Resources

8.5.121 The value of nature conservation resources including sites, habitats, species populations and assemblages of species is assessed in accordance with DMRB IAN 130/10, as summarised in Table 8-2.

Table 8-2: Resource Valuation (summarised from Table 1 of DMRB IAN 130/10 'Resource Valuation')

Resource Valuation	Typical Ecological Resources
International or European Value	Internationally designated sites e.g. Special Protection Areas (SPAs), SACs, or areas which meet the criteria but which are not themselves designated. Resident, or regularly occurring, populations of species which may be considered at an International or European level12 where: • the loss of these populations would adversely affect the conservation status or distribution of the species at this geographic scale; or • the population forms a critical part of a wider population at this scale; or • the species is at a critical phase of its life cycle at this scale.
National Value	Nationally designated sites e.g. SSSIs and National Nature Reserves (NNRs) or areas which meet the criteria but which are not themselves designated. Areas of Ancient Woodland e.g. woodland listed within the Ancient Woodland Inventory, and HPIs listed on Section 41 of the Natural Environment and Rural Communities Act (2006). Resident, or regularly occurring, populations of species which may be considered at an International, European, UK or National level where: • the loss of these populations would adversely affect the conservation status or distribution of the species at this scale; or • the population forms a critical part of a wider population at this scale; or • the species is at a critical phase of its life cycle at this scale.
Regional Value	Areas of key/HPIs identified in the Regional BAP (where available); areas of key/HPI identified as being of Regional value in the appropriate Natural Area Profile (or equivalent); areas that have been identified by regional plans or strategies as areas for restoration or re-creation of HPIs (for example, South West Nature Map); and areas of key/HPI listed within the Highways Agency's (now Highways England) BAP. Resident, or regularly occurring, populations of species which may be considered at an International, European, UK or National level and key/SPIs listed within the HABAP where: • the loss of these populations would adversely affect the conservation status or distribution of the species at this scale; or • the population forms a critical part of a wider population; or • the species is at a critical phase of its life cycle.
County	Sites designated in the county context (or considered worthy of such designation). Areas of key/HPIs identified in the Local BAP; and areas of habitat identified in the appropriate Natural Area Profile (or equivalent). Resident, or regularly occurring, populations of species which may be considered at an International, European, UK or National level where:

12 Such species include those listed within Council Directive 79/409/EEC on the conservation of wild birds or animal/plant species listed within Council Directive 92/43/EEC.

Resource Valuation	Typical Ecological Resources
	• the loss of these populations would adversely affect the conservation status or distribution of the species across the County; or • the population forms a critical part of a wider population; or • the species is at a critical phase of its life cycle.
Local Value	Designated sites including: Local Nature Reserves (LNRs) designated in the local context. Areas of habitat; or populations/communities of species considered to appreciably enrich the habitat resource within the local context (such as veteran trees), including features of value for migration, dispersal or genetic exchange.

8.5.122 Any receptors that are considered to be of lower than local value have been assigned a less than local value; only receptors valued local or above will be taken forward for detailed assessment.

8.5.123 Bat receptors (bat roosts, bat commuting routes and bat foraging areas) have been valued in accordance with guidance on valuing bats in ecological impact assessment by Wray et al, (2010) [41].

8.5.124 The guidance categorises UK bat species according to rarity within geographical range (rarest/rarer/common). Roost value is described in a similar geographic frame of reference used in IAN 130/10 (International/National/Regional/County/District, Local or Parish) where for example, SAC sites where bats are qualifying features are valued as International value, maternity sites of rarest species are valued as National, maternity sites of rarer species are valued as Regional value and maternity sites of common species are valued as County value. Commuting routes and foraging areas are valued using a scoring system based on rarity of species, number of bats using feature for commuting/foraging, number of roosts nearby and the type and complexity of the linear feature/foraging habitat characteristics.

8.5.125 In circumstances where there are other factors influencing the value of the receptor not covered by the guidance, then professional judgement has overruled the guidance.

Characterisation of Impacts

8.5.126 Chapter 2 The Project describes the proposed development including horizontal and vertical alignment, earthworks, structures, temporary site compounds and lighting. The types of potential impacts anticipated as a result of construction and operation of the scheme on nature conservation receptors in the absence of mitigation include:

Construction

- Permanent and temporary land-take;
- Permanent manipulation of habitats, e.g. landscaping;
- Temporary storage of construction materials within/adjacent to ecological resources with associated land contamination and compaction;
- Habitat fragmentation;
- Direct mortality during site clearance and construction;
- Direct and indirect disturbance from construction activities including visual, noise, vibration and lighting; and

- Pollution caused by use of hazardous materials and incidental release of dust, chemicals, fuels or waste materials.

Operation

- Direct mortality during operational use;
- Displacement, species loss and isolation;
- Increase in barrier effect due to presence of significant area of hard standing;
- Direct disturbance from operational use visual, noise, vibration and lighting; and
- Pollution caused by runoff and air deposition.

8.5.127 Where detailed assessment of specific receptors is considered appropriate, i.e. for those taken forward for detailed assessment, the potential project impacts on these receptors are described and characterised in detail in accordance with DMRB IAN 130/10. The project impacts are characterised firstly in the absence of mitigation and then with the proposed mitigation being taken into account as outlined in Table 2 of the guidance. The following terminology is used for the characterisation of impacts:

- Positive or negative impact;
- Probability of occurring (certain, probable or unlikely);
- Complexity (direct, indirect, cumulative);
- Extent (area measures and percentage of total (e.g. area of habitat/territory lost));
- Size (description of level of severity of influence (e.g. complete loss, number of animals affected);
- Reversibility (reversible or not reversible);
- Duration (permanent, or temporary in ecological terms); and
- Timing and frequency (important seasonal and/or life-cycle constraints and any relationship with frequency considered).

8.5.128 The CIEEM Guidelines for Ecological Impact Assessment [40] are used to guide the characterisation process. For example, in determining the complexity of the impact (whether it is direct or indirect, and the ZOI of that receptor will be considered). ZOI is explained in more detail under Section 8.4 (Study Area), however the maximum ZOI applied to the assessment, including the cumulative assessment, for ecological receptors are provided in Table 8-3.

Table 8-3: ZOI from the scheme for ecological features

Ecological Feature	Maximum ZOI from the scheme
Internationally designated sites e.g. SACs and SPAs	Two kilometres
Internationally designated sites for bats e.g. bat SACs	30 kilometres
Nationally designated sites, including SSSIs and NNRS	Two kilometres
Nationally designated sites for bats	Ten kilometres
Locally designated sites e.g. CWSs and CRVI sites	Two kilometres
Species including otter, badger, bat, and reptile	500 metres

8.5.129 The maximum ZOI for international sites designated for bats was established at 30 kilometres, and for national sites at ten kilometres due to the potential for bats associated with these sites to use habitats within this radius. For other internationally designated sites as well as nationally and locally designated sites,

two kilometres was selected as a maximum ZOI based on potential impacts. Regarding fauna, it is largely the behaviour of these species, including movement in the landscape, which determines the maximum ZOI.

Assessment of Significance of Effects

8.5.130 The significance of effects, both adverse and beneficial, is determined by assessing the value of resources/receptors against any residual impact in accordance with DMRB IAN 130/10 (Neutral, Slight, Moderate, Large, Very Large), see Table 8-4. The assessment will continue to rely on professional judgement and guidance as provided within CIEEM Guidelines.

Table 8-4: Summary of Table 3 'Significance of Effects' from DMRB 130/10.

Significance Category	Typical Descriptors of Effect (Nature Conservation)
Very Large	An impact on one or more receptor(s) of International, European, UK or National Value
Large	An impact on one or more receptor(s) of Regional Value
Moderate	An impact on one or more receptor(s) of County or Unitary Authority Area Value
Slight	An impact on one or more receptor(s) of Local Value
Neutral	no significant impacts on key nature conservation receptors

8.6 Baseline conditions

8.6.1 Desk study data for each habitat and protected species has been summarised here within each relevant sub-heading; which is followed by the field survey results. At the time of writing, the specific habitat and protected species reports were still in draft form and are therefore not included in this PEIR. Full details will be provided within the ES. Figures from the baseline reports are included to aid with visualisation of the baseline conditions.

8.6.2 All measurements of distances of designated sites, habitats and protect species have been made from the nearest edge of the scheme, or are stated where difference.

Designated Sites

Statutory Designations

8.6.3 Internationally important statutory designated sites include SPAs, SACs and Ramsar Sites. Nationally important statutory designations include SSSIs and NNRs, and locally important statutory designations are termed LNRs.

8.6.4 There is one internationally important site within the two kilometres search area. This is Newlyn Downs SAC which is located approximately 138 metres to the north of the scheme.

8.6.5 There are four nationally designated SSSIs within the two kilometres search area. These are the Newlyn Downs SSSI, Carrick Heaths SSSI, Ventongimps SSSI, and Carnkief Pond SSSI. The closest being Newlyn Downs SSSI which is consistent with the SAC boundary. There are no NNRs or LNRs within the two kilometres search area.

8.6.6 No SACs within 30 kilometres were identified with bats as a qualifying species. A total of one NNR and 22 SSSIs are present within the ten kilometres search area for bats, of which, only Trehane Barton SSSI, located approximately six kilometres south-east of the current A30, is designated in part for the bats it supports. The barns at Trehane Barton support the largest known breeding colony of greater horseshoe (Rhinolophus ferrumequinum) bats in Cornwall. It is one of only eleven such main breeding roosts of this rare and endangered species in Britain.

8.6.7 The full results from the statutory designated sites search are summarised in Table 8-5 below. At the time of writing, the 2017 Phase 1 Habitat Update Report was in draft form and is therefore not included in this PEIR. This report, along with full details of the statutory designated sites search will be provided within the ES Figure 8.1 shows the location of these sites in relation to the scheme.

Table 8-5: Statutory Designated sites within a two kilometre search area

Site	Reasons for designation	Distance from scheme
Newlyn SAC	The site is primarily designated for the presence of the Annex 113 habitat Temperate Atlantic wet heaths with Dorset heath (Erica ciliaris) and cross-leaved heath (Erica tetralix). This is the largest area of Dorset heath in Cornwall and helps to represent the full geographical range of the distribution of this habitat.	143 metres north at the eastern end.
Newlyn SSSI	The site sits within the same footprint as the SAC and is also designated for the presence of the Atlantic wet heath. The site supports dry and wet heath/mire communities and stands of willow scrub.	143 metres north at the eastern end.
Carrick Heaths SSSI	The SSSI is comprised of ten components, six of which lie within the two kilometres search area. The sites are characterised by a mosaic of wet and dry heathlands with populations of Dorset Heath. Other important plant species include nationally scarce yellow centaury (Cicendia filiformis) and Cornish moneywort (Sibthorpia europea). The sites support a range of fauna including the nationally scarce pearl-bordered butterfly (Boloria euphrosyne) and the Schedule 1 species, barn owl has been recorded at Penstraze Moor to the south west of the site.	345 metres north of side road. SSSI is located centrally within the scheme.
Ventongimps SSSI	The sites is comprised mainly of wet dwarf shrub heath with areas of bog and willow-alder carr. The heath is important for the presence of Dorset heath and an eyebright species (Euphrasia virgursii). The site is also important for supporting 13 species of Odonata including the nationally rare scarce blue-tailed damselfly (Ischnura pumilio) and 99 species of Lepidoptera including the narrow-bordered bee hawk-moth (Hemaris tityus).	1585 metres to the north.
Carnkief Pond SSSI	The site encompasses a range of habitats including swamp vegetation, deciduous woodland, streams, herb-rich meadows, wet heath and bog. Open water areas are also present supporting red data book species balm-leaved figwort (Scrophularia scorodonia) and 12 species of dragonfly.	1910 metres to the north.

[13] Annex I of the Habitats Directive (as amended by the 2003 Treaty of Accession) comprises a list of 189 habitat types. Member States must consider designation of SACs for each of the features which occurs in their European territory.

Non-Statutory Designations

8.6.8 There are 15 non-statutory County Wildlife Sites (CWS) within the two kilometres search areas and four Cornwall Roadside Verge Inventory (CRVI) sites along the route. CWS and CRVI sites are designated for their presence of habitats or species of local or regional importance by local authorities. Bats are included in the reason for designations for four of the CWS: Carland Moor; Allet Bog, Polvenna Wood and Benny Mill Valley.

8.6.9 The non-statutory sites are summarised in Table 8-6 below. Further details will be provided within the ES.

8.6.10 No other non-statutory sites were identified within the search area.

Table 8-6: Non-Statutory Designated sites within a two kilometre search area

Site	Reasons for designation	Distance from scheme
CRVI BS316	The site supports lowland heathland vegetation with Dorset heath.	Online at western end
CRVI BS214	The site supports wild parsnip (Pastinaca sativa) which is local in Cornwall	Online at western end
CRVI BS315	The site supports Dorset heath.	Online, central near Callestick
CRVI BS22	The site supports Babington's leek (Allium ampeloprasum babingtonii), a nationally scarce, South West endemic.	On side road centrally near to Shortlanesend
Carland Moor CWS	The majority of this moor is within the Carrick Heaths SSSI. It is comprised largely of willow/gorse scrub and marshy grassland with small areas of purple moor grass (Molinia caerulea). The site supports HPI wet woodland and SPIs lesser horseshoe bat (Rhinolophus hipposideros), brown long-eared bat (Plecotus auritus) and otter.	204 metres south.
Allet Bog CWS	The site lies adjacent to parts of the Carrick Heath SSSI at the head of a valley near to the River Allen. Wet willow woodland dominates with two areas of rough rush-dominated pasture are present. Some remnant heath is present supporting Dorset heath. HPIs are wet woodland, purple moor grass and rush pastures, and hedgerows. SPIs include a number of birds, common toad and common lizard (Zootoca vivipara), a number of bats including lesser horsehoe and noctule, and otter.	310 metres south east of side road
Trenerry Wood CWS	The site occupies a sheltered valley along a stream with a variety of woodlands. HPIs include wet woodland, hedgerows, upland mixed woodland and upland oakwood. SPIs include bullfinch (Pyrrhula pyrrhula) and eel (Anguilla anguilla).	331 metres south east
Polvenna Wood CWS	The site sits on either side of part of the Carrick Heath SSSI. The larger section is dominated by wet willow woodland supporting rich epiphytic growth and particularly rich ground flora. The smaller section includes wet woodland and open marshy areas with a man-made pond. HPI is wet woodland and SPIs include greater horseshoe bat and lesser horseshoe bat.	345 metres north
Goonwinnow CWS	The site is a low lying valley following a stream with well-developed and undisturbed wet willow woodland with abundant bryophytes and lichens. The HPI is wet woodland.	365 metres north

Site	Reasons for designation	Distance from scheme
Callestick Vean CWS	The site is a narrow sheltered valley along a stream comprising a range of habitats including broadleaved woodland, wet woodland and oak woodland. Fen is present within the site along with patches of scrub. HPIs are wet woodland, lowland fens and upland oakwoods, SPIs are otter.	430 metres north of slip road
Silverwell Moors CWS	The site lies adjacent to part of the Carrick Heath SSSI and is comprised of two rush dominated pastures which include some moderately rich fen communities. These pastures are enclosed by Cornish hedges which support large stands of grey willow. HPIs include lowland fens and hedgerows.	476 metres north west
Benny Mill Valley CWS	The site contains a range of undisturbed habitats along a four kilometres stretch of stream. The site is made up of grey willow dominated wet woodland and herb rich meadow. Drier broadleaved woodland occurs in the northern part of the site containing species such as Cornish elm (Ulmus stricta) and oak. The HPI is wet woodland and the site supports a number of notable species such as willow warbler (Phylloscopus trochilus), whiskered bat (Myotis mystacinus) and badger.	509 metres north east
Park Hoskyn CWS	The site lies along a steep sided valley with a fast flowing stream. It is comprised of broadleaved woodland, small areas of fen, scrub, a small quarry and disused mineshaft. HPI is lowland fen with SPIs including 10 moth species. Badger have also been recorded within the site.	781 metres north west
Lelight CWS & Brickmoor Plantation CWS	The site lies adjacent to part of the Carrick Heath SSSI. Lelight Plantation is dominated by a mosaic of commercial coniferous and broadleaved plantations. Brickmoor Plantation is dominated by silver birch woodland where there is a rich and diverse bryophyte and lichen flora and ferns. HPI is wet woodland, with SPIs of moth being present.	1015 metres north
Treworgan Quarry & Lower Tolcarne CWS	The site extends along a tributary of the River Allen with a poorly drained valley bottom, and forms a continuation between the Trenery Woods CWS and Bishops Wood CWS. The HPI wet woodland is dominated by grey willow, with abundant epiphytes and bryophytes throughout. The wet woodlands grade into marsh and wet meadow where soft rush dominates with greater tussock sedge (Carex paniculata) and a rich wetland flora. SPIs include linnet (Cardeulis cannabina) and otter.	1600 metres south
Carnhot CWS	The site extends along a tributary of the River Carnon, it is fast flowing with grassy margins and several shallow pools. Wetland habitats surround the site and supports a range of wildlife and is considered worthy of conservation for Odonata alone. HPIs are thought to be Lowland fens and SPIs include grass snake (Natrix natrix).	1255 metres south west
Carnkief Pond CWS	The site is situated near to the Carnkief Pond SSSI and comprises small areas of mixed broadleaved woodland, herb rich grassland and a series of poorly drained fields separated by wide hedgerows. SPIs include common toad, grass snake and hedgehog (Erinaceus europaeus).	1605 metres north
Carn Moor CWS	The site is bisected by a disused railway and supports a diversity of habitats and species. The moor is wet and dry heathland with scattered scrub and a man-made pond. HPIs are lowland heathland, purple moor grass and rush pasture, and wet woodland. SPIs include several butterflies such as pearl-bordered fritillary, reptiles such as adder (Vipera berus) and	1985 metres north west of side road

Site	Reasons for designation	Distance from scheme
	grass snake. A number of flora species are present including penny royal (Metha pulegium) and pale dog violet (Viola lactea).	
Bishop's Wood CWS	The main part of the site is comprised of commercial coniferous woodland where the management results in many intermediate habitats. Additionally, some ancient woodland remains such as neglected oak (Quercus robur) coppice. The site supports HPIs wet woodland and upland oak wood along with SPIs bastard balm (Melittis melissophyllum), slow worm (Anguis fragilis), song thrush (Turdus philomelos) and otter.	2025 metres south

Phase 1 Habitat Survey

Desk study

HPIs Action Plans

8.6.11 Six HPIs were identified within the search area; these were purple moor grass and rush pasture, deciduous woodland, good quality semi-improved grassland, lowland heathland, lowland fen, and traditional orchards. These are shown in Figure 2 in Appendix 8.3.

8.6.12 The majority of these areas of HPI were associated with the designated sites.

8.6.13 Of these habitats, deciduous woodland and lowland heathland are located in or within 100 metres of the scheme footprint. Lowland heath is identified at the eastern end of the site opposite Newlyn Downs SAC/SSSI. Deciduous woodland is located throughout the search area and is adjacent to the road in three locations around Marazanvose.

Field surveys

8.6.14 The scheme passes through largely arable and pastoral farmland areas (predominantly improved grassland), with hedgerows and belts of trees bisecting the fields. A small number of fields are more species-rich, with the scheme passing through an area of semi-improved neutral grassland at both the west and eastern ends of the scheme (Figure 8.2, and Figure 3 in Appendix 8.3). The sward in these areas was dominated by common bent-grass (Agrostis capillaris), Yorkshire fog (Holcus lanatus) and sweet vernal grass (Anthoxanthum odoratum). Full species lists, relative abundance and locations are presented in Appendix A in Appendix 8.2.

8.6.15 A total of 29 species-rich hedgerows with infrequent or no standard trees and a total 40 species-rich hedgerows with two or more trees per 100 metres were recorded across the study area. The number of species within the hedgerow and the trees included varied selections of the species listed for species-rich intact hedges, with ash (Fraxinus spp.) and pedunculate oak (Quercus robur) being the dominant standard trees

8.6.16 A total of 73 species-poor intact hedges (excluding un-vegetated Cornish hedges) and 33 species-poor hedgerows with trees were recorded across the study area, the locations of which are presented in Figure 3 in Appendix 8.3.

8.6.17 Furthermore, the 126 largely un-vegetated Cornish Hedges are included within the species-poor defunct hedgerows category, due to their low woody species

composition and degraded banks largely reducing their stock proofing abilities. A full species list is presented in Appendix A in Appendix 8.3.

8.6.18 Some areas of woodland are present within the survey area, along with heathland, marshy grassland, scrub and wet areas such as streams and ponds.

8.6.19 The scheme passes through six small semi-natural deciduous woodland blocks and one small semi-natural coniferous woodland block (predominately Monterey pine (Pinus cf. radiate)) which encompasses the quarry pond west of Carland Cross.

8.6.20 Of these, the woodland block at the eastern end of the scheme, the Chiverton Estate woodland and a small area of woodland near Nanteague Farm are mapped as HPIs, being deciduous woodland (Figure 2 in Appendix 8.3). The broad-leaved woodland within the survey area contained common and widespread deciduous trees, including sycamore (Acer pseudoplatanus), oak, goat willow (Salix caprea), ash and beech (Fagus sylvatica). A full species list is provided in Appendix A in Appendix 8.2.

8.6.21 The scheme also passes through a small isolated heathland area adjacent to the coniferous woodland as mentioned above and adjacent to the existing A30 west of Carland Cross. This habitat was dominated by bell heather (Erica cinerea), common heather (Calluna vulgaris), cross-leaved heather, purple moor grass and western gorse (Ulex galli). A likely hybrid of Dorset heath with cross-leaved heath was also found in this area during the NVC surveys as detailed below. A full species list is presented in Appendix A in Appendix 8.2. This heathland area is mapped as HPIs, being lowland heathland (Figure 2 in Appendix 8.2).

8.6.22 Standing water was located in two locations across the site as ponds, one within the heathland area west of Carland Cross, and one to the east of Mount Pleasant.

8.6.23 A number of slow running water systems were present across the site. These were largely narrow or ephemeral agricultural drainage ditches or ditches leading to the River Allen and surrounding catchment. Species composition observed was dependent on flow rate and depth of the channel. A full species list is presented for standing and running water in Appendix A in Appendix 8.2.

8.6.24 Japanese knotweed (Fallopia japonica) was present in two areas within the survey area to the south of Chiverton Cross and was evidently undergoing weedkiller treatment in situ. This plant infers no ecological value but is a Schedule 9 species on the WCA 1981 (as amended).

8.6.25 Other Schedule 9 species identified included Montbretia (Montbretia Crocosmia x crocosmiiflora), Japanese Rose (Rosa rugosa), Rhododendron (Rhododendron sp.), cotoneaster, three-cornered garlic (Allium triquetrum) and variegated archangel (Lamiastrum galeobdolon), locations of which are presented in Figure 2 in Appendix 8.2.

8.6.26 The full results of the most recent update in 2017 are shown on Figure 8.2, and the full baseline report will be provided within the ES.

8.6.27 Minor differences were identified between the 2015 verification report and the 2017 update survey. The majority of these differences were related to fields previously being identified as arable or grassland and changing as part of farming rotations. A number of areas were different due to the inability to fully

access these areas in 2015, which resulted in a re-classification of grasslands and in one area, at Carland Cross, was re-classified to semi-natural broadleaved woodland, when it was previously classed as scrub. Further details will be provided within the ES.

River Habitat Appraisal

Desk study

8.6.28 Aquatic desk study records are provided in the Fish section.

Field surveys

8.6.29 Eighteen watercourses in the study area were identified as potentially affected by the proposed routes, at the time of reporting.

8.6.30 Four of these were identified with the potential of being directly affected, although the aquatic ecological communities at these sites is thought to be limited, fish and macroinvertebrate surveys were recommended.

8.6.31 The remaining 14 watercourses may be indirectly affected, of these, four were deemed completely unsuitable for all fish and macroinvertebrate communities; fish and macroinvertebrate surveys were recommended on the remaining ten.

8.6.32 Six still waters (ponds) were identified with the potential of being directly affected, three of which were considered capable of supporting fish and four of which were considered capable of supporting a well-developed macroinvertebrate community.

8.6.33 As described in the methodology section above, the River Habitat Appraisal Report is not included in this PEIR. The full results will be detailed within the ES.

National Vegetation Survey (NVC)

Desk study

8.6.34 The desk study returned a large volume of records for plants within the two kilometres search area. This included seven SPIs and bluebell (Hyacinthoides non-scripta) which is listed under Schedule 8 of the WCA 1981 (as amended). These were yellow centaury, lead moss (Ditrichum plumbicola), heath lobelia (Lobelia urens), the toothed mushroom (Phellodon confluens), three lobed crowfoot (Ranunculus tripartitus), tongue-leaf copper moss (Scopelophila cataractae) and pale dog violet.

8.6.35 The Newlyn Downs SSSI/SAC is designated for the presence of the largest area of Southern Atlantic wet heath with Dorset heath and cross-leaved heath in Cornwall. Previous surveys in 2003 [9] indicated that these species were present in a fragment of heathland near to Carland Cross and may therefore represent a remnant section of this habitat. The Dorset heath was described as being in the south western tip of the heathland fragment.

Field surveys

Grasslands NVC

8.6.36 One of the drier grassland sites (Site 7) was classifiable as MG5c (crested dog's-tail (Cynosurus cristatus) - common knapweed (Centaurea nigra) grassland, and

heath grass (Danthonia decumbens) sub-community), listed within the Lowland Meadow HPI. This site which is located alongside the existing A30 near Penglaze (south of Newlyn Downs) is also a designated CRVI (BS214), for supporting wild parsnip which is local in Cornwall.

8.6.37 Five stands spread through the study area (9a, 10, 11, 28 and 29) supported drier mesotrophic grassland most strongly classifiable as MG6b (perennial ryegrass (Lolium perenne) - crested dog's tail grassland, and sweet vernal grass sub-community).

8.6.38 The MG6b classification is not included within the Lowland Meadow HPI classification or any other HPI habitat description; however, the grasslands recorded within stands 9a, 10, 28 and 29, were atypically herb-rich for MG6, with some affinity to MG5 swards. Despite not conforming to Lowland Meadow HPI criteria, these grasslands can be seen as being of some conservation value in supporting herb-rich swards with species characteristic of unintensively and traditionally managed grasslands such as common knapweed, meadow vetchling (Lathyrus pratensis), common bird's-foot trefoil (Lotus corniculatus) and yellow bartsia (Parentucellia viscosa).

8.6.39 Of the four remaining stands surveyed three (Stands 6a, 6b and 14) supported habitat categorised within NVC as being closest to MG10a (Yorkshire Fog, common rush (Juncus effusus) pasture, and typical sub-community), this habitat is generally widespread and species-poor wet pasture habitat not included within the Purple Moor-grass and rush pastures HPI. However, the more herb-rich stand 6a showed some affinity with the M23b (common rush and sharp flowered rush (Juncus acutiflorus), and marsh bedstraw (Galium palustre) rush-pasture, with a common rush sub-community), which is included within the Purple Moor-grass and rush pastures HPI classification. In the strictest sense the habitat does not fit into this classification, however, this stand supported some species more typical of the latter community including marsh bedstraw and great bird's-foot trefoil (Lotus pedunculatus).

8.6.40 The wetland habitat recorded at Site 9 (Stand 9b) showed no particularly strong association to any NVC community, the strongest being the M27c (meadowsweet (Filipendula ulmaria) and wild angelica (Angelica sylvestris) mire, common rush, and Yorkshire Fog sub-community). The habitat supported characteristic wet grassland/rush pasture/swamp species which complemented the adjacent wet woodland edge and drier, herb-rich grassland habitat of Site 9, but M27 and associated assemblages are not classified within the Purple Moor-grass and rush pastures HPI classification.

8.6.41 No uncommon or otherwise notable species associated with grassland or arable margin habitats were recorded during the survey.

8.6.42 As described in the methodology section above, the Grassland NVC Report is not included in this PEIR. The full results will be detailed in the ES. Raw data can be found in the tables within Appendix 8.6.

Heathland NVC

8.6.43 The heathland habitats within the survey area displayed an affinity to the following vegetation communities:

- Site 1 H4 Western gorse – bristle bent (Agrostis curtisii) heath; H4a Western gorse – bristle bent heath, bristle bent – bell heather sub-community, and H4c Western gorse – bristle bent heath, cross-leaved heath sub-community.
- Site 2 H4a Western gorse – bristle bent heath, bristle bent – bell heather sub-community.

8.6.44 Dorset Heath is known to be present within the Newlyn Downs SAC (Site 2 forms part of the SAC). Dorset Heath is not listed as an SPI and is not afforded legal protection per se. However, it is a nationally rare RDB species and is listed as an Annex II species on the Habitats Directive. A likely hybrid of this species with cross-leaved heath was also recorded within the western section of Site 1.

8.6.45 As described in the methodology section above, the Heathland and Woodland NVC Report is not included in this PEIR. The full results will be detailed within the ES. An overview of the results is shown on Figure 2 in Appendix 8.5. The raw data results can also be found in Appendix A in Appendix 8.5.

Woodland NVC

8.6.46 A series of fragmented semi-natural and plantation woodlands are located within 100 metres of the scheme. Affinities to communities and sub-communities of the NVC are provided:

- Site 1 - W21 common hawthorn (Crataegus monogyna) – common ivy (Hedera helix) scrub community; and W10c oak – eagle fern (Pteridium aquilinum) – blackberry (Rubus fruticosus) woodland, common ivy sub-community;
- Site 3 - W1 grey willow (Salix cinerea) - Marsh bedstraw community;
- Site 6A - W14 Beech - blackberry woodland;
- Site 7 - W10c English oak – eagle fern – blackberry woodland, common ivy sub-community;
- Site 8 - W14 Beech - blackberry woodland;
- Site 11 - W14 Beech - blackberry woodland.

8.6.47 No uncommon or otherwise notable species associated with woodland habitats were recorded during the survey. As described in the methodology section above, the Heathland and Woodland NVC Report is not included in this PEIR. The full results will be detailed within the ES. An overview of the results is shown on Figure 2 in Appendix 8.5. The raw data results can also be found in Appendix B in Appendix 8.5.

Hedgerow survey

Desk study

8.6.48 Plant and habitat desk study details are provided above in Phase 1 Habitat Surveys and National Vegetation Surveys.

Field surveys

8.6.49 The hedgerow survey results may differ from those presented in the Habitat Phase 1 survey results as different parameters are used within the survey methodology. Within the study area the hedgerow survey identified 305 native hedgerows, of which 274 can be classified as Cornish Hedges. 179 native hedgerows with woody growth were assessed against the Hedgerow

Regulations 1997 and the HEGS guidelines. Of these, 45 hedgerows qualified as 'important' under the Hedgerow Regulations 1997 (44 of which were Cornish Hedges). 102 hedgerows were classed as a nature conservation priority under the HEGS guidelines (84 of which were Cornish Hedges).

8.6.50 The survey also identified 126 Cornish Hedges with little or no woody species growth. These were therefore not assessed by the HEGS or Hedgerow Regulations 1997 methodology.

8.6.51 As described in the methodology section above, the Hedgerow Report is not included in this PEIR. The full results will be detailed within the ES. An overview of the results is shown on Figure 1 in Appendix 8.7. The raw hedgerow survey data can be found in Appendix A in Appendix 8.7.

Terrestrial Invertebrate survey

8.6.52 No report available at the time of writing, full details will be available within the ES.

Freshwater Macroinvertebrate survey

8.6.53 No report available at the time of writing, full details will be available within the ES.

Fish survey

Desk study

8.6.54 The desk study identified two records of fish within the two kilometres search area. These were an eel and a bullhead, located at the Ventongimps Nature Reserve and the River Allen respectively.

8.6.55 Previous baseline reports indicate that the water from the existing A30 runs into tributaries of the River Allen, Kenwyn, Tresillian, and Tinney along with a number of smaller streams, which are classed as having good or very good water quality for fish species.

Field surveys

8.6.56 Fish species were absent from seven of the 12 sites surveyed. Two of the remaining five sites had very low fish numbers. High numbers of bullhead were present at Site 12.1, and brown trout (Salmo trutta) were present in relatively good numbers at Site 12.3 and Site 16.2 (Figure 18 in Appendix 8.10).

8.6.57 Three species of fish were present at the five sites, with only two sites (12.1 and 12.3) having all three species; bullhead, brown trout and lamprey (Figure 18 in Appendix 8.10).

8.6.58 Overall, the population densities of these three species was poor (or unfavourable) with the exception of sites 12.1 and 12.3 which had fish populations which appeared to be self-sustainable and moderately diverse. It was notable that the aquatic conditions, notably the cleanliness of the substrate at these sites were favourable for fish with minimal upstream pressures arising from cattle encroachment or channel realignment.

8.6.59 The aquatic physico-chemical conditions at each of the fish survey sites was generally good with moderate to high dissolved oxygen concentrations (Figure

19 in Appendix 8.10), neutral pH and low conductivity (full details will be provided in the ES). These conditions are typical of the headwaters of small streams in the southwest of England and provide adequate conditions for most UK fish species.

8.6.60 All of the sites surveyed had evidence of fluctuating flows with some sites thought to cease flowing during dry periods. It is thought that this inconsistent and unpredictable flow is the main contributory factor limiting the fish populations.

8.6.61 As described in the methodology section above, the Fish Population Report is not included in this PEIR. The full results will be detailed within the ES.

Reptile survey

Desk study

8.6.62 The desk study identified 59 reptile records within five kilometres of the existing A30 within the last ten years. Of these, 19 were within two kilometres of the scheme and included all four common species. There were seven records of adder, which were located at Allet Bog, Newlyn Downs, Wheal Busy, Wheal Rose, and Chiverton Nature Reserve. All of these records were more than 700 metres from the scheme. There was one grass snake record at Mithian Downs, over one kilometre from the scheme. Five records of slow worm were returned from Ventongimps Nature Reserve, Newlyn Downs and Wheal Rose area. There were six records of common lizard within the search area, these were at Wheal Rose, the SSSI near Stanley Farm, Newlyn Downs and near Pollamounter. All of these records were more than 500 metres from the scheme.

Field surveys

8.6.63 Reptiles were present in four out of the ten surveyed areas, and likely absent in five areas. One area (Area 6, east of Zelah) contained moderate potential habitat with no reptiles recorded, however approximately half of the refugia were repeatedly destroyed by cattle, therefore it is considered that a small reptile population could be present.

8.6.64 All four common reptile species were recorded, with results indicating that there are high numbers of breeding common lizard and breeding slow worm present in Area 3 (the isolated heathland area surrounding the Quarry pond near Carland Cross), and breeding common lizard in Area 9 (south of the existing A30 near Tresawsen). Area 9 also supports a population of slow worm. Area 2 (near Carland Cross in habitat connected to Newlyn Downs SAC) supports populations of slow worms, common lizard, and adder. Area 5 (near the existing A30 junction with the B3285 north of Zelah) supports a population of grass snake at a range of ages and common lizard.

8.6.65 Areas are shown on Figure 3 in Appendix 8.11. As described in the methodology section above, the Reptile Report is not included in this PEIR. The full results will be detailed within the ES. An overview of the results is shown on Figure 3 in Appendix 8.11.

Bird survey

Breeding bird survey

8.6.66 Breeding birds will be fully described and assessed within the ES; however, data analysis was still ongoing during the time of writing this Draft chapter and as such is not fully reported here.

8.6.67 The field surveys identified over 50 species, of which two were Annex 1 species, one of which was also Schedule 1 but both being non-breeders (peregrine (Falco peregrinus) and golden plover (Pluvialis apricaria)) and eight SPIs (seven of which are at least likely breeders).

8.6.68 The preliminary analysis shows that the bird assemblage is typical of the types of habitats within the study area.

Wintering bird survey

Desk study

8.6.69 The desk study returned over 2,700 individual records of birds within the study area from the period 2005 to 2015 inclusive. This included 103 species, of which approximately 75 were considered to be resident or wintering species that could regularly occur in the study area.

Field surveys

8.6.70 The field survey identified a total of 66 species within the study area. Of these were three Annex 1 species14, four Schedule 1, and ten SPIs. 14 of the species were on the Red list, and 13 were on the Amber list of the Birds of Conservation Concern [42].

8.6.71 The six transects covered habitats including arable farmland, pasture fields, woodland blocks, hedgerows, residential and farm areas, and a small pocket of heathland towards the eastern end of the scheme.

8.6.72 A number of areas were identified as supporting higher levels of use by wintering species such as skylark (Alauda arvensis), meadow pipit (Anthus pratensis), and gulls, and waders such as golden plover and lapwing (Vanellus vanellus). These areas include:

- The arable fields surrounding Four Burrows tumuli, on both sides of the existing A30;
- The arable fields south of the Chybucca junction around Four Burrows wind farm;
- The arable fields to the north of Hillview Farm;
- The stubble fields west of Carland Cross adjacent to Newlyn Downs; and
- The pasture fields west of Carland Cross adjacent to the remnant heathland.

8.6.73 No particularly large aggregations of wintering birds were noted. The fields to the south of the Chybucca junction around the four burrows wind farm provided roosting and foraging grounds for gulls on a number of occasions with a peak of 375 gulls in November 2016. Species present included black-headed

14 Species listed as rare or vulnerable on Annex 1 of Directive 2009/147/EC (Birds Directive) on the conservation of wild birds.

(Chroicocephalus ridibundus), common (Larus canus), herring (Larus argentatus), lesser black-backed (Larus fuscus) and great black-backed gull (Larus marinus).

8.6.74 Small numbers of golden plover were also recorded foraging in arable fields and in flight over the study area, with a maximum flock of 37 birds immediately east of the Chybucca junction in March 2017. Similarly, small flocks of lapwing were encountered, with peak flock size of 43 birds. Other wading bird records w. ere scarce, with occasional records of dunlin (Calidris alpina), snipe (Gallinago gallinago) and woodcock (Scolopax rusticola).

8.6.75 Occasional records of raptors, including merlin (Falco columbarius) and peregrine were made, but these were rare and no regular foraging was observed.

8.6.76 A typical range of farmland passerines was recorded, with flocks of winter thrushes (fieldfare (Turdus pilaris) and redwing (Turdus iliacus)) linnet, meadow pipit and skylark made from the various transects. Largest flocks were recorded along transect one in the stubble fields to the north of the A30 adjacent to Newlyn Downs, in the fields around Hillview Farm, and around Four Burrows.

8.6.77 The results are shown on Figure 2 in Appendix 8.13. As described in the methodology section above, the Wintering Bird Report is not included in this PEIR. The full results will be detailed within the ES.

Schedule 1 barn owl survey

Desk study

8.6.78 The desk study records returned 95 records for barn owls within the last ten years within five kilometres of the scheme, and contained both roost and nest sites. Not all of the grid references were supplied with the records and therefore were not mapped (those that were supplied were mapped and are shown in Figure 1 in Confidential Appendix 8.14).

8.6.79 There are two RTC records of barn owl on the existing A30 between Chiverton and Carland Cross. These records are from 2000 and 2002. The 2000 record is located centrally within the scheme just north-east of Marazanvose, whilst the 2002 record is located towards the eastern end, halfway between Zelah and Carland Cross (Figure 1 in Appendix 8.1).

Field surveys

8.6.80 Stage 1 Scoping exercise identified a total of 149 buildings with the potential to support barn owl, which was increased to 153 during the Stage 2 and 3 fields surveys. No tree suitable for breeding were identified.

8.6.81 The habitats within the survey area were predominantly agricultural land, with large areas consisting of arable land and others being grazed pasture. Type 1 habitat was reserved to a few pockets within the survey area, with the remainder being a mosaic of Type 2 and Type 3 habitat. Some woodland areas were identified; however, these were not extensive within the survey area. The habitat mapping is presented in Figure 2 within Confidential Appendix 8.14.

8.6.82 Cornish hedges are considered likely to provide foraging grounds for barn owls in the survey area as they are largely grass banks within this region of the County with tussocks and some bramble rather than dense vegetation.

8.6.83 The field survey covered a total of 124 buildings. This equated to a survey coverage of 81% of buildings identified during scoping. Those not surveyed were due to a lack of access (Zone A, 500 metres from the scheme, had a coverage of 93%). 35 of these buildings had evidence to show that they supported barn owls as shown in Figure 3 in Confidential Appendix 8.14.

8.6.84 Of these there was one Observed Breeding Site (OBS), 16 Active Roost Sites (ARSs), 14 Temporary Rest Sites (TRSs) and four Potential Nest Sites (PNSs).

8.6.85 The OBS is located approximately 980 metres from the existing A30 and 850 metres from the main carriageway of the scheme.

8.6.86 The nearest ARSs were located approximately 60 metres and 185 metres from the main carriageway of the scheme with others located between 390 metres and 1.68 kilometres from the scheme. The nearest TRSs consisted of two located approximately 180 metres, and a third located approximately 215 metres from the main carriageway of the scheme, with others located between 470 metres and 1.5 kilometres from the scheme. The four PNSs were located approximately 85 metres, 275 metres, 1.4 kilometres, and 1.54 kilometres from the main carriageway of the scheme.

8.6.87 As described in the methodology section above, the Barn Owl Report is not included in this PEIR. The full results will be detailed within the ES. The raw field survey inspection results are detailed in Appendix A in Confidential Appendix 8.14. An overview of the results is shown on Figures 2 and 3 of Confidential Appendix 8.14.

Nightjar survey

Desk study

8.6.88 No records were returned of nightjar within two kilometres of the scheme within the last ten years. Of the 24 historic records identified, 14 records were from 2000-2004. These 14 records showed presence within three areas, around Porthtowan and Mount Hawke approximately three kilometres to the north west, near to Perranporth approximately five kilometres to the north, and around Newlyn East approximately three kilometres to the north.

8.6.89 There were two records returned near Carland Cross in 2002 and 2003, and the Cornwall Bird Watching and Preservation Society (CBWPS) identified a churring male within Newlyn Downs in 2009.

Field surveys

8.6.90 The scoping exercise identified three areas to be surveyed: Area 1 - Newlyn Downs; Area 2 - an area near to Trewaters Farm to the south of Carland Cross; and Area 3 - Allet Common.

8.6.91 No nightjar were identified within Area 2 and Area 3. Within Area 1, one pair of nightjar were recorded making contact calls, churring and making territorial flights on both survey visits around grid reference SW 8357 5408.

8.6.92 The results are shown on Figure 2 in Appendix 8.15. As described in the methodology section above, the Nightjar Report is not included in this PEIR. The full results will be detailed within the ES.

Otter survey

Desk study

8.6.93 The desk study identified a total of 13 records of otter within the two kilometres of the scheme. Of these there were seven RTC records, six of which were on the A30: Two were located near to Chybucca, one at Tresawsen, one at Marazanvose, two were at Zelah Hill, and one was located near to Carland Cross. The remaining records were spraints or field records.

8.6.94 The RTC records requested from ERCCIS in October 2017 returned 14 RTC records of otter on the existing A30 between Chiverton and Carland Cross, the majority of which are located centrally or towards the western end of the scheme (Figure 1 in Appendix 8.1). Four of these records were from the previous ten years.

Field surveys

8.6.95 Limited evidence of otter was recorded during the resting and breeding site surveys; a spraint and footprint recorded at the lake group connected to watercourses at Nanteague Farm and two spraints at a pond near Lower Ventongimps. Anecdotal evidence from a landowner suggested that a female and two cubs were seen downstream of ponds within this area approximately ten years ago.

8.6.96 All water courses surveyed were small due to their proximity to the watershed. Many were dry or at least not flowing, and were less than one metre wide and less than 500 millimetres deep. The exception was the River Allen, which runs parallel to, and just outside, the 250 metre buffer for resting sites survey. This was up to two metres wide and 150 millimetres deep.

8.6.97 There are extensive areas of good quality concealing groundcover in which otter could lie up in temporary above-ground couches, but no evidence of underground otter holts was found.

8.6.98 All ponds surveyed for breeding sites were small, even when the areas of neighbouring ponds were aggregated; none reached one hectare of water in area. No site reached a breeding site score of five and only two had scores of three (HR4 – a pond near Creegmeor Farm) or four (HR1 and HR3 - combined ponds near Lower Ventongimps, although these are outside of the 500 metres buffer).

8.6.99 All other sites are unlikely or very unlikely to be used for breeding.

8.6.100 A RTC otter was noted on the A30 near to Zelah at the Henver Lane junction on 23 August 2017. This incidental sighting provided evidence of use of the area by otter, and it was considered that the otter population move between river catchments across the A30.

8.6.101 As described in the methodology section above, the Otter Report is not included in this PEIR. The full results will be detailed within the ES Tables 1 and 2 in Appendix 8.16 details the raw survey results.

Badger survey

Desk study

8.6.102 The desk study returned 116 records of badger within two kilometres of the scheme, including nine records of badger sightings and four setts.

8.6.103 A previous survey in 2005 [9] identified 26 setts (three main and 23 outliers). The results of the desk study and of the previous survey can be found in Figure 1 in Confidential Appendix 8.17.

8.6.104 The RTC data requested from ERCCIS in October 2017 returned 100 RTC records of badger scattered throughout the existing A30 between Chiverton and Carland Cross (Figure 1 in Appendix 8.1).

Field surveys

8.6.105 The field survey identified 43 setts, and several areas of high badger activity within the study area at least 250 metres from the scheme. Of the 43 setts recorded, nine were classified as main, three as annexes, four as subsidiaries, and 26 as outliers.

8.6.106 The majority of activity was recorded in the eastern half of the survey area, with limited activity west of Four Burrows tumuli. One area of territorial significance was identified within the centre of the study, to the south of Zelah. Significant numbers of latrines were present along the hedgerows and field boundaries, and around the adjacent main, outlier and subsidiary setts. A recorded RTC immediately south of the Four Burrows tumuli group indicates that at least one clan of badgers crosses the current A30 in this location. The results are detailed in Figure 2 in Appendix 8.17.

8.6.107 Badger paths and footprints were found along field boundaries which will be impacted by the scheme, and at least one main sett is within the scheme.

8.6.108 As described in the methodology section above, the Badger Report is not included in this PEIR. The full results will be detailed within the ES. Figure 2, and the table in Confidential Appendix 8.17 give an overview of the survey results.

Dormouse survey

Desk study

8.6.109 No records of dormice were returned through the desk study within the search area.

8.6.110 The 2005 surveys [9] identified suitable habitat for dormice and carried out nest tube and nest box surveys. However, these proved inconclusive with no evidence shown.

Field surveys

8.6.111 The 2016 survey identified the presence of wood mouse (Apodemus sylvaticus), shrew (Sorex araneus), and harvest mouse (Micromys minutus) within the survey areas. No definitive results for dormice were found during the field survey. However, two tubes were found to contain the possible start of dormouse nests, which were then considered to be occupied by wood mice during the following survey. These nests were identified as potential dormice due to the presence of

stripped material such as grass and some green leaves, however were not conclusive due to the lack of woven structure.

8.6.112 The 2017 survey identified the presence of wood mouse and harvest mouse within the survey area. No evidence of dormice was found during the field survey.

8.6.113 As described in the methodology section above, the Dormouse Report is not included in this PEIR. The full results will be detailed within the ES The table in Appendix 8.18 details the raw survey results.

Bat surveys

Desk study

8.6.114 A total of 470 records of bats were recorded between 2005 and 2015 within 10 kilometres of the current A30, of which, 124 were roosts. A number of these roosts were located within 250 metres of the route including roosts for lesser horseshoe bat, common pipistrelle (Pipistrellus pipistrellus) bat, and Natterer's (Myotis nattereri) bat.

8.6.115 Bat species included barbastelle (Barbastella barbastellus), brown long-eared bat, common pipistrelle, Daubenton's bat (Myotis daubentonii), greater horseshoe bat, lesser horseshoe bat, Nathusius' pipistrelle (Pipistrellus nathusii), Natterer's bat, noctule bat, serotine bat, soprano pipistrelle (Pipistrellus pygmaeus) and whiskered bat.

8.6.116 The 2005 surveys [9] identified common pipistrelle and brown long-eared roost sites at Trevalso and NFH respectively.

8.6.117 There is one RTC record of a brown long-eared bat on the existing A30 between Chiverton and Carland Cross. This record is from 2006 and is located centrally within the scheme near Marazanvose (Figure 1 in Appendix 8.1).

Field Surveys

8.6.118 Due to the geographical location and habitat structure within the survey area every Plecotus bat recorded was assumed to be a brown long-eared bat. Unidentified Myotis species were assumed to be either Daubenton's bat, whiskered bat, Brandt's bat or Natterer's bat.

Tree Roosts

8.6.119 The surveys identified one tree roost within the footprint of the scheme. This was tree T99, which supported an individual Myotis species. The tree was located within the Merton Plantation, to the northwest of the Zelah Bypass.

8.6.120 The surveys identified three further tree roosts within 20 metres of the scheme footprint. These are T36 and T143, both individual Natterer's bat roosts and T25, an individual brown long-eared bat roost. These are all situated within North Plantation of Garvinack Brake, to the south of the existing A30.

8.6.121 The surveys identified two tree roosts between 20 metres and 50 metres of the scheme. These were T27 (individual Natterer's bat roost) and T94 (droppings recorded but could not be collected). T27 is within North Plantation of Garvinack Brake. T94 is within the Merton Plantation.

8.6.122 As described in the methodology section above, the Bat Roost Report is not included in this PEIR. The full results will be detailed within the ES.

Building Roosts

8.6.123 The surveys identified one building within the footprint of the scheme as a confirmed bat roost. This was Building 35 on the northeast side of the access track to NFH. This was found to be a multi-species roost since it supported a night roost of lesser horseshoe bat, Myotis species and brown long-eared bat, and a day/transitional/occasional roost for common pipistrelle and brown long-eared bat.

8.6.124 A total of four confirmed building roosts were found within 20 metres of the scheme, Building 9 to the west of Chiverton Cross roundabout, Building 36 NFH and Building 44A and 44G, both at Hill House, south of Zelah. These were all day/transitional roosts of common pipistrelle or brown long eared bats.

8.6.125 The surveys identified nine confirmed building roosts between 20 metres and 50 metres of the scheme, these are summarised as follows:

- Building 51 at Trevalso Cottage north of Zelah - maternity roost of a Myotis species (likely Natterer's bat), day/transitional roost of common pipistrelle.
- Building 70 adjacent to roundabout at Carland Cross - maternity roost of brown long-eared bats as well as a day/transitional roost of common pipistrelles.
- Building 16 at Little Tresawsen - maternity roost of common pipistrelle, day/transitional roost of brown long-eared bat.
- Building 16A/B at Little Tresawsen - maternity roost (possibly satellite) of up to 16 common pipistrelle bats.
- Building 37 - NFH - night roost of brown long-eared bat.
- Building 42 within the Merton Plantation to the northwest of the Zelah Bypass - day/transitional roost of brown long-eared bat and common pipistrelle.
- Building 53 within the Trevalso Farm complex - day/transitional roost of common pipistrelle roost.
- Building 56A Henver Cottage on the corner of Henver Lane and existing A30 - day/transitional roost of common pipistrelle and brown long-eared bat.
- Building 64 at Honeycombe Farm, south of existing A30 - day/transitional roost of common pipistrelle.

8.6.126 The surveys identified 11 further buildings within 50 metres to 100 metres of the footprint of the scheme which supported roosting bats. Of note were:

- Building 13 to the north of Chiverton Cross – maternity roost of common pipistrelle;
- Building 19 Nanteague Farm complex - maternity roost of common pipistrelle and brown long-eared bat;
- Building 38 NFH - maternity roost of common pipistrelle and brown long-eared bat, as well as a day/transitional/occasional roost of Myotis sp; and,
- Building 54 Trevalso Farm complex - maternity roost of common pipistrelle.

8.6.127 The remaining seven roosts were day/transitional/occasional roost of brown long-eared bat or common pipistrelle bats.

8.6.128 As described in the methodology section above, the Bat Roost Report is not included in this PEIR. The full results will be detailed within the ES. Figure 2 in Appendix 8.19 provides an overview of the built structure roosting survey results.

Hibernation Survey

8.6.129 Two disused mine shafts were identified within 100 m of the scheme Options. These were located within Newlyn Downs SAC and to the south of Callestick. Both of the disused mine shafts were fully capped with no obvious access point. As such, no further surveys were considered necessary as they are not considered suitable to support bats.

8.6.130 No further underground sites or features suitable to support larger numbers of hibernating bats have been identified within 100 m of the proposed scheme.

8.6.131 As described in the methodology section above, the Bat Roost Report is not included in this PEIR. The full results will be detailed within the ES. Figure 2 in Appendix 8.19 displays the locations of the two capped mine shafts.

Bat Activity Transect Survey

8.6.132 A total of nine species and one species group (Myotis species) were recorded during the walked activity transect surveys: common pipistrelle, soprano pipistrelle, serotine, noctule, Leisler's bat, brown long eared bat, lesser horseshoe bat, greater horseshoe bat, barbastelle's bat and Myotis species.

8.6.133 Of those bat calls recorded at point counts, the most commonly recorded species was common pipistrelle, which accounted for 87% of the calls. Myotis sp calls accounted for 6% and the remaining eight species accounted for between 0 and 2% of the remaining 7% of calls recorded during point counts.

8.6.134 The highest levels of bat activity, on average across the season, were recorded at the following four locations out of the total 50:

- Point Count 2 - along a Cornish hedgerow between Trevissome Farm and Silversprings Farm);
- Point Count 17 (at the edge of a woodland with an adjoining hedgerow within the Nanteague Farm complex);
- Point Count 22 (tree lined footpath within NFH); and
- Point Count 33 (tree-lined road within the Trevalso Farm complex).

8.6.135 The locations with the least activity were Point Counts 14, 28, 46, 49, and 50 which were located throughout the scheme within a mixture of habitats including large arable fields, grassland fields, and areas of heathland, where no bats were recorded.

8.6.136 The three Annex II species (greater and lesser horseshoe and barbastelle bat) recorded during the transect surveys were recorded in the following locations during the transect surveys:

- Barbastelle bat was recorded at only one of the 50 locations at Point Count 34 along a hedgerow and a stream connecting to areas of woodland surrounding the River Allen on the eastern side of the A30 near Zelah (with only two passes recorded in May 2016);
- Lesser horseshoe bat was recorded at four of the 50 locations at Point Counts 4 and 6 within large arable fields at the Chiverton end of the scheme, and at

Point Count 20 and 22 where they were recorded foraging along the lane within the NFH. All records were of single passes apart from Point Count 22 during June with 11 passes recorded; and

- Greater horseshoe bat was recorded at three of the 50 locations - with two passes at Point counts 36 and a single pass 37 to the north of Trevalso Farm, and at Point Count 27 where an individual was seen crossing the existing A30 via a footbridge between Zelah and the Tolgroggan Farm complex.

8.6.137 Myotis species were recorded throughout the scheme but with highest activity recorded at Point Count 33 and 35 along the land at Trevalso Farm. Brown long-eared bat were recorded at Point Count 21 on the lane to Marazanvose Farm and 28 on the edge of the woodland connected to Chyverton Park.

8.6.138 Both noctules and Leisler's bats were generally recorded within the eastern section of the survey area towards Carland Cross where the habitat is more open with Newyln Downs to the north. Peak levels of activity were recorded in June and August.

8.6.139 As described in the methodology section above, the Bat Activity Report is not included in this PEIR. The full results will be detailed within the ES. Figure 2 in Appendix 8.20 gives an overview of the activity transect survey results.

Automated Detector Survey

8.6.140 A total of 10 bat species and one species group (Myotis species) were recorded during the automated detector surveys in 2016 common pipistrelle, soprano pipistrelle, noctule, Leisler's, serotine, Nathusius' pipistrelle, barbastelle bat, lesser horseshoe bat, greater horseshoe bat, brown long-eared bat and Myotis species.

8.6.141 Over 88,000 bat passes15 were recorded in total during the surveys. As with the transect survey results, the highest level of bat activity was attributed to common pipistrelle, which accounted for approximately 89 % of all bat activity. Myotis species had the second highest level of bat activity, which accounted for 5 % of all bat activity.

8.6.142 Automated detector location 11 (within the Trevalso farm complex) had the highest level of activity, with an average of 69.69 bat pph. Activity levels here were highest during May (188.60 pph), September (83.22 pph) and October (81.01 pph), although activity levels were consistently high in comparison to the other detectors. Eight species and one species group were recorded at this location.

8.6.143 High levels of bat activity were also recorded at automated detector locations 4 and 5 (Marazanvose area), 9 (near Tolgroggan Farm), and 13 (along the road near Honeycombe Farm).

8.6.144 A total of 19 barbastelle bat passes were recorded sporadically throughout the survey area at static locations: one (Chiverton Cross), two (Callestick Vean), four, five, six (around NFH, Marazanvose), seven (Chyverton Lodge), and 13

[15] In the field, a 'bat pass' was defined as two or more bat calls in a continuous sequence, lasting for no more than 10 seconds. Each sequence or pass is separated by one second or more in which no calls are recorded.

(near Ennis Farm). Only individual passes were recorded, as such, no temporal peak levels of activity were noted.

8.6.145 Lesser horseshoe bat was recorded at all static locations except for 12 (Honeycombe Farm) and 14 (Carland Cross). A total of 183 passes were recorded throughout the surveys. Lesser horseshoe bats were recorded throughout the season with a peak in activity of 37 bat passes (0.77 pph) being recorded at location 6 in July (along a double tree-lined road in Marazanvoze, north side of A30 which links to Chyverton House). A single building within the NFH is confirmed to be a lesser horseshoe night roost.

8.6.146 Greater horseshoe bat was recorded across the scheme, at all static locations except for locations 3 (Nantaegue Farm), 10 (Zelah), and 12 (Honeycombe Farm). In total, 414 greater horseshoe bat passes were recorded throughout the surveys. The highest level of greater horseshoe bat activity (an average of 1.03 pph) was recorded at static 11 located along the access road to the Trevalso Farm complex in May 2016 when 312 bat passes (7.57 pph) were recorded over the 5-day period. This was the only month that greater horseshoe was recorded at this location.

8.6.147 Myotis species were recorded throughout the scheme but with peak activity recorded at location 2 (Callestick Vean) which was attributed to a peak in activity in September with 1526 bat passes (25.83 pph). Brown long-eared were recorded in low number of passes through out the scheme on seven of the 15 locations, with a peak recorded activity in July at location 9 (near Tolgroggan Farm) with 10 bat passes (0.21 pph) and October at location 11 (near Trevalso Farm complex) with 14 bat passes (0.21 pph).

8.6.148 Both noctule and Leisler's bat were recorded in low number throughout the scheme but with peak activity, predominantly noctules, at the eastern end of the scheme toward Carland Cross. With a peak activity being recorded at location 12 (Honeycombe Farm) of 143 bat passes (3.81 pph) in June, location13 (near Ennis Farm) of 214 bat passes (5.34 pph) in July, and location 14 (Carland Cross) of 109 bat passes (2.71 pph) also in July.

8.6.149 A peak of activity was also recorded at location 9 (near Tolgroggan Farm) in September of both noctule (198 bat passes (2.79 pph)) and Leisler's bat (93 bat passes (1.31 pph)).

8.6.150 As described in the methodology section above, the Bat Activity Report is not included in this PEIR. The full results will be detailed within the ES. Figure 3 in Appendix 8.20 gives an overview of the static detector survey results.

Crossing Point Survey

8.6.151 Bats were recorded crossing the scheme at all of the 12 Crossing Point survey locations. A bat was recorded as crossing when seen flying up or down the linear feature, as such in some cases this is likely to be the same bat moving/foraging up and down the feature. Bats that were heard but not seen were not included in the summary below.

8.6.152 Relatively high numbers of bats were found to be crossing the scheme at the following crossing point locations which confirm these locations to be important linear features for bat commuting and foraging that will be severed by the scheme:

- Crossing Point 3A near Nanteague Farm – a total of 218 bat passes were recorded along the linear feature, of these 90 were common pipistrelle, 84 were greater horseshoe bat, 36 were lesser horseshoe, the remaining eight were a combination of Myotis sp, noctule/serotine/Leisler's or unidentified bats). Of the 218 bat passes recorded, 140 were from one visit in July 2017 and may have been attributable to one or two bats foraging continuously along the linear feature during the survey visit. During the six survey visits, six bats (including greater and lesser horseshoe and common pipistrelle) were incidentally seen to cross the existing A30 at this location.
- Crossing Point 6 near NFH a total of 384 bat passes were recorded along the linear feature, of these 342 were common pipistrelle, 20 Myotis, four lesser horseshoe and six unidentified. The majority of these crossings were from one visit in August 2016 (181) and one visit in August 2017 (99). It is likely these peaks are due to individual common pipistrelles and Myotis forage up and down the feature.
- Crossing Point 7 near Chyverton Lodge - a total 589 bat passes were recorded using the linear feature, in this case the underpass under the existing A30. Of those seen crossing, 480 were common pipistrelle, 89 were Myotis sp, seven soprano pipistrelle, two greater horseshoe, one lesser horseshoe, one serotine and one barbastelle bat. Three bats (noctule and Serotine bats) were recorded flying over the underpass. The majority of the bats were recorded during the fourth visit in June 2017 (peak of 429 passes). It is likely that this peak was due to individual common pipistrelles and Myotis using the feature to forage underneath.
- Crossing Point 11 near Trevalso Farm - a total 1033 bat passes were recorded crossing using the linear feature, in this case the underpass under the existing A30. Of these, the majority were common pipistrelle (889), with Myotis (135), noctule (1) and unidentified bats (8) also recorded. There were very few crossings seen in the first two surveys both in 2016 (August and September), but the number of crossings were consistently high in the last four visits which were all in 2017 (June, July and August). The majority of the bats seen were foraging up and down the lane, with 28 common pipistrelle and Myotis species recorded flying over the existing A30.

8.6.153 Bats were also recorded crossing the existing A30 at crossing point 4A (lane leading to Marazanvose Farm; six common pipistrelle), 9 (Tologroggan Farm over bridge; 27 bats including common pipistrelle, Myotis species and one lesser horseshoe), and 12 (near Ennis Farm; four common pipistrelle).

8.6.154 Bats were recorded flying toward or away from the A30 at location 4B (near Marazanvose Farm), 6 (NFH) and 10 (near Zelah) but none were confirmed to be crossing the existing A30 in these locations.

8.6.155 As described in the methodology section above, the Bat Activity Report is not included in this PEIR. The full results will be detailed within the ES. Figure 3 in Appendix 8.20 gives an overview of the crossing point survey results.

Landscape Scale Transect Survey

8.6.156 A total six species plus two species groups (Myotis species and noctule/serotine/Leisler's species group) (minimum eight species) were recorded during the landscape scale transect surveys:

- common pipistrelle;

- Myotis sp.;
- brown long-eared bat;
- barbastelle;
- soprano pipistrelle;
- lesser horseshoe bat;
- greater horseshoe bat; and
- noctule/serotine/Leisler's species group.

8.6.157 The landscape scale transect with the peak bat activity levels was transect 9, which was along the lane to Honeycombe Farm, where a total of 251 bat passes were recorded.

8.6.158 Distance from the scheme had a significant positive effect on the number of bat passes with a predicted increase in bat activity of 83% from 0 and 1000 metres from the scheme. This is likely due to the presence of the existing A30 close to the scheme alignment.

8.6.159 Bat activity was significantly higher in habitat type 2 to 5 (2 - hedges/shrubby verges lining road/path & open fields beyond, 3 - intermittent medium trees/bushes lining road/path & open fields beyond, 4 - intermittent tall trees lining road/path & open fields beyond, and 5 - continuous tall tree cover lining road/path with woodland &/or open fields beyond), than habitat type 1 being fence or wall lining road/path & open fields beyond.

8.6.160 As described in the methodology section above, the Bat Activity Report is not included in this PEIR. The full results will be detailed within the ES.

Other Section 41 Species of Principal Importance (SPI)

Desk study

8.6.161 The desk study identified two further species listed as SPIs (other than those previously mentioned above) within two kilometres of the scheme. These were hedgehog and harvest mouse. The records identified 32 hedgehog records throughout the search area and one harvest mouse record near Chacewater.

8.6.162 The RTC records requested from ERCCIS in October 2017 returned 20 RTC records of hedgehog on the existing A30 between Chiverton and Carland Cross, of which four are from the last ten years. These records are scattered throughout the scheme, with the majority being located centrally near Zelah and Marazanvose or towards the western end near Chiverton Cross (Figure 1 in Appendix 8.1).

8.6.163 No other SPIs species RTC data was returned from ERCCIS.

Field survey

8.6.164 Species specific surveys were not undertaken for the SPI; however, habitat suitable to support a number of notable species was identified during the Habitat Phase 1 surveys.

8.6.165 The Habitat Phase 1 study area covered a variety of habitats, including networks of gardens within Zelah and near to Chiverton Cross roundabout. These habitats provide suitable habitat for hedgehog. Whilst no evidence was recorded during the survey of this species, the habitat was extensive enough to support a healthy population.

8.6.166 The network of arable and pastoral fields with good boundaries in the form of Cornish hedges provided suitable habitat for harvest mice and brown hare (Lepus europaeus) throughout the study area. The tussocky grass along the non-woody vegetated Cornish hedges may provide suitable breeding sites for harvest mouse. Harvest mouse were recorded during the dormouse surveys in 2016 and 2017 south of Zelah alongside the existing A30.

8.6.167 The wet areas within the survey area provided suitable habitat for common toad. These areas were located along the length of the study area, with notable areas near to Nanteague Farm, at Marazanvose, within the woodland at Chyverton Park, within the fields associated with Trevalso Farm near to Zelah, and within the fields either side of Penny-come-quick. The disused quarry located within the remnant of heathland south of the current A30 also provides habitat for both species. However, this is an isolated area with the A30 to the north and farmland to the south.

8.6.168 Polecat (Mustela putorius) have been recorded in Cornwall in recent years [43], and the first sighting of pine marten (Martes martes) in Cornwall for over 50 years has also raised questions whether this species is returning to Cornwall [44] [45]. Polecats set up home in lowland wooded habitats, marshes, along riverbanks or even in farm buildings or dry stone walls [46]; as such suitable polecat habitat are present throughout the study area. Pine marten are more habitat specialists, with preferred habitat being thick woodland or rocky hillsides, with dens frequently made in hollow logs or rock crevices, but also in rabbit burrows or the roofs of old buildings [47]. The lack of well-connected thick woodlands within the study limits the suitability of the habitats for this species.

8.7 Potential impacts

8.7.1 A highway scheme can have potential impacts on biodiversity and nature conservation in a number of ways during both construction and operation.

8.7.2 The potential impacts to habitats and species may be both permanent and temporary, and direct and indirect. The direct effects are of habitat loss and severance, species mortality through vehicle collisions, habitat damage from changes in air quality, surface run-off and pollution events. Indirect effects are of displaced individuals on the occupancy of alternative habitat, including reduced foraging success, increased competition and predation, genetic isolation and inbreeding, which can lead to local extinctions.

8.7.3 A summary of the main potential impacts is provided below.

Habitat loss

8.7.4 Habitats will be lost through the change of land use from countryside (predominantly farmland) to highway. Habitat loss within the highway boundary will be permanent, whereas some larger areas that will be used as compounds and borrow pits during construction will be temporary, with the habitat reinstated or in most cases enhanced post-construction.

8.7.5 In general, habitat loss, including that which supports key species, will be mitigated through creation of replacement habitat.

Habitat severance

8.7.6 Given that the proposed A30 scheme largely follows many sections of the existing A30, the habitat severance between habitats and the populations of animals they support north and south of the road are likely to be reduced compared to a new alignment through open countryside. Nevertheless, the road is likely to sever existing wildlife corridors and foraging areas and as such could still have significant effects on species populations in the area.

8.7.7 Severance can lead to isolation both within and between populations and from specific resources vital for survival. The indirect effects of this could include reduced foraging success, increased competition, genetic isolation and inbreeding, which can lead to local extinctions.

8.7.8 Although, the proposed alignment largely follows that of the existing A30 the larger road could prove a larger barrier to species movements. As such habitat severance, isolation and movements of species will be mitigated through the provisions of multispecies crossings and fencing to ensure their safe crossing and reduce any isolation effects.

8.7.9 Habitat severance will however, still occur during site clearance and construction but these effects can be reduced through the sensitive construction programming, for example in bat sensitive areas the vegetation clearance and planting schedule can be tailored to ensure minimal time of bear ground / habitat severance during bat activity periods.

Habitat damage

8.7.10 Habitats close to the scheme, such as hydrologically connected aquatic habitats, are sensitive to effects from both construction and operation such as pollution events from fuel and chemical spills, from change in vehicle emissions, and from sediment run-off.

8.7.11 Whilst best practice construction and operation design techniques for pollution prevention and control will be used, there is always a risk during construction and operation from vehicles and the transporting of potentially polluting goods.

8.7.12 Impacts may also arise on designated sites, in this case the Newlyn Downs SAC, where vegetation may be sensitive to elevated levels of airborne dust from the works and nitrogen deposition during both construction and operation of the road. Best practise control measures will be used to reduce this risk, and any changes in nitrogen deposition will be investigated.

8.7.13 Elevated oxides of nitrogen (NOx) concentrations are generally considered to be the main threat to vegetation from vehicle emissions. More details on air quality impacts are set out in Chapter 5 Air Quality, and any associated impacts on vegetation will be provided within the ecology and air quality chapters of the ES.

Disturbance

8.7.14 Disturbance effects could lead to significant impacts to sensitive species. This could lead to abandonment of territory or of young, increased predation risk and use of critical energy reserves. It is anticipated that these effects would be mitigated through specific construction phase Method Statements that would address potential impacts on species. This would for instance include the removal of vegetation outside of the breeding bird season, sensitive timing of

works for bats near roosts, and providing alternative setts for badgers that are close to construction areas.

8.7.15 Disturbance to bats from lighting can also lead to significant effects. The effect of road lighting is however complex, but includes roost disturbance and abandonment, severance and loss of foraging and commuting habitats, and a decline in airborne invertebrate prey.

8.7.16 Such potential impacts on bats will be mitigated through sensitive design of lighting and landscape planting, and implementation of measures to reduce such impacts during construction.

Species mortality

8.7.17 Species mortality can occur during construction as well as operation of highways. Less mobile species, or animals that are hibernating or have young, are likely to be most vulnerable to direct mortality during vegetation clearance and construction.

8.7.18 The effects of individual mortality can lead to local extinctions once a population falls below a critical threshold. These effects are often greatest within longer-lived species, with greater parental investment and low annual reproduction, which struggle to recover from loss of family or population members.

8.7.19 Many animals are killed by vehicle collision on UK roads each year and this is likely to be the case for the scheme in the absence of mitigation. Furthermore, the RTC on the existing stretch of the A30 suggests various species are crossing the road or susceptible to collision in this area.

8.7.20 Animals that are particularly susceptible and are at risk from collision are badger, otter and bats due to the severance of wildlife corridors, and birds, especially barn owl, due to the way in which they hunt.

8.7.21 There are mitigation measures which can reduce the risk of collision such as hedgerow and tree planting along the scheme to discourage species such as barn owl flying into the carriageway, and provisions of multispecies crossings and fencing to ensure their save crossing of species.

8.8 Assessment assumptions and limitations

8.8.1 The findings presented in this PEIR chapter represent those at the time of survey and reporting, and data collected from available sources. Ecological surveys are limited by factors that affect the presence of plants and animals, such as the time of year, migration patterns and behaviour.

8.8.2 Nevertheless, these surveys were conducted at the optimal survey periods and using methodologies which are accepted by Natural England and other statutory bodies. Furthermore, the results of the ecological survey allow evaluation of nature conservation value, assessment of the significance of potential impacts that may arise from the proposals and consideration of appropriate mitigation measures. Every effort has been made to ensure that the findings of the study present as accurate an interpretation as possible of the status of flora and fauna within the study area.

8.8.3 As described above, the specific species and survey baseline reports are not included in this PEIR. Specific limitations and assumptions will be provided in these baseline reports within the ES.

8.8.4 General gaps and uncertainties within this chapter are detailed within Table 8-7.

Table 8-7: Gaps and uncertainties within this draft PEIR chapter

Gaps and Uncertainties	Description
All baseline reports are still in Draft form, and are therefore not included in this PEIR. However, their associated figures (although also still in draft form) have been included to aid with visualisation of baseline conditions.	All baseline reports and their associated figures are in draft form, and are subject to minor change. These changes, as well as the full baseline reports, will be detailed in the ES.
Some baseline reports and their figures were unavailable at the time of writing and are completely absent from the Appendices (Appendix 8.8, 8.9 and 8.12).	The reports for Terrestrial Invertebrates, Freshwater Macro-Invertebrates, and Breeding Birds were unavailable for inclusion within this draft Chapter. Therefore, some data required to inform the assessment is missing at this time. This will be included in the ES.

8.9 Design, mitigation and enhancement measures

8.9.1 A detailed mitigation strategy is being developed to avoid or reduce the potential impacts described above. This strategy will seek to employ best-practice methods for dealing in particular with habitat loss, habitat severance, disturbance and species mortality.

8.9.2 Based on the draft ecological data, some of which is not fully analysed, it is thought that through the design of the scheme, as well as proposed mitigation and enhancement measures, the scheme will be able to deliver a net gain in terms of habitat creation, while also connecting habitats and reducing species mortality compared to the existing A30.

8.9.3 The Environmental Master Plan (Figure 7.6 Chapter 7 Landscape) prepared in November 2017 provides approximately 47.9 hectares of woodland (44.8 hectares of broadleaved woodland and 3.1 hectares of coniferous woodland), 24.4 hectares of species-rich grassland, 4.1 hectares of pollination strips, 4.9 hectares of heathland, 0.2 hectares of native bulb planting, 1.6 hectares of marginal aquatic, 1.6 hectares of wetland, 3.0 hectares of wetland rush pasture, and 41.4 kilometres of hedgerows (including 10.4 hectares of new Cornish Hedges). All of which has been designed to enhance the habitats within the local area, provide natural barriers to deter flying species from the carriageway, and provide habitat corridors leading to multispecies crossing points while also connecting to the wider landscape.

8.9.4 At present, a total of 23 crossings are proposed that will be suitable for badgers, otters, and/or bats, two of which have also been designed for reptiles. Of these 23 crossings, there will be 17 dry tunnels or over bridges suitable for both badger and otter and two drainage culverts which have been designed to be suitable for otter, badger and bat passage. Where culverts cannot accommodate otter passage a dry tunnel will be provided. A further four underpasses have been designed to accommodate bats, which will not be lit. At present, there are no crossing designed for species along this section of the A30.

8.9.5 Badger crossings have been provided at suitable locations where badgers paths and existing crossing points of the A30 where located, this equates to 19 badger crossings spread throughout the scheme and within at least every kilometre of the 12.7 kilometre route. The entire scheme either side will have badger fencing which will funnel the badgers to suitable crossings.

8.9.6 All badger crossing will also be suitable for otter, being at least 900 millimetres. Specific otter culverts on watercourses and drainage channels will have otter ledges as per DMRB guidance [2]. Otter fencing will be used around culverts and any dry passes for otters.

8.9.7 A total of ten bat crossings have been designed to be in alignment within the existing flight path corridor and associated vegetation, including a green bridge. Underpasses are at least 2.4 metres by 2.4 metres in height and diameter, with at least four of these being more than 10 metres diameter. All underpasses and the green bridge have been positioned in alignment with the habitat features being used by bats and as mentioned above, these underpasses will not be lit during periods of bat activity, between dusk and dawn, to ensure bat usage.

8.9.8 There are two areas with reptile populations present which the scheme could potentially isolate. As such as well as providing suitable habitat creation within these areas to increase their extent, suitable underpasses are proposed to link up existing and created habitats and reduce the risk of population isolation. These underpasses will be at least 1.2 metres in diameter.

8.9.9 It should be noted that animal and bird populations are already habituated to the presence of a busy road in the local landscape. As such, the proposed layout of the new road, that largely follows many sections of the existing A30, has considered this in its design evolution.

8.9.10 Whilst there will be a loss of some habitats used by populations of animals and birds, such as hedgerows and pastoral and arable farmland, habitat reinstatement and creation proposals are likely to achieve a net gain in the replacement habitats for such populations.

8.9.11 In particular, woodland planting, Cornish hedge provision, species-rich grassland, wild flower pollination strips and heathland habitat creation will generate habitats and foraging opportunities for various species, including bats, otters, badgers, breeding and wintering birds, reptiles and invertebrates (including bees). Attenuation ponds associated with the scheme are also likely to be of use for various species.

8.9.12 All habitat creation has been designed to provide wildlife corridors but also connect into the wider landscape. For example, the heathland creation has been designed to link the isolate heathland parcel at the eastern end of the scheme to the designated heathland area to the north, Newlyn Downs SAC.

8.9.13 The Environmental Master Plan design (Figure 7.6 Chapter 7 Landscape) has also considered potential disturbance and habitat loss effects to species. For example, the lighting throughout the scheme has been designed to ensure no light spill on to bat sensitive habitats, such as foraging and commuting routes and roosts; and suitable areas for alternative badger setts and bat roosts have been identified where setts and roosts will be disturbed during construction.

8.9.14 In addition to habitat creation, enhancement and multispecies crossings, standard construction best practice techniques and methods will be employed to

remove or reduce the risk of disturbance effects, pollution events and ultimately habitat damage and species mortality. Such techniques and controls will be detailed and managed through the Construction Environmental Management Plan (CEMP).

8.9.15 The CEMP will also detail the requirement of an Ecological Clerk of Works (ECoW) that would be appointed for the construction phase to conduct, for example, pre-construction searches in ecological sensitive habitats, implement a Breeding Bird Protection Plan, to oversee management of ecological issues as they arise, and to educate site personnel in ecological issues where needed.

8.9.16 Further details on standard construction best practice techniques and an Outline Environmental Management Plan (EMP), which will be the precursor of the CEMP, will be detailed within the ES.

8.10 Assessment of effects

8.10.1 The assessment here takes into account the potential impacts to each ecological receptor and the design, mitigation and enhancement measures to determine the significance of the effects.

8.10.2 Within this section, the receptors within the study area are valued in accordance to DMRB IAN 130/10 which assigns a geographical value. This value can then be used to determine the significance of the potential impacts of the scheme with design, mitigation and enhancement considered.

8.10.3 The effects have been separated into construction and operation effects.

Construction Effects

Designated Sites

Statutory Designations

8.10.4 Newlyn Downs SAC is the only internationally important site within the study area, and is located approximately 138 metres to the north of the scheme. This heathland designated site is of international value.

8.10.5 There are four nationally designated SSSIs within the study area. These are the Newlyn Downs SSSI (138 metres from the scheme), Carnkief Heath (385 metres from scheme), Carnkief Pond SSSI (1.8 kilometres from scheme) and Ventongimps SSSI (1.4 kilometres from scheme). All are considered to be of national value.

8.10.6 Potential effects from construction activities, such as from dust deposition, pollution events or sediment run-off, to designated sites which are within relative close proximity and/or are hydrologically connected to the construction footprint will be mitigated through standard best-practice techniques and methods which will be determine and detailed with the CEMP.

8.10.7 The potential effects from NOx emissions and nitrogen deposition during the construction phase are likely to be negligible as emissions from heavy goods vehicles and site equipment would be minimal and temporary. The effect on nitrogen deposition during the operational phase is discussed below, and will be further detailed in the ES and Draft Habitat Regulations Assessment (HRA).

8.10.8 On this basis, it is assumed that no significant effects will occur during construction on statutory designated sites. The overall effect is therefore likely to be of neutral significance.

Non-Statutory Designations

8.10.9 There are 15 non-statutory CWS and four CRVI sites within the study area. CWS and CRVI sites are designated for their presence of habitats or species of local or regional importance by local authorities, as such these sites are considered to be of county value.

8.10.10 None of the CWS are being directly affected by the scheme and with construction mitigation any effects are considered to be of neutral significance.

8.10.11 Three of the CRVIs are potentially being permanently and directly impacted as they fall, in part, within the construction footprint. However, two of these were surveyed within the grassland NVC survey (Site 18 and 20) and were described as 'botanically unremarkable and narrow' and as 'mown perennial ryegrass dominated amenity grassland'. The CRVI which will not being directly impacted was also surveyed for grassland NVC (Site 7) and this was classified as qualifying as HPI Lowland Grassland habitat. This habitat will be identified within the Outline EMP and the CEMP to ensure no indirect impacts will occur.

8.10.12 The 24.4 hectares of species-rich grassland, 4.1 hectares of pollination strips, and 4.9 hectares of heathland which will provided along the entire route and designed to connect into existing habitats and wildlife corridors will mitigate any loss of poor quality CRVIs and provide a net gain to biodiversity within the local area when they are installed. However, during construction before all landscape planting has been realised the effect is considered to be of minor adverse significance. This effect is likely to reduce to neutral significance as planting is started throughout the scheme, and once established could be of minor beneficial significance.

Habitats

8.10.13 The predominant habitats within the study area are improved grassland and arable fields which are of low ecological value and considered to be less than local value. Of the other grasslands recorded and further evaluated through NVC surveying, only one area of grassland (Site 7) was considered to be of HPI character. This site which is located alongside the existing A30 near Penglaze (south of Newlyn Downs) is also a designated CRVI (BS214). This grassland alone is considered to be county value, and is not directly affected by the scheme and has been discussed above. All other species-rich grasslands, including marshy grassland, are considered to be of local value.

8.10.14 A series of fragmented semi-natural and plantation woodlands are located within the study area, and are mostly considered to be of local value as they enrich the habitat resource within the local context. One woodland, which will be permanently and completely lost during construction, and three woodlands, which will be permanently but partly effected during construction are mapped as a HPI under deciduous woodland. These woodlands are valued at county value due to being mapped as HPI but not being of a particular high quality or interesting NVC community.

8.10.15 Two heathland areas are present within the study area, one being Newlyn Downs SAC which is of international value as detailed above, and one small isolated area south of Newlyn Downs and the existing A30. The isolated area is not considered to be contiguous with Newlyn Downs, it is however mapped as a HPI lowland heathland and is likely to be a remnant area of habitat which once would have blanketed this area of Cornwall. As such this small isolated heathland area is considered county value.

8.10.16 All other habitats within the study area, such as tall ruderal, scrub and hardstanding, would be considered less than local.

8.10.17 Hedgerows are considered separately below under Hedgerows, and watercourses and ponds in River Habitats.

8.10.18 A preliminary habitat loss calculation has been produced on the draft Habitat Phase 1 mapping which has provided estimated areas of specific habitats loss (subject to minor changes due to mapping refinement in the ES). Improved grassland has the highest area of habitat loss of approximately 180 hectares, with arable of approximately 110 hectares and approximately around 60 hectares of hard standing will be lost.

8.10.19 The loss of broad-leaved woodland and poor semi-improved grassland are estimated at approximately 20 hectares, and all other habitat losses were 10 hectares of less.

8.10.20 Habitats of potential interest and of higher value ecologically are broad-leaved woodland (as above), semi-natural woodland (broadleaved, coniferous and mixed, approximately one hectare), semi-improved grassland (approximately four hectares), marshy grassland (approximately 2.5 hectares) and acid dry dwarf shrub heath (approximately 1.5 hectares loss). The latter being loss from the small isolated heathland area.

8.10.21 Other habitats included arable, amenity grassland, scrub and tall ruderal.

8.10.22 As mentioned above in Section 8.9, the habitats being created and enhanced exceeds those being lost with 47.9 hectares of woodland (44.8 hectares being deciduous woodland), 24.4 hectares of species-rich grassland), 4.1 hectares of pollination strips, 4.9 hectares of heathland, 0.2 hectares of native bulb planting, 1.6 hectares of marginal aquatic, 1.6 hectares of wetland, and 3.0 hectares of wetland rush pasture some of which will become available before the end of the construction period, but mostly will be incompletely or in very early stages.

8.10.23 As such, the construction effects on the loss of these higher quality habitats would be considered to be of slight adverse significance, increasing to neutral as planting throughout the scheme starts to establish.

8.10.24 Other impacts on habitats such as root damage to retained trees and hedgerows, pollution events, dust and sediment run-off will all be mitigated through techniques and methods detailed in the CEMP. As such, these effects are considered to be of neutral significance due to available mitigation methods.

Hedgerows

8.10.25 The field boundaries in the study area west of Tresawsen are dominated by Cornish hedges, mostly being un-vegetated topped with grass, bracken and

scrub. East of Tresawsen the field boundaries are dominated by hedgerows with several being Important Hedgerows under the Hedgerow Regulations.

8.10.26 Important Hedgerows, priority Hedgerows and Cornish Hedges within the study area are considered to be of county value; all others of local value.

8.10.27 A preliminary habitat loss calculation has been produced on the draft Hedgerow mapping which has provided estimated lengths of hedgerow loss. For this calculation, the fenceline of the scheme was used, which will in reality include some hedgerows that will be retained. The only hedgerows removed from the current calculation were those surrounding the compounds. As such, these calculations are considered an over estimate at this stage and are subject to changes due to mapping refinement in the ES.

8.10.28 Approximately 2.4 kilometres of Important Hedgerow and 6.9 kilometres of Cornish Hedges will be lost during construction, with 9.1 kilometres of other native hedgerows also being lost.

8.10.29 Although some of the 13.3 kilometres of new hedgerow, 17.7 hectares of reinforced hedgerow, and 10.4 kilometres of Cornish hedgerow will become available before the end of construction much will be in early stage of growth and as such the effect of hedgerow loss during construction of hedgerows is considered to be of a moderate to slight adverse significance; increasing to neutral as planting throughout the scheme starts to establish.

8.10.30 Potential impacts on hedgerows being retained such as damage through root damage, pollution events, dust, and sediment run-off will all be mitigated through techniques and methods detailed in the CEMP. As such, these effects are considered to be of neutral significance.

River Habitats including Fish

8.10.31 Based on limited fish populations, it is concluded that all watercourses within the study area, and the fish populations supported by them, are of less than local value, with the exception of sites 12.1 and 12.3 which are of local value. All still waterbodies within the study area and the fish populations supported by them are of local value. However, at the time of writing, the Freshwater Macroinvertebrate Report was not available, and as such these valuations may be subject to change in the final ES.

8.10.32 Five watercourses cross the scheme or are within the construction footprint of the scheme. Of these, only one, which crosses the scheme, was considered moderately diverse, with an apparently self-sustainable fish population (site 12.1). The other watercourses supported only poor population densities, or fish were absent.

8.10.33 Of the six still waterbodies in the study area, five are within the construction footprint of the scheme. Of these five, two were considered capable of supporting fish, and three were considered capable of supporting a well-developed macroinvertebrate community.

8.10.34 The watercourses that will be crossed by the scheme may be subject to temporary habitat loss or alterations in water flow during construction. The majority of the scheme runs between the headwaters of catchments on either side of the road, the temporary loss of riparian habitat during construction is considered minimal. Measures to mitigate for changes in water flow due to cuttings or

embankments are laid out in Chapter 13 Road Drainage and the Water Environment.

8.10.35 Watercourses within the construction footprint may be subject to damage during construction activities, which may also result in species mortality. Instream work will be required in a number of watercourses (see Chapter 13 Road Drainage and the Water Environment), including those with fish populations present. Fish relocation should take place to move fish to suitable habitat elsewhere. This would only be done under licence from the Environment Agency.

8.10.36 The fish populations identified are thought to be fragile communities that would be extremely sensitive to changes in water quality conditions, including those due to pollution run-off or sedimentation. Measures to mitigate for changes in water quality are laid out in Chapter 13 Road Drainage and the Water Environment. These mitigation measures will be implemented at all watercourses, and not just those were fish species were found to be present, due to the possibility of colonisation into these watercourses in the future.

8.10.37 With the inclusion of these mitigation measures, it is considered that no significant impacts will occur and construction effects are of neutral significance.

Reptiles

8.10.38 Relatively high numbers of breeding common lizard and breeding slow worm were present in the isolated heathland area surrounding the Quarry pond near Carland Cross, and relatively high numbers of breeding common lizard were also recorded in suitable habitat south of the existing A30 near Tresawsen. Small populations of grass snake and adder were also recorded within the study area.

8.10.39 Likely reptile absence was however recorded in five of the ten survey areas, suggesting that the reptile populations within the study are relatively moderate and potential isolated in some areas. The common species recorded within the study area are common and wide spread throughout Cornwall and as such, the populations of reptiles within the study area are considered to be of local value.

8.10.40 Vegetation clearance, ground works and site traffic in suitable reptile habitat have the potential to impact reptiles directly, through removal of habitat or accidental killing of individuals. The killing or injuring of individual reptiles could also represent an offence under the WCA 1981 (as amended) and mitigation is therefore proposed.

8.10.41 Displacement, exclusion and translocation strategies will be produced within the final Outline EMP and the CEMP for each area where reptile are likely present. No population will be completely isolated within the final design, although some populations may have to be displaced into surrounding suitable habitats during construction; preferably this will be achieved through habitat manipulation. Reptile habitat to be retained will also be appropriately marked and fenced if required.

8.10.42 Although many of the habitats being created within the Environmental Master Plan (Figure 7.6 Chapter 7 Landscape) will be suitable for reptiles, most will not be completely available until later stages of construction. Nevertheless, considering the populations recorded and the loss of habitats predicted during construction, is not considered that an overall significant effect at a population level will occur, considering the extent and condition of the remaining connected habitats within the study area.

8.10.43 As such, considering mitigation methods provided, the construction effects on reptiles are considered to be of neutral significance.

Birds

Breeding Birds

8.10.44 Whilst final analysis of data is ongoing, based on the individual species, numbers of breeding pairs recorded on transects and breeding bird assemblage present, the study area is assessed to be of local value for breeding bird populations, typical of such areas of farmland in Cornwall.

8.10.45 During the construction phase, breeding birds are likely to be affected by disturbance/displacement associated with construction activities and habitat loss, primarily of arable land and hedgerows. Nest destruction could also occur in the absence of mitigation measures.

8.10.46 The CEMP will include full details of pollution control measures, working times and timing of vegetation clearance to avoid impacts on nesting birds.

8.10.47 With these measures in place, and considering abundance of similar habitats locally, it is predicted that no significant impacts will occur on the populations of breeding birds within the study area and legal compliance in regards to avoiding destruction of active nests can be achieved. As such, effects are assessed to be of neutral significance on breeding birds.

8.10.48 Embedded design mitigation will provide habitats that will be of use to breeding birds as described above which are likely to become available towards the end of the construction as reinstatement works progress. The provision of these will not change the overall significance of effect on breeding birds which remains as neutral.

Wintering birds

8.10.49 Based on the individual species, flock numbers and wintering bird assemblage present, the study area is assessed to be of local value for wintering bird populations, typical of such areas of farmland in Cornwall.

8.10.50 During the construction phase, wintering birds are likely to be affected by disturbance/displacement associated with construction activities and habitat loss, primarily of arable land and hedgerows.

8.10.51 As no particularly large or significant aggregations of birds were recorded, and considering the partial habituation to disturbance in the area from existing highways along with the abundance of similar habitats available for foraging, no significant impacts on this feature of local value are predicted and effects are therefore assessed as of neutral significance on wintering birds.

8.10.52 As for breeding birds, embedded design mitigation will provide habitats that will be of use to wintering birds as described above which are likely to become available towards the end of the construction as reinstatement works progress. The provision of these will not change the overall significance of effect on wintering birds, which remains as neutral.

Barn Owl

8.10.53 Baseline survey works confirmed barn owl activity along the length of the scheme and whilst only one OBS was recorded, a number of ARS were recorded throughout the survey area. Based on these results, it is concluded that the barn owl population in the study area is of local value.

8.10.54 Potential impacts on barn owls as a consequence of the scheme include; habitat loss (including nesting sites), disturbance, habitat severance, and direct mortality (vehicle collisions).

8.10.55 The construction of the scheme is likely to result in the loss of around 11 hectares of Type 1 habitat and 60 hectares of Type 2 habitats and based on an over-estimated calculation using the scheme fence line to determine loss. Some of the habitat within fence line will be retained and this will be calculated into the refined calculation for the ES.

8.10.56 None of the identified roost features (OBS, TRS, ARS, PNS) will be lost. The new scheme will still be located around 850 metres from the OBS. The realignment of the highway will move closer to some ARS/TRS/PNS but further away from others. Full details will be reported in the ES for the scheme once designs are finalised.

8.10.57 Habitat suitable for use by foraging barn owls would be created as part of the scheme. These include species-rich grassland along with heathland habitats shown on The Environmental Master Plan (Figure 7.6 Chapter 7 Landscape). At this stage, it is assumed that this would ensure that there is no net loss of semi-natural habitats that are of value to barn owls. These areas would be subject to long-term management in order to optimize their value to barn owls. Full details, including habitat calculations, will be reported in the ES for the scheme.

8.10.58 A temporary increase in general disturbance would occur as a result of construction, which could adversely affect any breeding barn owls or their dependent young. In advance of construction, repeat surveys of active and potential nest sites would be re-surveyed by an ecologist with a barn owl disturbance licence in order to determine those that are in use and therefore if specific mitigation measures are required. This would be undertaken during May and August in the year prior to the commencement of any construction activities, including clearance works.

8.10.59 If present, such specific mitigation measures may include avoiding works in areas, use of temporary screening and control of noise/light spill.

8.10.60 Habitat severance is not considered to be a significant issue for the scheme, given the presence of the existing A30 in the landscape and the fact that the scheme is not predicted to sever significant areas of Type 1 habitat.

8.10.61 Direct mortality due to collision with moving traffic during both the construction and the operational phase is possible and could have a permanent impact on the conservation status of this species as it is considered particularly vulnerable due to its foraging method. It should be noted that the population of barn owls in the local areas is likely to habituated to the presence of the existing A30, but direct mortality remains a valid consideration for this species.

8.10.62 During construction, site speed limits will be in place and work timings specified in the CEMP, which will to reduce risks of collisions.

8.10.63 To help further prevent direct mortality of barn owls during construction, construction timing and habitat manipulation techniques will be used to reduce this risk and deter barn owls from flying or foraging near the construction area. The design mitigation also includes sensitive planting along the road verge in order to deter barn owls from foraging near to the road.

8.10.64 With the inclusion of these measures, it is assumed no significant impacts will occur on the barn owl population and as such an effect of neutral significance is predicted.

Nightjar

8.10.65 Given the scarcity of nightjar as a breeding species in the UK (around 4,600 pairs [48]), and its rarity in Cornwall (present in only 12 tetrads [49] and a Cornwall BAP species), the breeding single pair located on Newlyn Downs SAC/SSSI is considered to be of county value.

8.10.66 Newlyn Downs SAC/SSSI will not be directly affected by the scheme and baseline surveys indicated that the closest nightjar activity to the proposed work areas was approximately 440 metres away from proposed work areas. Studies [50] [51] indicate that disturbance distances associated with construction work for this species when breeding range between 150 metres and 200 metres.

8.10.67 As described under habitats, no degradation of breeding habitat is predicted and embedded construction phase mitigation, including control of pollution events, dust and sediment run-off will all be controlled through techniques and methods detailed in the CEMP.

8.10.68 With the provision of these measures, no significant impact on this species is predicted; as such, effects are assessed to be of neutral significance on nightjar.

Otter

8.10.69 The South West is one of only two ‘regions’ in England that are believed to have reached carrying capacity for otters and otters now use all types of watercourses and wetland in the region [27].

8.10.70 Nevertheless, no resting or breeding places were found during the survey, with only limited activity recorded. Based on these survey results in context with the ‘healthy’ otter population in Cornwall, it is concluded that the otter population in the study area is of no more than local value.

8.10.71 A pre-construction survey will also be carried out to determine the level of activity at potential breeding and resting sites; the assessment however is based on current baseline.

8.10.72 Potential impacts on otters as a consequence of the scheme construction include:

- Temporary loss or damage of riparian habitat during ground clearance works;
- Habitat severance during site clearance;
- Damage to riparian habitat or prey species due to pollution run-off and/or sedimentation;
- Temporary disturbance by construction activities;
- Injuring or trapping of otters in excavations if left uncovered; and
- Direct species mortality (vehicle collisions).

8.10.73 There are five watercourses that cross the scheme or are within the construction footprint. However, as the majority of the scheme runs between the headwaters of catchments on either side of the road (see Chapter 13 Road Drainage and the Water Environment), the temporary loss of riparian habitat during construction is considered minimal and no areas identified as suitable for breeding were identified within these areas. The only site identified in the Otter Report (full details will be provided within the ES) requiring further observations was a pond within a substantial area of woodland west of Creegmeor Farm which was assessed as having a moderate potential to be used as a breeding site. However, this is at least 300 metres north of construction.

8.10.74 The habitat associated with the recorded otter signs at Nanteague Farm and north of Tresawsen will not be directly affected during construction.

8.10.75 Nevertheless, severance during site clearance and construction can lead to the isolation of otter populations, which in worst-case scenarios could result in breeding and local extinctions, a reduction in territory or foraging habitat size, and/or a complete isolation from vital resources such as foraging habitat. The severance of the current landscape by the existing A30 suggests that otters may be habituated to this impact. However, the number of RTC records on the existing A30 between Carland and Chiverton Cross indicates that otters still readily move within this landscape north and south of the road (Figure 1 in Appendix 8.1).

8.10.76 The negative effects of habitat severance and isolation will be mitigated by careful construction programming, the maintenance of safe crossing places for otters, and the installation of temporary and/or permanent fencing to funnel otters towards these crossings.

8.10.77 There is the potential for riparian habitat to be damaged due to pollution run-off, dust, or sedimentation during operation of vehicles or during the transportation of potentially polluting materials or substances. This pollution could negatively impact prey species, such as pollution intolerant salmonid fish, thus indirectly affecting otters by reducing foraging opportunities. This will be mitigated by the implementation of best practice construction techniques for pollution prevention and control, which will be detailed in the Outline EMP and ultimately the CEMP.

8.10.78 Construction activities can cause temporary disturbance to otter, which are known to be highly susceptible to human disturbance, which subsequently can lead to effects such as abandonment of territory or of young. As mentioned above potential resting and breeding areas will not be directly affected and are at reasonable distances as not to cause significant disturbance. Nonetheless, mitigation measures such as avoiding works in certain areas at certain times, and control of noise or light spill may be implemented and will be outlined in specific Method Statements and in the CEMP.

8.10.79 Otters may potentially become injured or trapped in excavations during construction. Any open excavations will therefore be covered at night or means of escape provided.

8.10.80 Direct species injury or mortality may occur during construction of the scheme, due to vehicle collisions or inadvertent damage to a holt (if present). Speed limits and work timings, which will be outlined in the CEMP, will be implemented to reduce the risk of collisions with construction vehicles. For example, minimising works at night when otters are active will be considered.

8.10.81 With the inclusion of these mitigation measures, it is assumed that no significant impacts will occur on the otter population during construction. Therefore, an effect of neutral significance is predicted.

8.10.82 Further details on standard construction best practice techniques will be detailed in the Outline EMP in the ES.

Badger

8.10.83 Survey works confirmed high to moderate levels of badger activity throughout the scheme, with a total of nine main setts, three annexes, four subsidiaries and 26 outliers. Desk study data including road causalities also indicated presence along the length of the existing A30 (Figure 1 in Appendix 8.17, and Figure 1 in Appendix 8.1). Nevertheless, badgers are likely to be numerous in this part of Cornwall with abundant habitat for both setts and foraging and reasonable habitat connectivity in the form of hedgerows (including Cornish hedges). As such, the badger population in the study area is considered to be of local value.

8.10.84 A pre-construction survey will also be carried out to determine the level of activity at potential breeding and resting sites; the assessment however is based on current baseline.

8.10.85 Potential impacts on badgers as a consequence of construction of the scheme include permanent or temporary habitat loss or damage (including setts and foraging habitat), habitat severance, habitat damage due to pollution and sediment run-off, temporary disturbance, and direct injury, trapping or mortality.

8.10.86 One main sett is located within the proposed fenceline of the scheme; assumed at time of writing to be the construction footprint. Two further main setts are located approximately 23 metres and 25 metres from the fenceline, with others located over 75 metres from the fenceline.

8.10.87 One annexe, one used subsidiary, and one active outlier were also located within the proposed fenceline of the scheme. As such, with the current alignment a total of four setts, including one main, could be permanently lost. At least two further main setts could be significantly disturbed, therefore requiring temporary exclusion. At this stage, it is anticipated that such loss will be mitigated by the creation of artificial setts in suitable locations under licence alongside appropriate closure of the setts.

8.10.88 Potential construction disturbances to setts will also be mitigated under licence ensuring no significant disturbances that could result in abandonment of territory or of young.

8.10.89 Habitat loss and severance during site clearance and construction could lead to the isolation of badger populations both within and between clans, which worst-case scenario could result in local extinctions. Severance may also cause an increase in conflict and competition between clans due to a reduction in territory and foraging habitat size, or completely isolated clans from vital resources such as foraging habitat. Habitat loss and severance will be mitigated by careful construction programming, the maintenance of safe crossing places for badgers where possible, and the installation of temporary and/or permanent fencing to funnel badgers towards these crossings. The creation and enhancement of habitats will further mitigate these losses, although these will only start to become available towards the end of construction,

8.10.90 There is the potential for badger habitat to be damaged due to pollution and sediment run-off during construction, which could indirectly affect badgers by reducing foraging opportunities. This will be mitigated by the implementation of best practice construction techniques for pollution prevention and control. These construction mitigation measures will be outlined in the Outline EMP in the ES and ultimately the CEMP.

8.10.91 Like otters, badgers may potentially become injured or trapped in excavations during construction. Any open excavations will therefore be covered at night or means of escape provided.

8.10.92 Direct species mortality may occur during construction of the scheme, due to vegetation clearance or vehicle collisions. Speed limits and work timings, which will be outlined in the CEMP, will be implemented to reduce the risk of badger collisions with construction vehicles.

8.10.93 With the inclusion of these mitigation measures, it is assumed that no significant impacts will occur on the badger population during construction. Therefore, an effect of neutral significance is predicted.

Dormice

8.10.94 Due to the lack of dormouse records, and the negative result during field surveys carried out, dormice are presumed absent from the study area, and thus any effects on dormice can be considered of neutral significance.

Bats

8.10.95 The barns at Trehane Barton SSSI were designated due to the greater horseshoe bat breeding colony they support, once the largest known in Cornwall. This species is restricted to the southwest of England and Wales, and this roost is therefore of national value, although confirmation is underway as to whether this roost is still in use. The scheme will have no significant impact on this maternity colony during construction as it is six kilometres16 away to the southeast with no shortage of alternative foraging and commuting habitat nearer the barns themselves, resulting in a neutral significance of effect.

8.10.96 Trevalso Cottage to the north of Zelah (Building 51) which lies between 20 and 50 metres of the scheme was found to support a maternity roost of a Myotis species (likely Natterer's bat), as well as a day/transitional roost of common pipistrelle, and is therefore of regional value. Myotis species and common pipistrelle were recorded crossing the existing A30 in this location and using the linear features leading towards and under the scheme. As such, although the scheme is immediate adjacent to the existing A30 in this location there is the potential for habitat loss and partial severance of the roost to potentially important foraging areas to the west of the scheme. To minimise such habitat severance impacts during the breeding season the clearance of the tree lines either side of the lane between Building 15 and the A30 will be timed to avoid the breeding season, thus reducing the overall disturbance effects to roost.

8.10.97 Mitigation such as temporary man-made hedgerows during bat activity periods (i.e. dusk to dawn) could also be provided across the construction site in place of

16 Four kilometres has been suggested for greater horseshoe when considering important habitats surrounding and supporting roosts [60] [61] [62] [63] [64]

the tree lines and hedgerows in order to retain important linear features to roosts or identified flight paths.

8.10.98 All works and mitigation associated with potential disturbance of the roost will be undertaken under a bat licence method statement drawn up in consultation with Natural England. With this mitigation in place, the effects are likely to be reduced to a slight significance.

8.10.99 The multi-species roost at NFH (Building 35), which comprises a night roost for lesser horseshoe bat and a Myotis species has been assessed as county value, and will be lost to the scheme. It is assumed at this stage that a suitable replacement roost will be constructed prior to the loss of the existing roost in accordance with a mitigation licence method statement to be drawn up in consultation with Natural England.

8.10.100 The location of the replacement roost will be within reasonable distance of the existing roost, however the disturbance effects of construction and the temporary habitat loss and severance from the clearance of the tree line from NFH to the existing A30 will need to be considered. As discussed above potential impacts associated with habitat severance can be managed and reduced through vegetation clearance outside of high bat activity periods and the use of man-made hedgerows to provide linear features across the construction area between dusk and dawn. Nevertheless, assuming this mitigation is in place, the effect on the county roost and potential severance to important habitat to the north is considered to be of slight significance.

8.10.101 Compensatory roosting habitat will be provided under a bat mitigation licence agreed with Natural England prior to the loss of the county value Myotis tree roost (T99) within the Merton Plantation to be lost to the scheme, resulting in an effect of neutral significance.

8.10.102 Any potentially disturbing activities within the vicinity of the other county value tree roosts within 20 metres (T36 and T143) and 50 metres (T27) of the scheme, will assessed and mitigated appropriately under a mitigation licence method statement agreed with Natural England (likely to be installation of bat boxes within the woodland further away from construction activities) resulting in an effect of neutral significance.

8.10.103 Any potentially disturbing activities within the vicinity of the county value maternity roosts of common species common pipistrelle or brown long-eared bat (tree T25, Building 70, Building 16 and Buildings 16A and 16B; all within 50 meters of the scheme) will assessed and mitigated appropriately under a mitigation licence method statement agreed with Natural England resulting in an effect of neutral significance.

8.10.104 None of the local value day/transitional roosts of common pipistrelle or brown long-eared bat (Buildings 9, 36, 44A, 44G (all less than 20 metres from the scheme), Buildings 42, 53, 64, 56A, 53, 37 (all between 20 metres and 50 metres from the scheme) will be lost to the scheme. However, as these roosts are in close proximity to the scheme, a method statement will be drawn up to minimise potential disturbance impacts such as noise and lighting on these roosts during construction and they may be included in bat licence applications as appropriate, resulting in an effect of neutral significance.

8.10.105 A brown long-eared bat night roost at NFH (Building 37) considered to be less than local value will be lost to scheme. A replacement roost will be provided under a mitigation licence method statement agreed with Natural England resulting in an effect of neutral significance.

8.10.106 As discussed above, habitat clearance to accommodate the scheme will result in temporary negative habitat severance impacts on a number of linear features, which provide commuting and foraging habitat for individual bats of the rarest species (barbastelle and greater horseshoe bat), as well as small numbers of rarer species (for example lesser horseshoe, Myotis sp, Nyctalus species and serotine) and small numbers of common species (common pipistrelle, soprano pipistrelle and brown long-eared bat). These linear features, such as mature hedgerows, tree lines, and woodland edge habitat, have been valued as of regional value (to account for the individual bats of the rarest species) in accordance with the guidance [41].

8.10.107 Construction mitigation strategies, such as man-made hedgerows can be provided at important and identified crossing locations to retain habitat connectivity where possible. Such mitigation will help minimise habitat severance impacts resulting in an effect of moderate to slight significance.

Other Section 41 Species of Principal Importance (SPI)

8.10.108 Habitat suitable for SPI (other than those discussed above), especially hedgehog, harvest mouse, brown hare, polecat and common toad, are present within the study area. However, the study area does not provide significant amount of suitable habitat to support populations of these species, greater than that considered to be of local value.

8.10.109 During construction potential impact could occur through permanent and temporary habitat loss, severance and disturbance, as well as individual mortality. However, embedded mitigation and best practise techniques, which will be detailed within the Outline EMP and the CEMP, will remove or minimise these risks. Habitat clearance designed and timed to be sensitive to these species alongside using habitat manipulation clearance techniques to deter species away from areas will be used and detailed within the CEMP. Habitat creation, some of which will be realised before the end of construction, will also provide alternative habitats for these species. Provisions will be identified and provided as for where any animals found during construction are moved to by the ECoWs. For example, the mitigation areas specifically for common toad will be provided adjacent to wet areas and ponds to be affected.

8.10.110 With the inclusion of these mitigation measures, it is assumed that no significant impacts will occur on these SPI population during construction. Therefore, an effect of neutral significance is predicted.

Operation Effects

Designated Sites

Statutory Designations

8.10.111 As described above in the construction effects assessment, it is concluded that the Newlyn Downs SAC is of international value, whilst Newlyn Downs SSSI,

Carnkief Heath SSSI, Carnkief Pond SSSI and Ventongimps SSSI are considered to be of national value.

8.10.112 Biodiversity 2020 [52] identifies air pollution as a direct threat to biodiversity in England. Many habitats of nature conservation importance in the UK are adapted to low nutrient conditions and/or are vulnerable to acidification and are sensitive to additional airborne NOx, sulphur dioxide (SO2), and ammonia (NH3), as well as to nitrogen and acid deposition. Pollutants come from a range of different sources, but transport is known to be the single largest source of NOx emissions [53]. There is potential for NOx deposition on surrounding habitats to the scheme, and this is of particular concern for sensitive habitats which are vulnerable, such as protected heathlands.

8.10.113 Carnkief Heath SSSI, Carnkief Pond SSSI, and Ventongimps SSSI are all over the distance for which effects from nitrogen deposition are considered significant, being over 200 metres from the scheme [54],and as such are not considered further within this Chapter. For further details on the air quality assessment of these sites, see Chapter 5 Air Quality.

8.10.114 Newlyn Downs SAC and SSSI is within 200 metres of the scheme, and comprises 'Temperate Atlantic wet heaths with Erica ciliaris and Erica tetralix' and 'European dry heaths' [55]. The critical loads17 of NOx, nutrient nitrogen, and NH3 for these two habitat types are listed below in Table 8-8.

Table 8-8: Critical loads of habitat types within Newlyn Downs SAC/SSSI [56].

Habitat Type	Critical Loads	
	NOx	Nutrient nitrogen
Northern wet heath	Erica tetralix dominated wet heath: 30µgNOx/m3 (annual mean)	Erica tetralix dominated wet heath: 10-20kgN/ha/yr (if exceeded, habitat will transition from heather to grass. Ericaceous species susceptible to frost and drought)
Dry heath	30µgNOx/m3 (annual mean)	10-20kgN/ha/yr (if exceeded, habitat will transition from heather to grass dominance, decline in lichens, changes in plant biochemistry, and increased sensitivity to abiotic stress)

8.10.115 The air quality assessment of the scheme is currently being undertaken and will provide details of the effect of the scheme on nitrogen deposition. Current nitrogen deposition at the designated sites and habitat specific critical loads will be determined using the Air Pollution Information System (APIS) website [56].

8.10.116 Guidance on assessing the significance of air quality impacts at designated sites published by Highways England will be used. The guidance provides impact descriptors to assess the effect of the scheme on annual mean NOx concentrations. For nitrogen deposition, the guidances states that where the impact of the scheme is less than 1% of the lower critical load then the impact will be not significant. However, an increase above 1% of the lower critical load

17 Critical loads are defined as "a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge. [57]

should not automatically be termed significant, but further consideration should be given on a site-by-site basis.

8.10.117 The current scheme alignment is slightly further away from Newlyn Downs SAC/SSSI by approximately 11 metres totalling a distance of 186 metres between the edge of the main scheme carriageway, and the nearest edge of the designated site. This would likely result in a slight improvement in nitrogen deposition at the designated site. However, the new link road off Carland Cross Junction to the existing A30 would come closer to the designated site, with an approximate 143 metres between the link road, and the nearest edge of the site.

8.10.118 The air quality modelling will predict any changes and provide the data for an assessment of effects to be conducted which will be reported within the ES, and ultimately within the Habitat Regulations Assessment (HRA).

8.10.119 Carrick Heaths SSSI is hydrologically connected to the scheme via Calenick Stream and Zelah Brook, and Benny stream flows through Newlyn Downs SSSI/SAC and is located 80 metres from the scheme at its closest point. At the time of writing, the Water Framework Directive (WFD) compliance assessment was yet to be finalised and is not included in the PEIR. Nevertheless, a negligible impact on water quality and an effect of neutral significance on these waterbodies during both construction and operation has been predicted (see Chapter 13 Road Drainage and the Water Environment for further details).

Non-Statutory Designations

8.10.120 As described above in the construction effects assessment, it is concluded that the CWSs and CRVIs in the study area are of county value.

8.10.121 All CWS's are over 200 metres [54] and as such are not considered to be effected by air quality impacts. Some of these however will be hydrologically connected and as such have the potential to be impacted during operation through pollution events. As mentioned above at the time of writing the WFD assessment had not been carried out, nevertheless, through sensitive drainage and attenuation pond design effects on these sites during operation is considered to be of neutral significance

8.10.122 As mentioned above the 24.4 hectares of species-rich grassland, 4.1 hectares of pollination strips, and 4.9 hectares of heathland which will provided along the entire route will mitigate any loss of poor quality CRVIs and provide a net gain to biodiversity. As such, the effects are considered to be of neutral but potentially increasing to minor beneficial significance subject to habitat development and ongoing management being currently designed.

Habitats

8.10.123 As described above in the construction effects assessment, designated and important habitats such as HPI woodland and heathland; important, Priority and Cornish hedgerows and CRVIs are county value all other habitats are local or less than local value.

8.10.124 As mentioned above in Section 8.11, the habitats being created and enhanced exceeds those being lost with 47.9 hectares of woodland (44.8 hectares being deciduous woodland), 24.4 hectares being species-rich grassland, 4.1 hectares of pollination strips, 4.9 hectares of heathland, 0.2 hectares of native bulb planting, 1.6 hectares of marginal aquatic, 1.6 hectares of wetland, and 3.0

hectares of wetland rush pasture providing a net gain to biodiversity. As such, the effects are considered to be of moderate to slight beneficial significance, subject to habitat development and ongoing management being currently designed.

Hedgerows

8.10.125 As described above in the construction effects assessment, it is concluded that the Important Hedgerows, priority Hedgerows and Cornish Hedges within the study area are of county value, whilst all others are of local value.

8.10.126 Also as described above 10.4 kilometres of Cornish hedgerows and 31 kilometres of new or reinforced hedgerows, some of which being double hedges to increase ecological value, particular for bats, have been design throughout the scheme to maintain and provide green corridors while enhancing the ecological connectivity into the wider landscape.

8.10.127 Based on an overestimated preliminary calculation of hedgerow loss being approximately 2.4 kilometres of Important Hedgerow and 6.9 kilometres of Cornish Hedges and 9.1 kilometres of other native hedgerows, the hedgerow planting as proposed above is considered to provide a neutral significance, increasing to slight beneficial significance if established and managed appropriately during operation.

River Habitats including Fish

8.10.128 As described above in the construction effects assessment, it is concluded that all watercourses, and the fish populations they supports, within the study area of less than local value, with the exception of site 12.1, and 12.3 which are of local value. All still waterbodies, and the fish populations they support, within the study area are of local value.

8.10.129 Drainage culverts will be provided to maintain hydro-connectivity, vegetated attenuation ponds will be provided to capture and treat surface run-off from the road and will act as holding tanks in the event of severe flooding or a major spillage from a collision. These measures and others designed to mitigate for potential impacts on the water environment are laid out in Chapter 13 Road Drainage and the Water Environment.

8.10.130 With the inclusion of these mitigation measures, it is considered that any operational effects are of neutral significance.

Reptiles

8.10.131 As described above in the construction effects assessment, it is concluded that the reptile populations in the study area are of local value.

8.10.132 Habitats suitable for reptile populations, such as Cornish hedgerows, species-rich grasslands, and heathland, have been provided within The Environmental Master Plan (Figure 7.6 Chapter 7 Landscape) which will increase and enhance optimal habitats for reptiles. Planting to enhance habitat connectivity throughout the scheme has also been designed, including heathland planting near Carland Cross. As well as planting to increase connectivity, two multi-species crossings suitable for reptiles will also be provided.

8.10.133 With the inclusion of crossings suitable for reptiles, and in time when the habitat planting is maturing, it is considered a slight beneficial effect is likely to occur for reptile populations throughout the scheme.

Birds

Breeding Birds

8.10.134 As described above in the construction effects assessment, it is concluded that the breeding bird population in the study area is of local value.

8.10.135 Once the scheme has been built and opened the only effects expected to be encountered by breeding birds are disturbance/displacement. However, again considering the partial habituation to disturbance in the area from existing highways along with the abundance of similar habitats available for foraging no significant impacts on this feature of local value are predicted.

8.10.136 As the habitats being created within the scheme mature will be of increasing use to breeding birds. Overall and in time this is considered to be a positive effect to those species associated with these habitats, however, the overall effect will remain at neutral significance.

Wintering birds

8.10.137 As described above in the construction effects assessment, it is concluded that the wintering bird population in the study area is of local value.

8.10.138 Once the scheme has been built and opened the only effects expected to be encountered by wintering birds are disturbance/displacement. However, again considering the partial habituation to disturbance in the area from existing highways along with the abundance of similar habitats available for foraging no significant impacts on this feature of local value are predicted.

8.10.139 As for breeding birds, habitat creation provided during the construction period matures, habitats such as hedgerows and heathland will be of increasing use to wintering birds. This is considered to be a positive effect to those species associated with these habitats, however, the overall effect of the scheme will remain at neutral significance.

Barn Owl

8.10.140 As described above in the construction effects assessment, it is concluded that the barn owl population in the study area is of local value.

8.10.141 As identified above, once operational the scheme could result in direct mortality due to collision with moving traffic. The characteristics of a barn owl's flight make them vulnerable to landscape changes and in particular, impacts can arise from built infrastructure. Road traffic mortality is significant in population densities near to major roads, and can be seen to reduce populations within 1.5 kilometres of a busy road [24]. As described in the barn owl desk study in Section 8.7, there were two RTC records of barn owl on the existing A30 between Chiverton and Carland Cross (Figure 1 in Appendix 8.1).

8.10.142 The Environmental Master Plan (Figure 7.6 Chapter 7 Landscape) shows habitats that will be created that will be of potential benefit for foraging barn owls away from the main carriageway of the scheme.

8.10.143 To help further prevent direct mortality of barn owls, the design mitigation includes sensitive woodland, tree and hedgerow planting along the scheme to deter barn owls crossing the road or foraging close to the road. In areas where this is not been possible a grass sward considered to be unattractive to foraging barn owls would be maintained on the verges directly adjacent to the highway, where practicable.

8.10.144 With the inclusion of these measures, it is assumed no significant impacts will occur on the barn owl population and as such, an effect of neutral significance is predicted.

Nightjar

8.10.145 As described above in the construction effects assessment, it is concluded that the nightjar population in the study area is of county value.

8.10.146 No disturbance or displacement effects are anticipated on the nightjar population during operation, based on the separation distances from the scheme. It should be noted that the main carriageway of the scheme will not be closer than the existing A30, which birds are habituated to in the landscape. Therefore, no significant impact on this species is predicted; as such, effects are assessed to be of neutral significance on nightjar.

8.10.147 As heathland habitat creation provided during the construction period matures, it is possible that it could be used by this species, though the proximity to the A30 may preclude nightjar from nesting. Whilst foraging may be more likely, at this stage it is assumed the proposed heathland will not have significant positive impact, so overall effects on nightjar remain at neutral significance.

<u>Otter</u>

8.10.148 As described above in the construction effects assessment, it is concluded that the otter population in the study area is of local value.

8.10.149 All watercourses will have culverts designed to maintain safe crossing for otters. Two culverts near Zelah will be 2.4 metre diameter box culverts with otter ledges for use in times of flood. The remaining three culverts will be 1.2 metres in diameter and will be available for otter use the majority of the time, with a 900 millimetre dry tunnel provided in these areas for use in times of flood.

8.10.150 Permanent severance of terrestrial habitat due to the operation of the scheme may lead to the same impacts as described above in the construction effects assessment. These impacts will be mitigated by the provision of dry multi-species crossings of at least 900 millimetres, allowing otters to move freely about the landscape. A further 15 multispecies crossing will be suitable for the use by otters, totalling 19 crossing suitable for otter throughout the scheme each being less than one kilometres apart.

8.10.151 A combination of badger and otter fencing will also be installed to funnel otters towards these crossings, as well as around attenuation ponds, to allow otter access to these whilst still preventing them from crossing the road.

8.10.152 To mitigate any potential impacts to otters associate with disturbance from road noise or lighting, the scheme will have planting on either side of the road including woodland, scattered trees, and Cornish hedges, which will help screen potential disturbances to otters from vehicle movements, noise and light.

Planting is detailed in The Environmental Master Plan (Figure 7.6 Chapter 7 Landscape), and more details on noise impacts are set out in Chapter 11 (Noise and Vibration). Lighting is also being designed to be sensitive to otters and other wildlife.

8.10.153 With the inclusion of these mitigation measures, it is assumed that no significant impacts will occur on the otter population during operation. Therefore, an effect of neutral significance is predicted.

Badger

8.10.154 As described above in the construction effects assessment, it is concluded that the badger population in the study area is of local value.

8.10.155 The number of RTC records on the existing A30 between Chiverton and Carland Cross indicates that badgers are still frequently crossing the road or are susceptible to collision in this area (Figure 1 in Appendix 8.1).

8.10.156 A total of 19 crossings suitable for badger use, located between 50 to 1000 metres apart, have been provided at suitable locations throughout the scheme where badgers paths and crossing points of the existing A30 were located, and ensuring at least one crossing in each identified territory. Badger fencing will also be installed throughout both sides of the scheme to funnel badgers towards these crossings.

8.10.157 The majority of the scheme will have planting in the form of woodland, scattered trees, or Cornish hedges on either side of the road, which will help screen the noise and light, and reduce disturbance to badgers and other surrounding wildlife. This planting is detailed in The Environmental Master Plan (Figure 7.6 Chapter 7 Landscape), and more details on noise impacts are set out in Chapter 11 (Noise and Vibration). Lighting will also be designed to be sensitive to badgers and other wildlife.

8.10.158 With the inclusion of these mitigation measures, it is assumed that no significant impacts will occur on the badger population during operation. Therefore, an effect of neutral significance is predicted.

Dormice

8.10.159 As described above, dormouse are considered likely absent from the study area, and as such, the operational effect on dormice is of neutral significance.

Bats

8.10.160 The bat populations in the study area are of varying values from national to less than local; please see the construction effects assessment above for further details.

8.10.161 No operational effects are considered on the national roost being over 6 kilometres from the scheme.

8.10.162 Woodland planting in the area of Trevalso Cottage will mitigate any long-term effect of habitat loss on the regional value Myotis species maternity roost resulting in an effect of neutral significance. The construction of an underpass for bats and planting in this area will mitigate any long-term habitat severance impacts resulting in an effect of neutral significance.

8.10.163 The replacement roost at NFH and compensatory habitat planting, in line with the mitigation licence, will mitigate any long-term impacts on the bats associated with the county value multi-species roost (Building 35), resulting in an effect of neutral significance. The provision of a green bridge suitable for bat crossing in this area will also mitigate any long-term habitat severance impacts resulting in an effect of neutral significance.

8.10.164 Woodland planting throughout the scheme will mitigate for the loss of the county value Myotis tree roost (T99) to be lost due to the scheme in the long-term, resulting in an effect of neutral significance.

8.10.165 Following the construction of the ten multi-species crossings suitable for bats, and establishment of extensive mitigation planting designed to provide habitat connectivity and enhanced foraging for bats, there will be no long term negative severance impact on the regional value linear features resulting in an effect of neutral significance during operation.

Other Section 41 Species of Principal Importance (SPI)

8.10.166 As described above in the construction effects assessment, it is concluded that the SPI populations in the study area are of local value.

8.10.167 Potential effects on SPI during operation of the scheme disturbance and direct morality through vehicle collision.

8.10.168 As mentioned above in Section 8.10, the habitats being created and enhanced exceeds those being lost within the scheme, with the exception of lower valued habitats such as arable and improved grasslands. The habitats being created throughout the scheme will provide suitable habitat for SPI, including hedgehog, harvest mouse, brown hare, polecat and common toad. These habitats have been designed to enhance habitats within the local area and provide habitat connectivity within the wider landscape.

8.10.169 A total of 19 multi-species are located throughout the scheme at least every kilometre that could be used by these SPI's.

8.10.170 Due to the creation and enhancement of habitats, and the provision of multi-species crossings, the effects of scheme operation on SPI populations is considered to be of neutral significance.

8.11 Monitoring

8.11.1 At present, moderate to slight adverse effects have been identified during construction relating to the temporary severance of bat habitats associated with regional value linear features and those associated general habitat loss of high quality habitats such as woodlands, hedgerows and species-rich grasslands. This temporary loss of vegetation is near impossible to mitigate during construction, although timing of vegetation clearance and construction in these areas may help minimise the impacts, they are not avoidable. Man-made hedgerows can be used to reduce temporary habitat severance for bats, as mentioned above, and as such, monitoring may be required to determine whether the bats are using such structures or alternative linear features.

8.11.2 Monitoring will be required during and post construction at identified crossing points for bats and along landscape scale transect for comparative analysis [3]].

8.11.3 Monitoring will be required for habitat clearance to ensure no animals are harmed during the clearance and to ensure all retained vegetation are not damaged during the works. Habitats planted throughout the scheme which will provide a moderate to slight beneficial effect, will also require detailed monitoring and management plans, which will be provided in the ES.

8.11.4 Monitoring will be required under licence applications for bats and badgers, to ensure these species are correctly and fully excluded before demolition of currently used setts and roosts, and to determine whether artificial setts and roosts are being utilised. Reptile mitigation strategies, such as fencing, will also require monitoring throughout construction and post-construction, if required. Monitoring may also be required for otter presence during construction, particularly in locations where they are likely to cross the construction of the road.

8.11.5 Once the scheme is in operation there are no adverse effects predicted, however monitoring of mitigation strategies will be required, such as mammal fencing and multispecies crossing to ensure these are functioning correctly. Details of the monitoring and management of such assets will be provided within the ES.

8.11.6 Monitoring requirements may change as more data becomes available for analysis and during consultation. Any potential changes, including the requirement for monitoring and what form that monitoring will take, will be detailed in the ES.

8.12 Summary

8.12.1 The majority of ecological receptors within the study area have been assessed as being of local, or less than local value, the exceptions being mainly associated with designated sites and bats.

8.12.2 Newlyn Downs SAC is of international value. SSSIs and maternity roosts of rarest bat species are of national value. Maternity roosts of rarer bats species and linear features for rarest bat species are of regional value.

8.12.3 At present, a moderate to slight adverse effect has been identified during construction relating to the temporary severance of linear features used by rarest, rarer and common species of bats. As mentioned above, this follows mitigation to minimise impacts through provision of man-made hedgerows during activity season and period (dusk to dawn). Any bat roosts being impacted during construction will be mitigated through artificial bat roosts or other mitigation measures provided under licence.

8.12.4 Moderate to slight adverse effects have been identified during construction relating to general habitat loss, including hedgerows, because the majority of habitats being created and enhanced will not be fully available until the operational phase. However, these habitats when fully planted and maturing will provide a moderate to slight beneficial effect during operation.

8.12.5 No adverse effects have been predicted during operation. This will be achieved through landscape planting designed to provide a net gain for biodiversity and connectivity into the wider landscape. Numerous multi-species crossings with fencing throughout the scheme will also provide safe connectivity for mobile species.

8.12.6 Full details of habitat creation and enhancements, and their associated maintenance and monitoring will be provided within the Outline EMP in the ES.

Further Work

8.12.7 It should be noted that at this stage the information presented here is preliminary, and is based mostly on the 2017 scheme design, as described in Chapter 2 The Project. Further EIA work is currently being undertaken to confirm the scale and significance of predicted environmental impacts arising from the scheme design. The final EIA work will be reported within the ES, which will accompany the DCO application to be made in Summer 2018.

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A30 Chiverton to Carland Cross Improvement Scheme

Preliminary Environmental Information Report

Chapter 9 Geology and Soils

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9 Geology and Soils

9.1 Introduction

9.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) describes and characterises the baseline geological setting of the A30 Chiverton to Carland Cross scheme ('the scheme') with respect to geology, geomorphology, designated sites, land stability, mineral resources, hydrogeology and land contamination (hereafter referred to as 'geology and soils' unless otherwise stated). This chapters identifies and assesses the potential effects of the construction and operational phases of the scheme with respect to geology and soils and is assessed in accordance with the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 11 [1].

9.1.2 This chapter sets out a baseline conceptual site model with respect to soil and groundwater contamination, and identifies plausible contaminant linkages formed due to the construction and/or operational phases of the scheme.

9.1.3 This chapter describes the assessment methodology, baseline conditions, potential significant effects, mitigation measures and the likely residual effects remaining after implementation of mitigation measures. Mitigation measures reduce the significance of potential adverse effects on geological resources or receptors of soil and/or groundwater contamination.

9.1.4 Chapter 10 (Materials) describes the use of materials and the generation and management of waste. It also describes the suitability for reuse of soils. Chapter 12 (People and Communities) describes the potential effects of the scheme on the agricultural use of soils.

9.1.5 Whilst this chapter describes the potential effects on groundwater and surface water quality in a context of land contamination, Chapter 13 (Road Drainage and the Water Environment) describes the potential effects on groundwater and surface water of drainage and discharge and potential effects on hydrogeology associated with the construction and operation of the scheme.

9.2 Legislation, policy context and guidance

Legislation background

9.2.1 Geological sites of national importance are principally afforded protection under the Wildlife and Countryside Act 1981 (as amended) or the National Parks and Access to the Countryside Act 1949 by designation as Site of Special Scientific Interest (SSSI) or National Nature Reserve (NNR). In addition, the Joint Nature Conservation Committee (JNCC) have carried out a Geological Conservation Review (GCR) and Earth Science Conservation Review (ESCR) to identify the best and most representative earth science sites in Great Britain, with a view to their long-term conservation. Although GCR/ESCR identification does not itself give any statutory protection, many GCR/ESCR sites have been notified as SSSIs/ASSIs.

9.2.2 Environmental legislation and regulation provide separate drivers to manage contamination. The main legislative drivers for managing risks to human health and the environment from land contamination are:

- Part IIA of the Environmental Protection Act (1990);

- Contaminated Land Regulations (2012);
- Environment Act (1995); and
- Environmental Permitting Regulations (2016).

9.2.3 Under Part IIA of the Environmental Protection Act, sites are identified as 'contaminated land' if they are causing, or if there is a significant possibility of causing significant harm to human health or significant pollution of controlled waters (as defined by Section 104 of the Water Resources Act 1991).

9.2.4 In general terms, the legislation advocates the use of a risk assessment approach to assessing contamination and remedial requirements.

9.2.5 A list of additional key legislation and guidance considered within the assessment relating to contamination and the water environment include:

- Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009;
- EU Water Framework Directive (WFD) 2000/60/EC (as amended by supplementary directives and decisions);
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 which implement Water Framework Directive (2000/60/EC), and transpose aspects of the Groundwater Directive (2006/118/EEC) and the Priority Substances Directive (2008/105/EC);
- The Water Framework Directive (Standards and Classification) Directions England and Wales 2015;
- Groundwater Regulations (England and Wales) 2009, which transpose the EC Groundwater Directive 80/68/EC into UK law;
- Groundwater Daughter Directive (GWDD) (2006/118/EC);
- Department for Environment Food and Rural Affairs (Defra) (2015) The Water Framework Directive (Standards & Classification) Directions (England and Wales);
- The Environmental Damage (Prevention and remediation) Regulations 2009; and
- Flood and Water Management Act 2010.

9.2.6 The Geology and Soils chapter of this PEIR documents the assessments carried out in line with the requirements of DMRB Volume 11 Section 3 Part 11, which does not include the assessment of waste production, disposal or management, which are included in Chapter 10 Materials.

National and regional policy

9.2.7 The National Planning Policy Framework [2] and the Regional Planning Guidance for the South West (RPG 10) [3] provides general guidance and information with regard to development planning in England and the south-west region. It provides information on the planning objectives for the region, and puts particular emphasis on the need for sustainable development in terms of the resources used, the maintenance of the environment, the economic use of land and consideration of society in the general area. Within the policy, the importance for the restoration of derelict and contaminated land is stated.

9.2.8 In relation to conserving and enhancing the natural environment, the National Planning Policy Framework [2] states that impacts on geodiversity should be minimised by preventing harm to geological conservation interests. In the UK,

geological sites are afforded consideration at a local level by designation, including:

- Geological Conservation Review (GCR) sites (England, Scotland, Wales);
- Geoparks;
- Regionally Important Geological and Geomorphological Sites (RIGS);
- Locally Important Geological and Geomorphological Sites (LIGS);
- Sites of Importance for Nature Conservation (SINC).

9.2.9 The National planning guidance sets out the principles of the planning system with respect to the development on unstable land and land affected by contamination. It places an emphasis on the requirement to understand the ground risks, and on the development of appropriate remediation to make ground hazards material considerations during the planning process.

9.2.10 The National Planning Policy Framework [2] paragraph 120 states: “Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner”

9.2.11 Relevant national and regional policy documents include:

- National Planning Policy Framework (NPPF), Department for Communities and Local Government (DCLG), March 2012 [2];
- Regional Planning Guidance for the South West (RPG 10), 2001 [3].
- National Policy Statement for National Networks (NN NPS), Department for Transport, 2014 [4];
- Technical Guidance to the NPPF, DCLG, 2012 [5] ;

Local planning policy

9.2.12 The Cornwall Local Plan [6] provides guidance with respect to development planning in Cornwall Council (CC). It provides information on the spatial strategy and places emphasis on the value and sensitivity of geodiversity. It provides guidance on the protection of geodiversity in accordance with international, national and local status and recommends mitigation. Development should avoid adverse impact on existing features as a first principle and enable net gains by designing in opportunities for geological conservation alongside new development.

9.2.13 CC is preparing a Minerals Safeguarding Development Plan Document [7] to identify areas of mineral resource and infrastructure that will be safeguarded for future use. The draft Development Plan [7] provides guidance on safeguarding of mineral areas. A list has been developed of strategically important shafts and mining areas. It states that its principal objective is “to safeguard mineral resources, sites and infrastructure from other forms of incompatible development”. Safeguarding policy states that applicants for non-mineral development within Mineral Safeguarding Areas must demonstrate that no mineral resource in the area will be sterilised by the proposed development.

Relevant guidance

9.2.14 This PEIR and the Environmental Statement to follow is undertaken with due consideration of the following guidance:

- Geotechnics and Drainage, Earthworks, Managing Geotechnical Risks DMRB Volume 4, Section 1, Part 2 HD22/08 [8];
- Assessment and Management of Environmental Effects, DMRB Volume 11, Section 2, Part 5 [9];
- Geology and Soils, Environmental Assessment, Environmental Assessment Techniques, Highways Agency, DMRB Volume 11, Section 3, Part 11 [10];
- Contaminated Land Statutory Guidance, Department for Environment, Food and Rural Affairs (Defra), 2012 [11];
- Model Procedures for the Management of Land Contamination (CLR11) Defra and Environment Agency, 2004 [12];
- CIRIA R132: A Guide for Safe Working on Contaminated Sites [13];
- CIRIA SP73: Roles and Responsibility in Site Investigations [14];
- BS 5930: 2015: Code of Practice for Site Investigations [15];
- BS 10175:2011 + A1 2013: Code of Practice for Investigation of Potentially Contaminated Sites [16];
- Groundwater protection [17];
- The Environment Agency's approach to groundwater protection [18];
- CIRIA 552: Contaminated Land Risk Assessment, A guide to good practice [19];
- BS 8485:2015: Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings [20];
- CIRIA 665: Assessing risks posed by hazardous ground gas to buildings [21];
- CIRIA 681: Unexploded ordnance (UXO) A guide for the construction industry [22];
- CIRIA 733: Asbestos in soil and made ground: a guide to understanding and managing risks [23];
- CIRIA C765: Asbestos in soil and made ground: good practice site guide [24];
- Eurocode 7 (BS EN 1997-1 [25] & EN 1997-2 [26]) and all relevant normative guidance;
- Planning Practice Guidance for land stability [27];
- Draft version of CIRIA RP940: Abandoned Mine Workings Manual [28].

9.3 Study area

9.3.1 The scheme study area for all aspects of the Geology and Soils chapter (including geology, geomorphology, designated sites, land stability, mineral resources, hydrogeology and land contamination) comprises the maximum physical extent of the development footprint (the scheme) plus a buffer zone of 250 m. This distance is referenced in best practice documents, including Guidance for the Safe Development of Housing on Land Affected by Contamination: R&D Publication 66 (NHBC, 2008 [29]), and is typical at the hazard identification stage of an assessment. The scheme study area has been increased to 1km for the assessment of the effects on groundwater abstractions.

9.3.2 If there is considered to be a potential for features outside of this buffer zone to be impacted by or to constrain the scheme, then these will be included in the assessment and presented in the Environmental Statement. It is noted that Volume 11 Section 3 of the DMRB does not specify a minimum study area distance for the assessment of impacts to geology and soils.

9.4 Potential impacts of the scheme on soils and geology

Geology and geomorphology

9.4.1 No protected areas with respect to geology or geomorphology have been identified within the study area, and therefore no potential effects on such features have been identified. Rock exposures as a result of cuttings may have a beneficial effect as a result of exposing the geological formation.

9.4.2 The majority of the scheme is offline and therefore the scheme would limit access to mineral resources beneath the proposed alignment. Some embankments are proposed, which will prevent future access to the underlying rock, which is considered a mineral resource. The proposed cuttings would result in removal and potential effective use of mineral resources.

9.4.3 There are no Mineral Safeguarding Sites within the vicinity of the scheme, and hence there are no potential effects on these locally designated sites.

9.4.4 The scheme is located within areas that have been mined historically, both below ground and from the surface. If mine working or mine entrances are present beneath the scheme there is an increased risk of collapse settlement of the ground surface. The stabilisation of possible mine workings may also affect the hydrogeological regime, including the chemical characteristics of the groundwater and the flow and supply of groundwater. If necessary (following detailed mining investigations) the effects on groundwater chemistry resulting from mine working stabilisation will be assessed as part of the Environmental Statement and the effects on the hydrological and hydrogeological resources will be considered within the Road Drainage and Water Environment Chapter.

9.4.5 Temporary or even permanent drainage may be required in areas of cutting, which may affect the supply of water to springs, streams and other surface water features such as bogs, marshes and ponds. This will be assessed within the Road Drainage and Water Environment Chapter of the PEIR. Consideration will also be given the position of embankments to ensure that they do not block springs and streams.

Soils

9.4.6 Potential effects upon soils within the study area will manifest as a result of the construction and presence of the scheme. The potential effects on the agricultural use of soils are considered within Chapter 12, People and Communities.

9.4.7 Other potential effects to soils that will be considered within the chapter of the PEIR include the following:

- Soil erosion as a result of new road cuttings leading to sediment loading of nearby surface water bodies (if contaminated this could potentially be a more significant negative effect); and
- Soil compaction and devegetation as a result of increased hardstanding cover leading to a reduction in infiltration and an increase in surface water runoff.

Contaminated land

9.4.8 Potential effects of the construction and operation of the scheme in relation to contaminated land may include:

- Creation of new migratory pathways between potentially contaminated soils and underlying aquifers through ground disturbance such as piling activities;
- Re-use of site won or imported contaminated materials in the construction;
- Creation of migratory pathways between potentially contaminated land and construction workers and neighbouring site users;
- The migration of ground gas in association with mine workings/mine entrances, migration and accumulation in excavations, structures (drainage etc);
- The introduction of contaminative materials, e.g. due to inappropriate storage and use of fuels, etc., or use of grout during mineworkings treatment works, which may impact water resources.
- Contamination of controlled waters as a result of contaminated surface water runoff from the proposed development discharging into surface water bodies or groundwater resources will be discussed within the Road Drainage and Water Environment Chapter.

9.4.9 Any potential mitigation measures will be developed as the assessment is carried out and will be included in the scheme design.

9.4.10 It will be assumed that potential effects on human health (e.g. construction and maintenance workers) will be mitigated through adherence to all relevant legislation and best practice including the Construction (Design and Management) Regulations (CDM) 2015 and the Control of Substances Hazardous to Health Regulations (COSHH) 2002, as amended.

9.4.11 The assessment will also consider potential constraints on the scheme design relating to designated sites and existing land contamination, including the potential aggressivity of chemical agents in the ground, which are destructive to concrete.

9.5 Assessment methodology

Value of receptor

Approach to identification of baseline conditions

9.5.1 The identification of baseline conditions in relation to site geology, geomorphology and land contamination is primarily based on desk study information included within the PSSR [30] prepared for the scheme and information obtained during the Phase 1 GI. The results of this investigation are presented within the Factual Report [31] and the interpretation presented within the GIR [32]. Further pertinent information has been included from previous investigations and studies of the site as detailed in paragraph 9.6.62. Following collation of the factual information, the interpretation of this factual data has been presented in the Baseline Conditions Section 9.4.

9.5.2 The baseline conditions in relation to agricultural soils are presented in Chapter 12, People and Communities.

9.5.3 The following studies and reports were also reviewed as these were referenced as key sources for the PSSR [30]:

- Hyder Consulting (2003), A30 Chiverton to Carland Cross PSSR [33];
- Parsons Brinckerhoff (2005), A30 Chiverton Cross roundabout improvement, geotechnical report [34].

- AccordMP (2008). A30 Chiverton Cross CCTV mast. Geotechnical Report for Highways Agency [35];
- Engineering Services Laboratory (CC) (2009). A30 Chiverton Cross Roundabout Improvement Preliminary Sources Study Report (PSSR) for CC [36].

9.5.4 The following factual reports of ground investigation were also reviewed:

- Department for Transport (1988). London – Penzance Trunk Road A30 Penhale to Carland Cross Improvement factual report for Department of Transport [37].
- Soil Mechanics (2004). A30 Chiverton to Carland Cross preliminary ground investigation factual report for Hyder Consulting Ltd [38].
- Parsons Brinckerhoff (2005), A30 Chiverton Cross roundabout improvement, geotechnical report (including factual information) for Highways Agency [34].
- AccordMP (2008). A30 Chiverton Cross CCTV mast. Geotechnical Report (including factual information) for Highways Agency [35].

9.5.5 A gap analysis of the information contained within the PSSR has been undertaken and the existing information validated and updated where appropriate. The scope of baseline survey is discussed for specific topic areas below:

- Geology and geomorphology:
  - British Geological Survey (BGS) 1:50,000 scale geological map of Newquay, Sheet 346. 2012 [39];
  - BGS ‘Geology of Britain’ viewer [40];
  - Memoir for the Geological Map Sheet 346, Geology of the Newquay district [41];
  - Memoir for the Geological Map Sheet 352, Geology of the country around Falmouth [42];
  - Topographical survey [43];
  - BGS Onshore Geoindex [44].
- Current and historical land use:
  - Groundsure Enviroinsight Report [45] and Geoinsight [46] including historic 1:2,500 and 1:10,000 Ordnance Survey plans, included in the 2017 PSSR report [30];
  - Results of a site walkover carried out 4th August 2016 as reported within the 2017 PSSR [30];
  - Aerial photography interpretation;
  - Environment Agency ‘What’s In Your Backyard?’ application [47];
  - Defra online ‘Magic’ map application [48].
- Hydrology and hydrogeology:
  - Meteorological Office website [49];
  - Groundsure Enviroinsight Report [45] and Geoinsight [46], included in the PSSR [30].
- Mining and mineral safeguarding:
  - Highways Agency Geotechnical Data Management System (HAGDMS) [50]

  - CC online web viewer [51];
  - Cornwall Consultants mining records and assessment provided within the 2003 Hyder Consulting Ltd PSSR [33];
  - Updated Cornwall Consultants mining report and risk assessment [52];
  - The Review of Mining Instability in Great Britain – South West Regional report prepared by Arup for the Department of the Environment [53];
  - BGS report on the metalliferous mining region of south-west England [54];
  - BGS 1:100,000 Mineral Resource map for Cornwall and the accompanying Mineral Resource Information for Development Plans report [55];
  - Historic OS plans contained within the Groundsure report [30] will be used to identify the potential presence of historic quarries.

- Land stability:
  - Results of a site walkover carried out 4th August 2016 as reported within the PSSR [30];
  - Aerial photography interpretation [56];
  - Groundsure Enviroinsight Report [45] and Geoinsight [46], including historic 1:2,500 and 1:10,000 Ordnance Survey plans, included in the PSSR report [30].
- Soil survey:
  - The land use baseline with respect to agricultural use will be discussed within Chapter 12, People and Communities.
- Ground conditions encountered during ground investigations:
  - Results of a site walkover carried out 4th August 2016 as reported within the2017 PSSR [30];
  - Groundsure Enviroinsight Report [45] and Geoinsight [46], including historic 1:2,500 and 1:10,000 Ordnance Survey plans, included in the 2017 PSSR report [30];
  - Information from historical and recent ground investigations as listed within paragraph 9.5.4;
  - The BGS borehole records database has been reviewed and available borehole records obtained for the local area [40].
- Consultation with statutory and non-statutory bodies and agencies
  - Environment Agency;
  - Natural England;
  - CC;
  - Environmental Record Centre for Cornwall and the Isle of Scilly (ERCCIS).

Ground investigation survey methodology

9.5.6 The intrusive ground investigations were undertaken in line with best practice current at the time of the report production. The most recent investigation in 2017 by Structural Soils was carried out in accordance with BS EN 1997-2 Eurocode 7 [57] and BS5930:2015 Code of Practice for Site Investigations [58]. These investigations involved a mixture of mechanically excavated trial pits and borehole excavated using dynamic sampling and rotary coring techniques. Soil and rock samples were recovered and sent to suitably accredited laboratories for chemical and/or geotechnical testing.

9.5.7 As part of the investigations, boreholes were equipped with groundwater and ground gas monitoring installations. Groundwater level monitoring was undertaken from these installations, however, ground gas monitoring was not undertaken. As part of the Soil Mechanics 2004 investigations, samples of groundwater were obtained and were sent to a suitably accredited laboratory for chemical testing. No other groundwater sampling and analysis was undertaken.

9.5.8 The exact details of the methodology employed by the ground investigation contractors are described within the ground investigation contractor's factual report.

Baseline assessment methodology

9.5.9 The assessment of baseline conditions is based on the scope of baseline studies presented in paragraph 9.5.2 to paragraph 9.5.5. Geological and geomorphological features that have potential to be impacted by the scheme have been identified. This information has also informed the baseline information associated with land stability and land contamination.

9.5.10 The baseline Land Contamination Conceptual Site Model is based on the information reviewed as part of the baseline study preparation, as detailed paragraph 9.5.2 to paragraph 9.5.5 and presents the identified potential pollution linkages, i.e. the presence of sources of contamination, receptors (both human and environmental) and pathways through which the contamination could have a detrimental impact on these receptors.

9.5.11 Sensitive receptors have been identified based on the review of the existing information and additional works undertaken to inform the EIA process. Identified receptors include:

- Areas of geological or geomorphological interest;
- Soils and or groundwater;
- Sensitive human receptors;
- Controlled waters that may be affected by contaminants; and
- Ecological receptors that may be affected by contaminants.

9.5.12 Potential sources of contamination have been identified based on the review of existing information, including the results of contamination testing from previous intrusive investigations and other works undertaken to inform the EIA process. These include:

- Historic industrial/commercial activities;
- Current industrial/commercial activities;
- Possible or known areas of made ground;
- Locations of pollution incidents or licensed discharges; and
- Review of past and present environmental permits, processes, licences.

9.5.13 Potential pathways through which the contamination from identified sources may reach the sensitive receptors have been based on the review of the study study information and ground investigation information, relevant pathways include:

- Ingestion, inhalation, or dermal contact with soils/dust originating from the sources of contamination;
- Inhalation of ground gasses/hydrocarbon vapours originating from sources of contamination; and

- Leaching and migration of contamination.

Methodology for assessment of construction impacts

9.5.14 The assessment of the construction impacts on the geology, geomorphology and land contamination has been carried out through consideration of baseline conditions in the context of the extent, method and programme of proposed earthworks and construction activities. A detailed description of the scheme proposals is presented in Chapter 2 The Project.

9.5.15 For the purpose of the assessment the following construction activities are considered:

- Construction of cuttings – the location, name and maximum depth of cutting are presented within Chapter 2.
- Construction of earth embankments – the location, name and maximum height of embankments are presented within Chapter 2.
- Construction of structures – the location, name and proposed design solution are presented within Chapter 2. Culverts would be required to accommodate the watercourses and springs crossing the proposed alignment; these would be constructed as part of the embankment construction.

9.5.16 The methodology for assessing the construction impacts on the geology and soils is in accordance with the procedure outlined in Volume 11 of DMRB (Section 3 Part 11, Geology and Soils). This is summarised below:

- Step 1: assess the importance / value of any geological or geomorphological feature or identified receptor using the criteria;
- Step 2: assess the magnitude of the effect of construction on the geological or geomorphological feature or identified receptor using the criteria; and
- Step 3: combine the importance and the magnitude of the effect of construction on the receptor using the relevant matrix to establish the overall significance of the effect.
- Step 4: determine the significance of cumulative effects using the relevant matrix.

9.5.17 A review of the baseline data identifies and refines the extent of potentially contaminated land site within the study area, the need for further focussed assessment has been considered where existing or suspected contamination may be affected by the route, i.e. by creating or altering pollutant linkages between sources and sensitive receptors.

9.5.18 For the assessment of construction impacts the Conceptual Site Model (CSM) has been revised to include new pollution linkages introduced during the construction phase. The revised Conceptual Model has been used to establish the risks posed and the potential need for further assessment.

9.5.19 Those contamination sources identified fully outside of the study area have been scoped out and therefore require no further assessment.

Methodology for detailed assessment of potential effects

9.5.20 Assessment of effects in relation to land instability (for mining, landsliding and natural cavities) have been undertaken in accordance with industry best practice as presented within Planning Practice Guidance on land stability [27]. More

specific guidance in relation to mining has been followed, including the Abandoned Mine Workings manual CIRIA C758 [28].

9.5.21 If land stability is considered to be a hazard, the steps set out in the Planning Practice Guidance on land stability [27] shall be carried out to manage the risks and identify further action that may be required. This would include appropriate desk study, site visits and other investigations. Investigations should be undertaken with the aim of ascertaining that the site is or can be made stable.

9.5.22 Assessment of effects in relation to contamination will be undertaken in accordance with industry best practice as presented in CLR11 [12]. The risk assessment process is underpinned throughout by the development of the Conceptual Site Model (CSM), which provides a schematic representation of the identified contaminated linkages.

9.5.23 The process comprises a tiered approach, which starts with a simple and conservative Tier 1 assessment of potential risks from possible Pollutant Linkages (Source-Pathway-Receptor). At this stage potential Pollutant Linkages are identified. Where suitable investigation data exists to assess these, the data will be used to ascertain whether a risk exists. If suitable investigation data does not exist, the required investigations to confirm whether such a linkage is viable will be defined, e.g. where there is a possibility of presence of made ground, soil sampling and laboratory testing will be identified as the required investigation.

9.5.24 Any potential risks identified at Tier 1 will be studied in more detail through a Tier 2: Generic Quantitative Risk Assessment (GQRA). The results of any investigations completed will be reviewed at this stage and quantitative assessment is undertaken. The methodology for a GQRA is presented in Sections 9.5.27 to 9.5.32.

9.5.25 If a Tier 2 assessment identifies potential risk, i.e. the applied generic assessment criteria are exceeded, a Tier 3: Detailed Quantitative Risk Assessment (DQRA) is required. This involves derivation of site specific assessment criteria and may involve additional targeted ground investigations to refine the Conceptual Site Model. Where pollutant linkages are identified as viable on completion of Tier 3 assessments, remediation mitigation measures would be identified. However, the detailed design of how required mitigation would be implemented, would be completed at a detailed design stage including remedial options appraisal and remediation and verification plan. It is also acknowledged that as per any other highway scheme, further investigation work will be carried out and additional assessments will be completed as construction progresses. These however would follow the methodology set out above.

9.5.26 The assessment is on the basis of all soils that are suitable for reuse being retained on site as part of the scheme. Geotechnical and chemical acceptability criteria will be established for any soils proposed for reuse, with soil samples tested and screened against the acceptability criteria as the work progresses. This will ensure that the acceptability of soils for reuse is demonstrated and verified. Any soils that do not meet the chemical acceptability criteria shall be treated or disposed of to a suitably licenced facility. In addition, a discovery strategy will be developed to enable unforeseen ground conditions to be addressed if or when encountered. Any imported soils will also require verification prior to use within the scheme. This approach to soil sampling, testing and assessment will be defined in an earthworks specification for the construction

works that will be prepared in accordance with the Specification for Highway Works Series 600 Earthworks – that is applicable for the scheme.

Generic quantitative risk assessments methodology – human health

9.5.27 Where a potential pollution linkage is identified in relation to human health a generic quantitative risk assessment (GQRA) will be undertaken. This will be done by screening available soil chemical test results against published generic assessment criteria for a suitable land use scenario, such as DEFRA Category 4 Screening Levels (C4SLs) [59], and where these are not available, the LQM/CIEH Suitable 4 Use Levels (S4ULs) [60].

9.5.28 The applied assessment criteria, as per paragraph above, have been derived using the Environment Agency Contaminated Land Exposure Assessment (CLEA) model. This model defines Age Classes for receptors within a number of generic end use scenarios.

Generic quantitative risk assessments methodology – controlled waters

9.5.29 Where a potential pollution linkage is identified in relation to controlled waters a GQRA is undertaken. Where impact of groundwater onto surface waters is being assessed, this is achieved by screening available water chemical testing results against the Environmental Quality Standards for annual average inland surface water (freshwater) values. Assessing the impact on drinking water resources is achieved by screening available water chemical testing results against UK Drinking Water Standards. Impact of hazardous leachable contaminants on the underlying groundwater will be assessed by comparing minimum reporting values against measured concentrations.

9.5.30 Where the FEQS is dependent on bioavailability, which is the case for copper, manganese and zinc, for the purpose of the assessments, it has been conservatively assumed that the measured concentrations reflect the bioavailable dissolved metals. This is due to the fact that the groundwater analysis available was undertaken before the implementation of the bioavailability protocols and on this basis critical parameters for the assessment of bioavailable concentrations were not analysed (e.g. calcium and dissolved organic carbon concentrations).

Ground gas risk assessment methodology

9.5.31 Where a potential pollution linkage is identified in relation to ground gas an initial screening exercise is undertaken based on a review of the potential for ground gas generation undertaken CIRIA C665, CL:AIRE RB17. On the basis of this initial assessment the requirement for further intrusive ground gas monitoring will be derived.

9.5.32 Due to the nature of the scheme, i.e. no buildings are included within the development, the assessment involves only derivation of Gas Screening Values (GSVs) based on recorded maximum concentrations of methane and carbon dioxide, and the measured maximum gas flow. The derived GSV will be then compared to GSV thresholds to obtain a risk classification.

Methodology for assessment of operational impacts

9.5.33 The assessment of the operational impacts on the geology, geomorphology and land contamination will be carried out through consideration of baseline conditions in the context of the operational activities. Assessment of any new

pollution linkages will be undertaken in line with the processes detailed in paragraph 9.5.20 to 9.5.32.

9.5.34 The assessment will be on the basis of all soils that are suitable for reuse being retained on site for reuse within the scheme. It is on the basis of measures being taken to establish acceptable reuse criteria and procedures for the scheme to ensure that suitability of material for reuse can be demonstrated and verified. For this approach, a discovery strategy would be developed to enable unforeseen ground conditions to be addressed if or when encountered. This approach is in line with the Specification for Highway Works, Series 600 – Earthworks that is applicable for the scheme, and standard practice for earthwork. Inter-relationships with the Materials chapter of the PEIR would be captured relating to soil re-use.

Magnitude of impacts

9.5.35 The significance and magnitude of impacts will be assessed by attributing an environmental value or sensitivity to each receptor impacted, in combination with the magnitude of impact that would occur to it. The sensitivity of each receptor will be assessed based on Table 9-1, and the magnitude of impact in accordance with Table 9-2.

Table 9-1 Criteria and DMRB definitions of sensitivity or value according to HA 205/08 [61].

Value (sensitivity)	Typical Descriptors
Very high	**Geology/ Mineral Resources:** Very rare and of very high national and regional geological/geomorphological importance with no potential for replacement (e.g. designated sites of national importance including SSSI, active quarries and mining activities of national importance). **Groundwater:** Groundwater with a high quality and rarity on a regional or national scale with limited potential for substitution (e.g. principal aquifer providing potable water to a large population). **Surface water:** European Community (EC) Designated Salmonid/Cyprinid fishery Water Framework Directive (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. **Land Contamination:** Human health (High sensitivity land use scenario e.g. residential, public open space). **UXO** Human health
High	**Geology/ Mineral Resources:** Medium national and high regional geological/ geomorphological importance with limited potential for replacement (e.g. currently non-designated GCR site, regionally important site, active quarries and mining activities of regional or local importance). **Groundwater:** Groundwater with a high quality and rarity on a local scale with limited potential for substitution, or attribute with a medium quality or rarity on a regional or national scale with limited potential for substitution (e.g. principal aquifer providing potable water to a small population and/or large resource potential). **Surface water:**

Value (sensitivity)	Typical Descriptors
	WFD Class 'Good' Major Cyprinid Fishery Species protected under EU or UK habitat legislation **Land Contamination:** Sensitive receptor, which is the reason for SSSI designation. Human health (Lower sensitivity land use scenario e.g. commercial, industrial)
Medium	**Geology / Mineral Resources:** Low regional and high local geological/ geomorphological importance with some potential for replacement (e.g. allocated RIGS or recommended RIGS). **Groundwater:** Groundwater with a medium quality and rarity on a local scale with limited potential for substitution, or attribute with a low quality and rarity on a regional or national scale with limited potential for substitution (e.g. secondary aquifer unit supporting abstraction for agricultural or industrial use and/or moderate resource potential). **Surface Water:** WFD Class 'Moderate' **Contamination:** Receptor that is of regional importance.
Low	**Geology / Mineral Resources:** Of local geological/geomorphological importance with potential for replacement (e.g. non-designated exposure/former quarries and mining activities). **Groundwater:** Groundwater with a low quality and rarity on a local scale with limited potential for substitution (e.g. non-aquifer unit that does not afford protection to underlying water bearing units). **Surface Water:** WFD Class 'Poor' **Land Contamination:** Human health (Low sensitivity land use scenario e.g. highway construction). Receptor of local importance.
Very low	**Geology / Mineral Resources:** Little local geological/geomorphological interest. **Land Contamination:** Receptor with low importance and rarity.

Table 9-2 Criteria and DMRB definitions of magnitude of impact according to HA 205/08 [61].

Magnitude of Impact	Typical Criteria Descriptors
Major	**Geology / Mineral Resources:** The proposals are very damaging to the geological environment/soils resource of the area. May result in loss or damage to areas designated as being of regional or national geological interest. Loss of resource and/or quality and integrity of resource. Severe damage to key characteristics, features or elements. Impacts cannot be mitigated for (e.g. destruction of a designated site (SSSI or RIGS)). (Adverse) **Controlled Waters (aquifers/surface water):** Reduction of water quality rendering groundwater or surface water unfit to drink and/or substantial adverse impact on groundwater dependent environmental receptors. (Adverse) **Land Contamination:** Major effect upon receptor. Severe or irreversible effect on human health. Temporary severe or irreversible effect on ground/surface water quality. (Adverse).
	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality (Beneficial).
Moderate	**Geology / Mineral Resources:** The proposals may adversely affect the geological/hydrogeological conditions/soils resource existing at the site but would not result in the loss of, or damage to, areas designated as being of regional or national geological interest. Loss of resource, but not adversely affecting the integrity. Partial loss of/damage to key characteristics, features or elements. Some mitigation may be possible but would not prevent scarring of the geological environment, as some features of interest would be lost or partly destroyed. (Adverse) **Controlled Waters (aquifers/surface water):** Reduced reliability of a supply at a groundwater or surface water abstraction source. (Adverse) **Land Contamination:** Moderate effect upon receptor. Long term or short term moderate effect on human health. Moderate effect on ground/surface water quality, reversible with time. (Adverse)
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial).
Minor	**Geology / Mineral Resources:** The proposals would not affect areas with regional or national geological interest/soils resource but may result in the loss of, or damage to, areas of local geological/soils resource interest. Cannot be completely mitigated for but opportunities exist for the replacement of lost or damaged areas which may be of similar local geological/soils interest. (Adverse) **Controlled Waters (aquifers/surface water):** Marginal reduced reliability of a supply at a groundwater or surface water abstraction source. (Adverse) **Land Contamination:** Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc.). Slight effect on ground/surface water quality, reversible with time. (Adverse)

Magnitude of Impact	Typical Criteria Descriptors
	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	**Geology / Mineral Resources:** The proposals would result in very minor loss or damage to local area of geological interest/soils resource such that mitigation is not considered practical. Very minor loss or detrimental alteration to one or more characteristics, features or elements. (Adverse) **Controlled Waters (aquifers/surface water):** Non-measurable change to quality, level and flow. (Adverse) **Land Contamination:** Results in no discernible change or an impact on attribute of sufficient magnitude to affect the use/integrity. (Adverse) e.g. Soil contaminants present, but risk assessment suggests negligible/ low risk to human health. (Adverse)
	Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial).
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

Assessment of significance

9.5.36 The assessment of significance for negative (adverse) and positive (beneficial) effects is based on consideration of the sensitivity or value of a receptor (within Table 9-1) combined with the magnitude of impact (within Table 9-2). The significance of an impact will then be assessed by considering the combination of both the sensitivity of the receptor in combination with the magnitude of impact in accordance with Table 4-3 in Chapter 4.

9.6 Baseline Conditions

Topography and geomorphology

9.6.1 The findings of the Preliminary Sources Study Report (PSSR) [30], Ground Investigation Report (GIR) [32] and a review of aerial photography [56] have been used to describe the topography and geomorphology. Figure 9 1 presents a digital terrain model (DTM) derived from the publicly available Environment Agency LiDAR data. Details of the level changes are summarised within Table 9-3 below.

Table 9-3 Summary of significant level changes along the scheme alignment.

Chainage (m)	Existing elevation (mOD)	General Description
0+000 to 0+900	122 to 147	Gradual uphill slope with minor gentle undulations.
0+900 to 1+800	147 to 131	Very gentle downhill slope with minor gentle undulations.
1+800 to 2+700	131 to 143	Gentle uphill slope with minor gentle undulations.
2+700 to 4+200	143 to 96	Gradual downhill slope with minor gentle undulations
4+200 to 5+200	96 to 121	Gentle uphill slope with minor undulations

Chainage (m)	Existing elevation (mOD)	General Description
5+200 to 6+100	121 to 79	Gradual becoming steep downhill slope with minor gentle undulations. Fluvial valley
6+100 to 6+600	79 to 100	Gradual uphill slope with minor gentle undulations.
6+600 to 7+200	101 to 78	Steep becoming gradual downhill slope with slight gentle undulations.
7+200 to 7+800	78 to 101	Gradual uphill slope with gentle minor undulations.
7+800 to 8+500	101 to 107	Flat becoming steep uphill slope with moderate undulations
8+500 to 9+000	107 to 69	Steep downhill slope with minor undulations.
9+000 to 13+400	69 to 144	Steep becoming gentle uphill slope with minor stepped undulations becoming minor gentle undulations.
13+400 to 14+400	144 to 118	Gentle becoming steep uphill slope with minor gentle undulations.

9.6.2 Figure 9-1 shows that the scheme alignment follows a south-west to north-east striking ridge, which falls away on both sides to form a relative high in comparison with the surrounding topography. The landscape surrounding the route comprises numerous steep sided valleys, which have been cut by the fluvial action of watercourses. These watercourses are sourced from springs proximal to the scheme alignment that flow outwards. Watercourses create an undulating landscape, most notably towards the middle section of the route.

9.6.3 Generally, no evidence of unstable slope forms was observed, other than features of shallow slope movement within steep wooded slope adjacent to observed seepage north of Carland Cross junction (Ch. 13+700 to 13+800) (see Figure 9-1).

Published geology

9.6.4 This section describes the published geology based on examination of the published geological maps of Newquay, Sheet 346 [39] and Falmouth, Sheet 352 [62], and review of the accompanying geological memoirs [63] [64]. The published geology is presented within Figure 9-2.

9.6.5 Information on the ground conditions is provided within the GIR [32] and Paragraph 9.6.64 to Paragraph 9.6.66 of this report.

Artificial ground

9.6.6 Artificial ground is indicated to be present underlying the scheme between chainage 12+675m and 12+775. This aligns with the location of a flooded quarry. No other areas of artificial ground are indicated within the scheme Study Area.

Superficial geology

9.6.7 Head deposits are present within the base of fluvial valleys, which record the active periglacial[1] weathering, solifluction[2] and deposition during the last phase of the Quaternary glaciation [63]. This stratum is largely heterogeneous comprising

[1] Periglacial = relating to an area affected by repeated freezing and thawing.
[2] Solifluction = the slow or gradual movement of soil down slope relating to freeze-thaw activity.

sandy clay with quartz pebbles and small angular local rock fragments with dispersed blocks [63]. Cryoturbation[3] has affected the upper layers of head deposits due to the freeze-thaw action during and proceeding the last phase of glaciation.

9.6.8 More recently, active fluvial deposition by streams has resulted in the presence of Alluvium at valley bottoms, although this is generally thin. The published geological maps [39] [62] indicate Alluvium to be generally absent within the study area.

9.6.9 The location of superficial deposits along the scheme alignment are summarised in Table 9-4.

Table 9-4 Summary of the location of superficial deposits along the scheme alignment.

Strata	Chainage (m)	Note
Head	8+900 to 8+930	Minor tributary of the River Allen; Culvert proposed
Head	9+210 to 9+290	Minor tributary of the River Allen; Culvert proposed
Head	11+030 to 11+080	Penny-Come-Quick underbridge; Minor tributary of the River Allen
Head	13+040 to 13+110	North-west of Carland Cross Junction; Newlyn Downs
Head	13+550 to 13+640	North-east of Carland Cross Junction; Minor tributary of the River Gannet

Bedrock Geology

9.6.10 The scheme alignment is predominantly underlain by Devonian bedrock of the Gramscatho Basin Succession, comprising predominantly clastic sedimentary rocks formed from mud and sand produced by erosion and deposited in a deep marine environment [63].

9.6.11 The scheme alignment transects the thrust fault separating the Gramscatho Basin Succession and the Looe Basin Succession to the north. The Looe Basin Succession, comprising a shallow water facies of variable siliciclastic mudstones, siltstone and sandstones with internal structures representing strong water movements. The stratigraphy is summarised within Table 9-5, from youngest to oldest.

Table 9-5 Summary of the stratigraphy beneath the scheme alignment.

Period		Succession[1]	Group	Formation	Description[2]
Devonian	Middle to Upper	Looe Basin Succession	Meadfoot Group	Trendrean Mudstone Formation	Dark grey to black mudstone with upward-fining siltstone laminae and some beds of pale grey fine-grained sandstone.
		Gramscatho Basin Succession	Gramscatho Group	Porthtowan Formation	Interbedded slaty mudstone, grey and grey-green, and sandstone. Subordinate sandstone beds are up to 2m thick, typical turbidites.

[3] Cryoturbation = refers to the mixing of materials from various horizons of the soil down to bedrock due to freezing and thawing.

Period		Succession[1]	Group	Formation	Description[2]
	Middle			Grampound Formation	Thinly interlaminated grey slaty mudstone and mid-grey siltstone, weathering yellowish green, with sporadic thin beds of sandstone and sparse lenticular limestone.

Notes
[1] Approximately synchronous deposition of Looe Basin and Gramscatho Basin Successions
[2] Description based on the British Geological Survey (BGS) lexicon [65]

9.6.12 The distribution of the various Formations along the scheme alignment based on the published geology is summarised in Table 9-6 and presented within Figure 9-2.

Table 9-6 Summary of the bedrock geology along the scheme alignment.

Formation	Chainage (m)	
	From	To
Porthtowan Formation	0+000	8+050
Grampound Formation	8+050	13+720
Trendrean Mudstone	13+720	14+490

9.6.13 Metalliferous rich mineral veins (lodes) are present within the area originating from the emplacement of the St Austell and Carnmenellis Granite and the associated circulation of hydrothermal fluids and subsequent mineral precipitation. According to the BGS (1994) [54] the scheme alignment lies within the St Agnes Mining District. Locally these lodes contain mainly tin, copper, zinc, lead, with arsenic, sulphur, silver. Mining is discussed in more detail within Paragraph 9.6.23 to Paragraph 9.6.35.

Structural Geology

9.6.14 The bedrock geology has been affected by numerous phases of tectonic deformation, most significantly the late Palaeozoic mountain building period known as the Variscan Orogeny [54]. This has resulted in approximately east-north-east trending structures, resulting in cleavage and bedding dipping generally to the south-east. Rocks are also locally folded and faulted.

9.6.15 A regionally persistent north-west to south-east trending thrust fault separates the Gramscatho Basin Succession and the Looe Basin Succession to the north. This thrust fault is also cross cut by regular locally persistent approximately north-south trending faults, creating a step like boundary. These faults are also indicated to affect the geological boundary between the Grampound Formation and the overlying Porthtowan Formation.

9.6.16 As shown in Figure 9-2, the scheme alignment transects faults at the locations summarised within Table 9-7.

Table 9-7 Summary of the presence of faults along the scheme alignment

Chainage (m)	Location relative to scheme alignment	Comments
8+190	Online	Locally persistent fault trending approximately north-south downthrowing the Porthtowan Formation to the west
12+130	Online	Locally persistent fault trending approximately north-south and crossing the Trendrean Formation, Grampound Formation and the Porthtowan Formation. This fault downthrows to the east and intersects the east-west trending regional thrust fault.
11+200 and 12+300	200m north	East-west trending regional thrust fault within 200m of scheme alignment. It forms a hanging wall of the Grampound Formation to the south of the Trendrean Mudstone Formation.
13+720	Online	Locally persistent fault downthrows to the west and forms the boundary between the Grampound Formation to the west and the Trendrean Formation to the east.

9.6.17 The review of aerial photography [56] states that the faults interpreted in the BGS 1:50,000 maps are not strongly expressed in the aerial imagery. However, it suggests that short lengths of ravines and small valleys are controlled by minor unmapped faults.

Site history

9.6.18 The history of the study area has been interpreted through review of various editions of the Ordnance Survey mapping as presented in the the PSSR [30] for the site.

9.6.19 The main industrial activity in the study area are numerous mines, associated spoil tips/heaps, shafts, pits and workings. These are typically present on the earliest maps and many are noted as disused in by 1879. By the late 1800's and early 1900's all are labelled as disused. In addition to the mines, numerous quarries are located throughout the study area, many of these are initially indicated as 'old' on the 1879 mapping and by later editions are either being used as tips or are no longer shown. Mining and mineral resource features are discussed within Paragraph 9.6.23 to Paragraph 9.6.36 and presented within Figure 9-3.

9.6.20 Aside from the industrial land uses, the historic mapping also indicates numerous tumuli along the study area in addition to other features of archaeological and heritage interest. These are discussed further and assessed within Chapter 6 Cultural Heritage.

9.6.21 Review of the historic mapping has indicated that the previous mining use and associated mine waste, infilled quarries and tips, and the potential use of made ground materials in previous A30 route upgrades, and the existing use of the A30 are the most likely sources of anthropogenic contamination across the study area. Smaller industrial uses such as blacksmiths and mills are also considered to be potential contamination sources, however it is considered likely that their influence would have been more localised.

Unexploded ordnance (UXO)

9.6.22 Based on the findings of a preliminary assessment within the PSSR [30], the UXO risk is considered to be low. Given the generally rural nature of the site it is not

expected that significant targets would have been present on or in the vicinity of the study area. Similarly, the lack of sensitive or military assets near the study area is considered to preclude the likely presence of defensive installations that may also provide a UXO source. Aerial photographs taken during the war (1942 to 1946) [56] do not indicate evidence of military installations, potential bombing targets or evidence of bomb strikes within the scheme study area.

Mining and mineral resources

Introduction

9.6.23 The 1:100,000 scale Mineral Resources map of Cornwall [55] indicates the scheme alignment to be underlain by a sandstone resource (of interbedded sandstone and shale/slate). This map is intended to be used to inform planning decisions, with the ultimate aim of protecting mineral resources.

9.6.24 The CC Interactive Map [51] does not indicate the presence of any Mineral Safeguarding Areas within the scheme study area. The policy for the safeguarding of minerals is discussed within the CC draft Minerals Safeguarding Development Plan Document [7].

9.6.25 The Air Photo Interpretation Report [56] indicates the presence of areas of extensive mottled soil without distinct boundaries between chainage 1+320m and 2+830m. This indicates poor drainage and may relate to ancient shallow surface workings. No areas of mining subsidence were detected along the scheme alignment.

9.6.26 All mining features described within this section, including recorded and suspected shafts, adits, mines, quarries, and lode outcrops are presented within Figure 9-3. Also presented on this figure are the mining risk zones as defined by the Cornwall Consultant Ltd mining search (described in Paragraph 9.6.29 to Paragraph 9.6.35).

Historical mining and methods

9.6.27 Metalliferous minerals have been extracted across the South West for thousands of years, throughout which shallow prospecting was widespread. Costean (trial) pits were dug to in order to discover the mineral lodes, then often mined by openworks (linear excavations) along the outcrop and later by means of shafts, adits and levels driven away from the shafts. The ore was extracted from between the levels to leave narrow chasms. Steam pumping engines introduced in the 19th century enabled deeper workings. Industrial decline by the end of the century led to the closure of most mines, often left abandoned without being secured due to a lack of funding and regulations. Most old and shallow mine workings are poorly recorded due to an historical lack of legal requirements.

PSSR [30] and GIR [32] summary

9.6.28 The study area lies on the two mining districts of Chacewater to the south-west and St Agnes to the northeast. The district was historically prospected by means of pits excavated to bedrock to uncover lodes not visible at the surface. Resources mined are generally metalliferous, with historical maps showing a number of disused lead, silver, copper, zinc, iron and tin mining sites throughout the study area. No evidence of mining was observed beneath the proposed alignment. However, in areas of workable deposit, it is prudent to assume the presence of potential unrecorded workings.

Cornwall Consultants Ltd (2017) mining search [52]

9.6.29 Cornwall Consultants Ltd were appointed in August 2017 to carry out a mining search and mining risk assessment with the aim of predicting the existence, location and severity of the risk from recorded and unrecorded mine workings. This covered a buffer area of 500m either side of the scheme alignment.

9.6.30 Six named mines sites and four unnamed trial workings were identified within the search area. A further four trial sites or mines lie on the search area boundary and may have associated unrecorded workings that enter the search area.

9.6.31 Inferred or recorded lode outcrops traverse the roadway at six locations and there is the potential for unrecorded prospective mine workings to exist on these outcrops. Unrecorded workings on lode outcrops are the most widespread adverse features in the region and give rise to the greatest number of problems for land development. Such workings can comprise partially filled and/or voided stope workings that extend from surface to adit level and on to much deeper levels of the mine.

9.6.32 In addition to the outcrop of lodes that traverse the alignment, an elvan (quartz porphyry) dyke traverses the alignment at approximately chainage 14+000m. Elvan has the potential to contain metalliferous ores and therefore unrecorded working might exist here in addition to the known surface quarries and opencast workings.

9.6.33 There are no recorded or suspected shafts, adits or deep workings beneath the scheme alignment, although it is interpreted that an adit exists beneath the scheme at approximately chainage 0+450m. This is based on the assumption the major shafts associated with the Burra Burra Mine were drained by an adit and discharged in the valley to the south-east or connected to the former Prince Coburg Mine to the west.

9.6.34 The Engine Shaft (closest to the road on the eastern side) intercepted the inclined lode at a depth of 18 fathoms (33 metres). This might be the depth of the adit, because it would have been reasonable for the engine shaft to connect to it vertically. The adit would be a near-horizontal tunnel with approximate dimensions 1.0 m wide by 1.8 m high.

9.6.35 The Cornwall Consultants Ltd (2017) [52] report concludes that the interpreted land instability risk to the scheme arising from past extractive metalliferous mining is low. Risk zones derived by Cornwall Consultants Ltd are presented within Figure 9-3. Moderate risk zones have been assigned to those features that are indirectly related to extractive metalliferous mining activity, whereas a high risk zone has been applied to all features directly related to extractive metalliferous mining activity, irrespective of their proximity to the roadway.

Evidence for mining

9.6.36 The evidence for the presence of mine workings and mine entrances within the scheme study area are presented within Figure 9-3. These have been separated into areas based on the most proximal mining sett name. These will be summarised with further details, including distance from the scheme alignment in a table in the ES.

Hydrology and hydrogeology

Introduction

9.6.37 The hydrological and hydrogeological baseline conditions have been determined based on a review of the PSSR [30] and GIR [32]. Where necessary other relevant resources have been used and referenced throughout. The location of all hydrological and hydrogeological features are presented in Figure 9-4. A review of historical and more recent aerial photography has identified a number of hydrological and hydrogeological features, including springs, seepages and poorly drained ground, which are also presented within Figure 9-4.

Surface water

9.6.38 The scheme alignment generally traverses a boundary between two watersheds. Several springs emerge along the flanks of this watershed boundary, flowing to the north and south. The River Gannel and its tributaries flow to the north, and Rivers Kenwyn, Tresillian and Allen and tributaries flow to the south [30]. All surface water features, including streams, springs, seepages and poorly drained ground are presented in Figure 9-4. A summary of the hydrological features within the study area are presented in Table 9-8 and Table 9-9.

Table 9-8 Summary of watercourse features.

Watercourse Feature	Chainage (m)	Approx. distance from scheme alignment (m)	Comments
Headwater stream[3]	0+180	30m east	Both merge 250m east of the scheme before eventually joining the Truro River to the east.
Headwater stream[3]	0+250	160m east	
Headwater stream[3]	1+210	150m north-west	Flows north.
Headwater stream[3]	1+500	150m east	Flows east before meeting a pond 700m east of the scheme.
Headwater stream[3]	3+700	130m south	Flows south eventually merging with the River Kenwyn.
Headwater stream[3]	4+500	240m north	Flows north before forming a pond 320m north of the scheme.
Headwater stream[3]	6+060	80m south-east	Flows south-east as tertiary river, then secondary river 180m from scheme. Merges with a pond 220m south-east of the scheme. Eventually merging with the River Allen.
Headwater stream[3] (Pond[2])	7+210	150m south-east	Flows east, eventually merging with the River Allen.
Headwater stream[3]	8+850	135m north-west	Both merge together at ch 8+900 45m north-west of the scheme before crossing beneath at ch 8+910. River flows east before joining a river network eventually merging with the River Allen.
Headwater stream[3]	8+910	80m north-west	
Headwater stream[3]	9+250	Beneath scheme	Flows south-east crossing under the scheme at ch 9+250. River flows south-east before joining a river network eventually merging with the River Allen.
Headwater stream[3]	9+980	190m north	Flows north as tertiary river till 270m from scheme, river is then culverted flowing north-west

Watercourse Feature	Chainage (m)	Approx. distance from scheme alignment (m)	Comments
Headwater stream[3]	11+030	150m north-west	Flows south-east, crossing scheme at ch 11+040. Continues to flow south-east.
Headwater stream[3]	11+920	190m south-east	Flows south-west away from scheme.
Headwater stream[3]	12+890	220m north-west	Flows north-west away from scheme.
Headwater stream[3]	13+500	185m south-east	Flows south as tertiary river before being culverted 250m south of the scheme, flowing south-east
Headwater stream[3] (Spring[3])	13+600	180m south-east	Flows south before merging with culvert 400m south-east of scheme.
Headwater stream[3]	13+680	55m north-west	Flows north-east

Source:
[1] Cornwall Consultants metalliferous minerals mining search [52].
[2] PSSR [30]
[3] Groundsure Report [46] [45]

Table 9-9 Summary of springs and ponds.

Hydrological feature	Chainage (m)	Approx. distance from scheme alignment (m)
Spring[1]	1+760	250m north-east
Spring[1]	3+710	135m south
Spring[1]	6+200	200m south-east
Pond[2]	6+200 to 6+250	210m, extending to 300m south-east
Pond[2] (group of two)	7+100 to 7+120	145m, extending to 205m south-east
Spring[1]	7+700	160m north-west
Spring[1]	7+770	165m north-west
Pond[2]	10+450 to 10+490	40m, extending to 80m north-west
Pond[2] (group of two)	11+000 to 11+080	25m, extending to 40m north
Pond[2]	12+700 to 12+260	Along alignment, extending 30m north
Spring[3]	13+600	180m south-east
Spring[3]	13+680	55m north-west
Spring[1]	14+496	150m north

Source:
[1] Cornwall Consultants metalliferous minerals mining search [52].
[2] PSSR [30]
[3] Groundsure Report [46] [45]

9.6.39 The Water Framework Directive status of the surface waters are discussed in detail within Chapter 13 Road Drainage and Water Environment.

Groundwater flooding

9.6.40 BGS data contained with the Groundsure report [46] [45] indicate the scheme alignment to traverse areas having a moderate to high susceptibility to groundwater flooding within superficial deposits. High potential areas are defined as having the potential for groundwater flooding at the surface and moderate potential areas have the potential for groundwater flooding to affect structures below ground level.

9.6.41 The flood risk assessment, which considers groundwater flooding, is included in Chapter 13 Road Drainage and Water Environment. Groundwater flooding areas within the 250m scoping area are summarised within Table 9-10.

Table 9-10 Summary of groundwater flooding areas within the scheme study area

Groundwater flooding susceptibility	Chainage extents (m)	Approx. distance from scheme alignment (m)	Association
Very high[1]	1+280 to 1+360	200m to 300m north-west	Tertiary River[1]
Moderate to high[1]	5+990 to 6+100	Crosses scheme between Ch 5+990 to 6+080. Extends south-east	Seepage[2]
Very High[1]	6+000 to 6+210	30m to 145m south-east	Tertiary River[1], Seepage[2]
Very High[1]	6+110 to 6+220	190m to 290m south-east	Secondary River[1], Seepage[2], Pond[3]
Very High[1]	8+900 to 9+500	80m to >300m south-east	Tertiary River, Seepage
Very High[1]	10+940 to 11+150	Crosses scheme at ch 10+960 to 11+060. Extends 80m north and >250m south	Tertiary River[1], Seepage[2], 2No. Pond[3]

Source:
[1] Groundsure Report [46] [45]
[2] Air Photo Interpretation Consultancy [56]
[3] PSSR [30]

Hydrogeology

9.6.42 Environmental Agency hydrogeological mapping [47] provides information on annual average rainfall, groundwater flows in aquifers, surface water, and groundwater features in England. The entire site is classed as a ‘Secondary A’ aquifer for bedrock geology. These aquifers consist of permeable layers that store water at a local rather than strategic scale, in some cases forming an important base flow to rivers.

9.6.43 The location of aquifers in superficial geology generally corresponds to the position of Head and Alluvial deposits. Superficial deposit aquifers in this area are all either ‘Secondary A’ or ‘Secondary undifferentiated’ aquifers. This indicates that they comprise permeable layers capable of supporting water supplies at local rather than strategic scale, and in some cases form an important source of base flow to rivers.

9.6.44 The Environmental Agency Groundwater Vulnerability Map [47] identifies the vulnerability of groundwater to contamination in England and Wales. It is based on the soil leaching class, drainage properties, drift properties, and groundwater

flow regime in the area. It indicates the risk posed to groundwater from surface activities by categorising ground conditions into six vulnerability classes. These maps indicate that the majority of the scheme lies within minor aquifer low and minor aquifer intermediate Groundwater Vulnerability Zones. A high minor aquifer groundwater vulnerability zone overlaps the scheme approximately 500m south-west of Two Barrows Junction.

9.6.45 Approximately 600m of the current A30 northeast of Carland Cross lies within a 'Zone 2' groundwater source protection zone. Furthermore, two 'Zone 1' groundwater source protection zones directly underlie the scheme alignment (see Figure 9-4). Zones 1 and 2 are defined as the 50 and 400-day travel time from any point below the water table to the source respectively.

9.6.46 It is known that a large number of springs are exploited for both domestic and agricultural uses. Consultation with CC and publicly available Groundsure data has confirmed the presence of a number of private abstraction licence within the scheme study area as presented on Figure 9-4. Records indicate there are numerous historical abstraction licenses relating to farms within the area.

Ground hazards

9.6.47 The geological risks potentially affecting the scheme alignment, as defined by the BGS, are described below:

- Potential for collapsible ground stability hazards (Very Low);
- Potential for compressible ground stability hazards (Moderate (Alluvium) – Negligible);
- Potential for ground dissolution stability hazards (Negligible);
- Potential for landslide ground stability hazards (Low (Meadfoot beds & Porthtowan Formation) - Negligible);
- Potential for running sand ground stability hazards (Low (Alluvium),Very Low (Head) Negligible (bedrock);
- Potential for shrinking or swelling clay ground stability hazards (Very Low - Negligible); and
- Potential for Karstic features (Negligible).

9.6.48 This does not include the risks associated with man-made activities such as mining.

9.6.49 A land stability assessment plan is illustrated in Figure 9-7.

Geological designated sites

9.6.50 No Regionally Important Geological Sites (RIGS) of geological or geomorphological significance are present within 250m radius of the proposed alignment.

9.6.51 There are no statutory or non-statutory designated geological sites within the Geology & Soils Study Area. The nearest RIGS is located approximately 2.8km north-west of Chybucca Junction (ch 4830m). This RIG is called Lambriggan Mine and is important due to the 700-ton pile of lead-zinc ore left standing after the closure in 1930. It also contains pyrite, chalcopyrite and chlorite. This may be the only site of its kind in Cornwall or even further afield.

Environmental setting

9.6.52 A review of the current industrial land uses in the Groundsure report included in the PSSR [30] indicates that fuel stations are present at both Carland Cross at approximate chainage 13+500m, and Chiverton Cross at approximate chainage 0+600m. In addition, a vehicle servicing centre is present at Chiverton Cross and new vehicle sales units are also present at Chiverton and Carland Cross at similar chainages to the petrol filling stations. Another new vehicle sales premise is present at approximate chainage 6+300m to the north of the existing A30. Aside from these, many of the entries within 250m of the route alignment relate to electrical infrastructure such as pylons, turbines, sub-stations, and solar electricity generation. Numerous tanks have been noted throughout the study area, little information is provided in the Groundsure entries for these, however, review of the current OS mapping and aerial imagery indicates that many, if not all of these are likely to be in relation to agricultural irrigation, private water supply, or livestock/farm use. Some quarries and mine shafts are also listed; however, these are not considered to be currently in use. A contaminated land features plan is presented within Figure 9-6.

9.6.53 Review of the historic land uses listed in the Groundsure report [30] indicate that the majority of features within the study area are in relation to previous mining history and comprise mines, mineshafts, wheel and pump houses, pit wheels and other mining infrastructure. Numerous spoil heaps are noted across the study area, mostly in relation to areas of mining activity but also in areas between these features too. In addition to mining, a number of former quarries are noted across the study area, with many of these no longer indicated on current OS mapping suggesting their subsequent in-filling. Aside from mining and quarrying, an area at approximate chainage 0+000m and an area at approximate chainage 8+050 to 8+150m and immediately to the north of the existing A30 were noted as former nurseries. Numerous smithies were noted in the local villages. Lastly a former garage was indicated just within the north eastern extent of the study area beyond chainage 14+496m.

9.6.54 Review of records of Environment Agency Recorded Pollution Incidents indicate that a total of 3No. incidents have occurred within the study area. Two are located in the south west of the study area, the first relates to release of lubricating oils on the existing A30 at the far southern point of the proposed alignment which resulted in a category 3 minor land impact. The second relates to the commercial waste immediately to the north of the A30/A390 junction which resulted in a category 4 (no) impact. The third pollution incident relates to the presence of asbestos containing wastes located in woodland to the east of the village of Zelah, approximately 250m from the proposed route alignment which was recorded as a category 3 minor land impact.

9.6.55 Numerous Environment Agency Discharge Consents are noted within the study area. Many of these relates to domestic soakaway drainage, or direct discharge of surface water to surface water systems from both domestic and farm properties. A soakway for the Shell filling station at Carland Cross is also noted as this may have a higher risk of potential contamination from possible petroleum substances spills and leaks, it is considered highly likely that a fuel interceptor will be in place at this location, however this may have defects which would result in potential contaminants being released.

9.6.56 Review of Part A2 and Part B Local Authority Pollution Prevention Controls indicates that the only entries relate to the filling stations located at Carland Cross, Chiverton Cross and a waste oil burner located at Town and Country Motor Centre approximately half way along the route near Little Tresawsen to the north of the existing A30.

9.6.57 No current or historic landfills or waste treatment facilities lie within the study area.

9.6.58 Review of Designated Environmentally Sensitive Sites indicates that much of the scheme lies within a DEFRA designated Nitrate Vulnerable Zone. The far south west of the scheme (south of Chiverton Cross) is situated within the Cornwall and West Devon Mining Landscape World Heritage Site. The Newlyn Downs Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI) is located approximately 230m north east of the scheme alignment at the closest edge of carriageway.

9.6.59 The study area lies within the St Agnes Mining District and has been affected by mining of metalliferous ores through below ground and above ground workings. Building stone quarries are also present throughout the study area and have largely been infilled. A detailed description of the mining features is provided within paragraph 9.6.23 to paragraph 9.6.36 and mining features presented within Figure 9-3.

9.6.60 Review of the records of groundwater abstractions within 1km of the scheme indicate that the majority of records relate to historical licenses. Two active potable water abstractions are present beneath the scheme earthworks at approximate chainages 13+600m and 13+740m, these are in relation to the two active SPZs discussed in Section 9.5.17. A single active groundwater abstraction licence on relation to spray irrigation is present approximately 700m south-east of chainage 2+000m.

9.6.61 Review of the records of surface water abstractions within 250m of the scheme indicates that the majority of records relate to historic licenses.

Ground investigations

9.6.62 A number of ground investigations have been completed within the study area. These are listed below. A short summary of the scope of work will be provided in the ES as part of the DCO submission. The factual results from the ground investigation including exploratory holes logs and in-situ and laboratory test results are contained within the respective factual reports referenced throughout. The previous ground investigations include:

- Department for Transport (1988), London to Penzance Trunk Road A30 Penhale to Carland Cross Improvement Site Investigation Report [37];
- Soil Mechanics (2004), A30 Chiverton to Carland Cross Preliminary Ground Investigation Factual Report [38];
- Parsons Brinckerhoff (2005), A30 Chiverton Cross Roundabout Improvement, Geotechnical Report (including factual information) [66];
- Accord (2008), A30 Chiverton Cross CCTV Mast, Geotechnical Report [35];
- Structural Soils Ltd (2017). A30 – Chiverton to Carland Cross. Factual Report on Ground Investigation [31]

9.6.63 All exploratory hole positions are shown on Figure 9-5, the ground investigation location plan.

Ground conditions

9.6.64 The baseline ground conditions within the scheme study area have been determined on the basis of a review of available published geological maps and memoirs, and available ground investigation information. The ground conditions are discussed in detail within the GIR [32].

9.6.65 Ground conditions are summarised in Table 9-11 and typically comprise topsoil, limited localised areas of Made Ground and Alluvium or Head or both within valley bottoms. Generally, from Chiverton Cross to Marazanvose the bedrock comprises Porthtowan Formation (interbedded slates and turbidite sandstones), from Marazanvose to Carland Cross the bedrock is Grampound Formation (interbedded sandstone and subordinate siltstones), and east of Carland Cross the bedrock is the Trendrean Mudstone Formation (mudstone with siltstone laminations and occasional sandstone beds).

Table 9-11 Summary of encountered ground conditions.

Material	Thickness (m)
Topsoil	Absent to 0.9
Made Ground	Absent to 0.9
Alluvium	Absent to 7.2
Porthtowan Formation	Maximum proven thickness of 16.0m
Grampound Formation	Maximum proven thickness of 24.6m
Trendrean Mudstone Formation	

Made ground

9.6.66 The site is generally agricultural land, with rare sightings of Made Ground. Previous ground investigations have encountered Made Ground in at least 13 No. exploratory holes, the details of which have been summarised in Table 9-12. Most Made Ground has been encountered near access roads or embankments, but there is more than one instance of Made Ground being encountered in potential mining areas.

Table 9-12 Summary of locations and origins of Made Ground

GI	Hole	Chainage (m)	Distance (m)	Thickness (m)	Description and (*origin where known*)
WSP 2017	TP-P-009	6+060	55m SE	0.45	Slightly gravelly clayey sand with a low cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse phyllite, quartz and brick. Cobbles are subangular phyllite. (*Possible landowner access track*)
WSP 2017	TP-R-088A	13+280	Along scheme	0.80	0.50m of white slightly sandy gravel overlain by 0.30m of dark brown very gravelly sand. Sand is fine to coarse. Gravel is subangular fine to coarse of mixed lithologies, possibly including concrete.

GI	Hole	Chainage (m)	Distance (m)	Thickness (m)	Description and (*origin where known*)
					(*Possibly associated with nearby backfilled quarry*)
WSP 2017	BH-R-030	12+080	Along scheme	0.55	Firm brown slightly sandy slightly gravelly clay. Sand is fine to coarse. Gravel is angular to subangular fine to coarse weathered weak slate and rare fine concrete and brick fragments. (*Possibly associated with nearby mine workings*)
WSP 2017	BH-R-040C	13+850		0.45	Light brown slightly clayey slightly gravelly fine to coarse sand (possible Made Ground). Gravel is angular to subangular fine to coarse slate and mudstone. Part of access track construction. (*Possibly associated with nearby backfilled Elvan quarry*)
WSP 2017	BH-R-041	14+030	Along scheme	0.90	0.10m topsoil, 0.80m of gravelly sand and sandy gravels. Gravel is angular to subangular fine to coarse slate. (*Possibly associated with backfilled Elvan quarry*)
WSP 2017	BH-S-019	5+995	Along scheme	0.23	Thin band of fill material containing cobbles of mudstone/shale and tarmac gravel.
WSP 2017	BH-S-032	8+700	25m NW	0.15	Light beige and brown clayey gravel containing low cobble and boulder content. Cobbles and boulder are tabular grey slate approx. 350mm x 180mm.
Accord 2008	TP1	0+700	10m E	Unproven, at least 1.30	Soft to firm, dark orange red silty gravelly clay, and medium dense to firm moist dark orange red to dark brown clayey gravel. (*Possibly associated with embankment for the existing A30*).
Soil Mechanics 2006	BH17	9+770	Along scheme	1.30	Brown and black very sandy angular fine to coarse gravel of tarmac and slate, and black tarmac. (*Possibly associated with embankment for the existing A30*).
Soil Mechanics 2006	WS1	9+320	15m NW	4.35	Gravelly fine to coarse sand, with gravel of various lithologies including slate and mudstone. This overlays 0.10m of hard dark brown sandy slightly gravelly clay, followed by 3.45m of medium dense to dense light brown clayey sandy angular to subangular fine to coarse gravel of slate and mudstone. (*Possibly associated with embankment for the existing A30*).

GI	Hole	Chainage (m)	Distance (m)	Thickness (m)	Description and (*origin where known*)
Soil Mechanics 2006	WS2	9+320	30m NW	Unproven, at least 4.65	0.9m of very clayey very gravelly fine to coarse sand, and 3.75m medium dense red brown very clayey sandy angular to subangular, fine to coarse gravel of slate and mudstone. Finally, an unproven depth of moderately strong white medium grained quartzite was encountered at the bottom of the sample, to an unproven depth. (*Possibly associated with embankment for the existing A30*).
Parsons Brinckerhoff 2005	TP1	0+640	140m NW	Unproven, at least 0.80	0.3m of reddish brown clayey silty gravel followed by 0.2m sandy gravel, 0.1m of black hard road pavement and 0.8m of very stiff sandy gravel, to an unproven depth. (*Possibly associated with embankment for the existing A30*).
Parsons Brinckerhoff 2005	TP6	0+710	10m E	Unproven, at least 1.40	Firm silty clay with gravel of mudstone and slate. Fragments of wood, plastic bags and paper were also found. (*Possibly associated with embankment for the existing A30*).

Groundwater levels

9.6.67 During the most recent ground investigation by Structural Soils [31], groundwater monitoring installations were installed in 13 No. boreholes across site. Data logging ‘divers’ were installed and data logs planned to be downloaded every two months. The results presented within the GIR [32] are summarised in Table 9-13.

Table 9-13 Summary of the results of groundwater monitoring within the Structural Soils 2017 boreholes.

Borehole	Chainage (m)	Response zone (m bgl)	Bedrock Formation	Ground Level (mOD)	Groundwater monitoring data								
					03/04/2017	03/04/2017	08/06/2017	08/06/2017	Minimum from level logger		Maximum depth from level logger		Seasonal fluctuation (m)
					Depth (mbgl)	Level (mOD)	Depth (mbgl)	Level (mOD)	Depth (mbgl)	Level (mOD)	Depth (mbgl)	Level (mOD)	
BH-S-005	1+000	3.0 to 15.0	Porthtowan	143.7	8.7	135.0	-	-	No level logger data available				
BH-R-004	2+900	3.0 to 5.0	Porthtowan	143.6	4.6	139.0	Dry	Dry	4.65	138.8	4.81	139.0	0.16
BH-R-010	3+950	2.0 to 5.6	Porthtowan	107.1	3.8	103.3	5.2	101.9	3.85	101.8	5.3	103.2	1.46
BH-S-012	4+850	1.0 to 7.0	Porthtowan	116.7	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	-
BH-R-013	5+800	3.0 to 6.0	Porthtowan	98.7	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	-
BH-S-019	6+000	0.8 to 6.5	Porthtowan	81.8	4.1	77.7	5.1	76.7	4.2	7.7	5.2	7.8	0.1
BH-R-017	7+100	4.5 to 7.5	Porthtowan	79.3	-	-	-	-	3.0	74.3	5.0	76.3	2.0
BH-S-032	8+700	1.5 to 5.5	Grampound	80.3	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	-
BH-S-036	11+000	8.0 to 24.6	Grampound	111.3	4.8	106.5	5.3	106.0	4.9	106.0	5.4	106.4	0.5
BH-R-027	11+400	4.4 to 7.4	Grampound	120.4	4.3	116.1	6.4	114.0	4.5	113.2	7.2	115.9	2.7
BH-S-042	12+900	3.0 to 9.0	Grampound	146.8	8.5	138.3	Dry	Dry	Dry	Dry	Dry	Dry	-
BH-S-049	13+350	5.5 to 9.0	Grampound	143.7	7.0	136.7	Dry	Dry	7.1	135.1	8.6	136.6	1.5
BH-R-041	14+050	1.0 to 7.3	Trendrean	135.9	Dry	Dry	-	-	5.7	129.8	6.1	130.2	0.4

9.6.68 Groundwater levels were generally recorded at depths of between 5.0 and 10.0m below ground level. The highest recorded groundwater level was 3.0m in BH-R-017 at chainage 7+100m. Generally, lower ground levels corresponded to slightly higher groundwater levels, and vice versa. Therefore, shallow groundwater may be encountered within excavations within the central third of the site, as it is at a lower elevation on average than the east and west of the route.

Permeability

9.6.69 Soakaway infiltration tests carried out in the Porthtowan Formation during the Structural Soils (2017) GI [31] recorded infiltration rates of $2.3x10^{-3}$ to $1.6x10^{-5}$ m/s. Two in-situ rising head permeability tests undertaken in borehole BH-S-036 in the Grampound Formation (response zones of 2.7m and 19.3m) recorded permeability of between $2.3x10^{-5}$ and $3.1x10^{-7}$ m/s respectively.

Conceptual site model

9.6.70 The following paragraphs detail the Conceptual Site Model for the existing baseline condition. The Conceptual model presents the potential sources, pathways, and receptors (potential pollution linkages) identified from the review of the baseline conditions within the study area. The conceptual model identifies potential current impacts from contamination in the existing baseline conditions.

9.6.71 The sources are split into those on, and those off site. For the purpose of the conceptual model those sources listed as on site relate to locations within the boundaries of the scheme. Sources identified outside this area but within the boundaries of the study area are deemed to be off site sources.

9.6.72 The potential sources of contamination identified during review of the baseline conditions are presented in Table 9-14.

Table 9-14 Identified potential sources of contamination.

Potential Source	Potential Contaminants
On site	
Made Ground soils	
Possible made ground associated with existing road infrastructure (A30 and other routes crossing the scheme): • 0-1+600m A3075 and A30 • 1+800m B road • 1+950m to 2+100m A30 • 3+650m to 5+000m A30 and B3284 • 5+500m farm track • 5+800m B road • 6+400m to 6+600m A30 adjacent • 7+100m B road • 7+300m to 8+600m farm track, A30 and B road • 9+300m B road • 9+500m to 9+800m A30 adjacent and B road • 10+950m B road • 11+400m B road • 12+850m to 12+950m A30	Metals, hydrocarbons, asbestos, herbicides in soils and groundwater, ground gas

• 13+300m to 14+496m A30	
Made ground identified during intrusive investigations with elevated soil concentrations and leachable concentrations of contaminants: • BH-R-030 • BH-R-040C • BH-R-041 • TP-P-009 • TP-R-088A	Metals in soils, leachable levels of metals and hydrocarbons in soils.
Made ground associated with private development/farmland crossing the scheme. There is a potential risk in all areas of the scheme however attention is drawn to the following locations: • 5+500m two small outbuildings along alignment • 6+200m private access track to a Farm • 7+100m Private dwellings and land.	Metals, hydrocarbons, asbestos, in soils ground gas
Historic mining and infilled quarries	
Historic mining areas with associated mine waste, backfilled mining areas, backfilled quarries. In particular, those identified as part of historic and environmental searches, however there is a risk of un-recorded features being encountered along the scheme. • See Figure 9-3 for locations where mine workings are on site.	Heavy metals, hydrocarbons, asbestos, ground gas.
Current or Historic Activities	
Activities associated with the operation of the existing road infrastructure (A30 and other routes crossing the scheme). These activities may have resulted in accidental spillages or leakages of fuels or oils, the gradual discharge of fuel/oil contaminated run off into defective drainage networks and release to the surrounding ground. It may also include fly tipped materials on more minor roads and tracks.	Metals, hydrocarbons, asbestos.
Current or historic land uses (excluding mining): • 0+600m Petrol filling station • 1+700m electrical repair premises. • 7+650m electricity pylon • 7+900m electricity pylon • 8+100m to 8+150m former nursery on 1993 mapping • 13+500m filling station It should be considered that the main historic and current land use in the location of the scheme is for agricultural purposes. On this basis there is potential for the accumulation of herbicides and pesticides in the site soils along the scheme alignment.	Metals, hydrocarbons, asbestos, PCBs, herbicides and pesticides, ground gas
Environment Agency Recorded pollution incidents: • 0+050m Lubricating Oils – Minor 3 Land • 0+850m Commercial Wastes – No impact	Hydrocarbons
Contaminated Groundwater	
Impact of the above listed sources on the groundwater in the vicinity of the sources through leaching of soil contaminants	Metals, hydrocarbons, herbicides, PCBs
Impact of the above listed source on the groundwater through leaks/spills etc (Petrol stations, vehicle servicing etc)	Hydrocarbons
Off Site	

Potential Made Ground soils	
Made ground associated with existing road infrastructure such as the A30 and other routes in close proximity to the proposed alignment that may have impacted on or be impacting on the scheme via, dust migration, leaching and migration of contamination or migration of ground gas. Given the scheme location, there are numerous areas where this scenario is possible over much of the route and as such individual locations are not listed for the purpose of brevity.	Metals, hydrocarbons, herbicides in soils, ground gas.
Made ground associated with private development/farmland in close proximity to the scheme. There is a potential risk in all areas of the proposed route.	Metals, hydrocarbons, asbestos, herbicides in soils, ground gas.
Historic mining and infilled quarries	
Historic mining areas with associated mine waste, backfilled mining areas, backfilled quarries in close proximity to the scheme. In particular, those identified as part of historic and environmental searches, however there is a risk of un-recorded features being encountered in the study area. • See Figure 9-3 for off site locations.	Metals, hydrocarbons, asbestos, ground gas.
Current or historic activities	
Activities associated with the operation of the existing road infrastructure (A30 and other routes in close proximity to the scheme). These activities may have resulted in accidental spillages or leakages of fuels or oils, the gradual discharge of fuel/oil contaminated run off into defective drainage networks and release to the surrounding ground. It may also include fly tipped materials on more minor roads and tracks.	Metals, hydrocarbons, asbestos.
Current or historic land uses (excluding mining/quarries): • 0+600m Petrol filling station. vehicle sales, vehicle servicing. • 0+900m to 1+000m grave yard. • 1+700m electrical repair premises, construction services • 1+800 wind turbine • 3+500m electricity sub station. • 4+250m wind turbine • 4+600m wind turbine • 6+200m Civil engineering/sewerage premises. • 6+350m vehicle sales garage and waste oil burner. • 6+600m solar farm • 7+200m infilled pond on 1879 mapping • 7+400m to 8+500m electricity pylons • 8+100m to 8+150m former nursery on 1993 mapping • 8+400 to 8+600m four disused quarries on 1879 mapping • 9+200m smithy noted on 1879 mapping • 10+450m infilled pond on 1906 mapping • 11+000m refuse heap noted on 1958 mapping • 11+200m potentially infilled pond on 1879 mapping • 11+900m potentially infilled pond on 1879 mapping • 13+000m power turbine • 13+500m power turbine • 13+500m filling station	Metals, hydrocarbons, asbestos, herbicides , PCBs (old electricity sub stations)

It should be considered that the main historic and current land use in the location of the scheme is for agricultural purposes. On this basis there is potential for the accumulation of herbicides and pesticides within site soils in areas in proximity to the scheme.	
Numerous soakaway discharge consents are present in proximity to the scheme alignment. Whilst these should be for infiltration of surface water (rain) they have potential to be conduits for contamination release to the local groundwater.	Metals, hydrocarbons.
Contaminated Groundwater	
Impact of the above listed sources on the groundwater in the vicinity of the sources through leaching of soil contaminants	Impact of the above listed sources on the groundwater in the vicinity of the sources through leaching of soil contaminants
Impact of the above listed source on the groundwater through leaks/spills etc. (Petrol stations, vehicle servicing etc.)	Impact of the above listed source on the groundwater through leaks/spills etc. (Petrol stations, vehicle servicing etc.)

9.6.73 No visual or olfactory evidence of contamination was noted during the intrusive works on site.

9.6.74 Review of the investigations undertaken on site to date have generally confirmed the site is predominately underlain by natural soils, with minor areas of made ground identified.

9.6.75 Soil analysis, leachate analysis and groundwater analysis has been obtained as part of the baseline information. Should a plausible pathway be identified between the sources identified in Table 9-14 the results of this testing can be used to assess the impact further.

9.6.76 Ground gas monitoring was not undertaken as part of intrusive works on site, however, given the natural geology and other potential contaminant sources present across the majority of the scheme it is not considered that a significant source of ground gas is present. The alluvial soils may present some potential for ground gas generation, however these are generally located in discrete areas across the scheme area, freely venting to atmosphere and therefore not considered to present a risk in the baseline scenario.

9.6.77 The potential receptors to the identified sources of potential contamination are presented in the Table 9-15.

Table 9-15 Identified potential baseline Receptors.

Receptors	Discussion
Human:	
Residents and workers of nearby villages, hamlets, and farms in the scheme and study area.	Residents and workers in the scheme and study area are considered to be sensitive receptors which may be impacted by long term exposure to the potential contamination sources identified in the previous section.
Users of agricultural land and countryside (ramblers etc) in the scheme and study area.	Due to shorter term exposure durations, it is considered that these receptors are less likely to be impacted.

Receptors	Discussion
Maintenance workers on the existing A30 (which form part of the scheme) and other highways crossing the scheme and study area.	Regular and possible long term (albeit intermittent) exposure to the potential contamination sources identified in the previous section.
Users of the existing A30 road at tie in points with the scheme and other highways crossing the scheme, including motorists, cyclists, pedestrians, horse riders etc.	These receptors are considered to be at a low risk due to the transient nature of their likely exposure to the potential contamination sources.
Environmental:	
Groundwater beneath the scheme and study area (Secondary A Aquifers)	Impact from contamination within the scheme, or study area and migration into the scheme
Surface water features identified in Section 9.4	
Water abstraction points identified in Section 9.4	

9.6.78 The pathways identified between potential sources of contamination and the potential receptors are presented in the Table 9-16.

Table 9-16 Identified potential baseline pathways.

Pathway	Discussion
Human Health:	
Ingestion of soil and dust	Exposed soils in temporary excavations e.g. road works/farmland in the immediate vicinity, during cutting of verges etc
Inhalation of soil dust	Generation of dust during temporary excavations (e.g. roadworks) or other works such as farming, grass cutting etc.
Inhalation of gases and volatile organic contamination	Inhalation on gasses or vapours from sources such as spills/leaks, ground gas generated from made ground or natural deposits of alluvium.
Dermal contact with soils and dust.	Contact with temporarily exposed site soils (road works / farming) /groundwater in excavations or from dust created. Considered unlikely that contact with groundwater will occur.
Controlled Waters:	
Direct release of contaminants from leaks or spills into controlled waters (groundwater, streams, springs, rivers etc.).	Leaks or spills near controlled waters, or into drainage which discharges to controlled waters etc.
Release of contaminants from leaks or spills into the sub-surface and subsequent vertical and lateral migration through unsaturated and saturated zones.	Migration through pore space/fractures in rocks and soils, along preferential pathways such as service corridors or higher permeability strata. Impact on aquifers within subsurface, surface waters through springs/issues.
Leaching of contamination from soils into surface waters, or into the sub-surface and subsequent vertical and lateral migration through unsaturated and saturated zones.	

9.6.79 Review of the above potential source pathway receptor (SPR) linkages indicate that in the current baseline conditions, nearby residents and workers are unlikely to be exposed to potential sources of contamination through ingestion, inhalation

and to groundwater and soils through dermal contact on a frequent basis, if at all, for the following reasons:

- The ground investigations to date have generally encountered natural soils across the study site.
- Where made ground soils have been encountered these have been generally isolated to small areas and did not display visual or olfactory signs of contamination.
- The most likely source for contamination is either made ground associated with the existing road infrastructure or possible mining waste. In the current baseline, the former is likely to be largely isolated from these receptors by road surfacing, while the latter is considered likely to be isolated to some degree by vegetation and or topsoil layers.

9.6.80 Review of the above potential SPR linkages in relation to recreational users of the study site indicate that they are unlikely to be impacted in the current baseline for the following reasons:

- The ground investigations to date have generally encountered natural soils across the study site.
- Where made ground soils have been encountered these have been generally isolated to small areas and did not display visual or olfactory signs of contamination.
- Exposure frequency is likely to be relatively sporadic, and in addition the duration is likely to be short term. For example, it is overly pessimistic to assume that an entire walking route would be over exposed contaminated soils.

9.6.81 Review of the possible impact to maintenance workers indicates that, in current baseline conditions, they are considered the most likely to be impacted by the potential sources of contamination for the following reasons:

- Maintenance workers or highways workers may be directly exposed to contaminated soils or made ground during works on the existing infrastructure on site. Exposure pathways would include dermal, ingestion and inhalation. Exposure duration is likely to be relatively short term, however it is feasible that this could be on a regular basis, over the lifetime of the worker (e.g. grass cutting on verges).
- Due to likely location of the works (in association with highways) it is considered that there is a higher potential for made ground, or contaminated soils to be present.

9.6.82 However, as regular maintenance works are not considered likely to involve deep excavations, no direct exposure to groundwater is considered likely to occur. In addition, given the likely nature of the site soils, ground gas risk is considered to be low. Furthermore, it is considered that man entry into excavations/confined spaces would be limited and likely to be controlled with mitigation measures and risk assessment to reduce the risk to maintenance workers from ground gasses.

9.6.83 Existing users of the A30, or other highways in the study area are not considered likely to be impacted by contamination on the basis of the following:

- Relative isolation within vehicles.
- Their transient nature and likely short term duration.

9.6.84 The possible pathways in relation to controlled waters are considered to be plausible for the following reasons:

- Potential contaminants within the identified sources are considered to be freely leachable from the site soils via infiltration of rain or surface water given the absence of drainage or hard cover.
- The investigations to date have indicated the site soils to comprise a mixture of granular and cohesive materials overlying weathered bedrock. While not considered to be highly permeable strata, vertical and lateral migration is still plausible, especially in bands of higher permeability strata or in granular made ground, service runs, or old mining features.

9.6.85 On the basis of the above discussion, Table 9-17 presents the plausible pollutant linkages present in the baseline setting for the scheme.

Table 9-17 Baseline Source-Pathway-Receptor Linkages.

Sources	Pathways	Receptors	Comments
On Site **Made ground:** Existing road infrastructure Made ground identified during previous ground investigations **Historic Mining and Quarries** Mine waste used to fill/level areas. Backfilled mine workings with mine wastes (possible surface workings along lodes) Back filled quarries – unknown backfill with potential contamination. **Current or historic activities** Possible contamination associated with operation of A30 and other highways crossing the scheme alignment. Land use – filling stations, electrical distribution network, agriculture. Previous pollution incidents (recorded and un-recorded). **Off Site** **Made ground:** Possible made ground associated with the existing road infrastructure crossing the scheme alignment. Possible made ground associated with private developments, farm land. **Historic Mining and Quarries** Mine waste used to fill/level areas. Backfilled mine workings with mine wastes (possible surface workings along lodes) Back filled quarries – unknown backfill with potential contamination **Current or historic activities**	**Human Health** Ingestion of soil and dust Inhalation of soil and dust Inhalation of gasses and volatile organic contamination Dermal contact with soils, dust.	**Human Health** Maintenance workers on highways or other land that crosses the scheme alignment.	**Human Health** Made ground, mining waste or backfilled workings, and potential current contaminative processes are considered likely to be present in locations in the study site. Maintenance workers on existing highways may be directly exposed to potential contaminated made ground
	Controlled Waters Leaching of contaminants, vertical and horizontal migration within the subsurface. Direct discharge into ground.	**Controlled Waters** Groundwater beneath the scheme alignment (Secondary A Aquifers) Surface water features Water Abstractions	**Controlled Waters** Direct release into the groundwater is not considered likely, however migration of contaminants from spills or leaks or via leaching of soil based contamination is considered plausible. Given the distance from the scheme to surface water features it is not considered likely that direct releases will impact. However indirect migration of contamination may be considered plausible. Source protection zones related to abstractions exist beneath the scheme. These are considered likely to be impacted by any contamination present.

Sources	Pathways	Receptors	Comments
Possible contamination associated with operation of A30 and other highways crossing the scheme alignment. Land use – filling stations, smithy's, electrical distribution network, horticulture, agriculture. Previous pollution incidents (recorded and un-recorded). Soakaway drainage as possible contamination pathways.			

Assessment of potential impact of current baseline conditions

Land contamination

9.6.86 Table 9-17 indicates that in the baseline condition the potential plausible pollution linkages are:

- Maintenance workers impacted by direct exposure to contaminants in soils/made ground.
- Controlled waters impacted by potential contamination present in made ground or mine workings, leaks and spills, and current land use (petrol filling stations).

9.6.87 On the basis of the above and in accordance with the proposed assessment methodology (chapter 9.8) a Generic Quantitative Risk Assessment (GQRA) has been carried out to assess the risk. The details are presented in the following paragraphs.

Human Health GQRA

9.6.88 The following GQRA is based on the results obtained from the intrusive ground investigations undertaken on site to date.

9.6.89 As part of the GIR [32] chemical analysis of soil samples. A total of 21No. soil samples were submitted for chemical testing. Of these 5No. were from made ground soils, 4No. were from weathered bedrock, 1No. was obtained from alluvium, and 11No. were obtained from Topsoil.

9.6.90 In relation to the risk from contaminated soils the identified receptor are Maintenance workers. Published generic screening criteria for the exposure scenario associated with this type of work are not available. On this basis the assessment criteria chosen for the GQRA are for residential without plant uptake end use. These criteria are considered to be conservative given the likely exposure scenario encountered by a maintenance worker, however they are likely to be suitable to establish if further discussion or detailed assessment is required.

9.6.91 The results of the screening assessment indicate that the majority of chemical concentrations fall below the applied screening criteria with the following exceptions:

- A single concentration of arsenic in a sample of made ground from TP-P-09 at 0.3m bgl which showed a concentration of 96.0mg/kg against the screening criteria of 40.0mg/kg.
- A single lead concentration of from a sample of made ground from BH-R-030 at 0.65m bgl which showed a concentration of 236.0mg/kg against the screening criteria of 200.0mg/kg.

9.6.92 Review of the soil descriptions for TP-P-09 does not indicate a potential source of the arsenic. Review of the location of TP-P-09 indicates it was situated within an area of that has been in agricultural use since the earliest edition of the Ordnance survey mapping. As such, there is no clear indication as to why an elevated level of arsenic would be present in this location.

9.6.93 Review of the soil descriptions for BH-R-030 does not indicate any potential sources for the lead aside from the general description of made ground with concrete and brick. Review of the location of BH-R-030 indicates that the borehole lies approximately 100m north of the location of an old shaft and heap

(possible mine waste) shown on the historic mapping from 1879 to 1958. The mapping following 1958 no longer shows the shaft or heap, the heap may well have been re-graded across the area and it may be this that is the cause of the elevated arsenic in this location.

9.6.94 All organic contaminant concentrations were recorded at levels below the laboratory limit of detection. Asbestos was not identified in any of the 21No. samples tested.

9.6.95 The results of the soil screening exercise have indicated that the measured concentrations of soil contaminants were below the applied screening criteria in samples of topsoil and natural ground and as such do not pose a risk to human health.

9.6.96 Two elevated levels of heavy metals have been recorded in samples of made ground present in the scheme. On this basis, it is concluded that the made ground throughout the scheme has the potential to contain elevated levels of heavy metals. However, it should be noted that in general the levels fell below the screening criteria, that the screening criteria are likely to be overly conservative in relation to assessing the risk to maintenance workers, and that it is likely that much of the risk to maintenance workers would be mitigated by the likely use of Personal Protective Equipment (PPE). On this basis, it is not considered that a risk to human health is present.

Controlled Waters GQRA

9.6.97 In order to assess the likely impact on controlled waters a GQRA based on the results of leachate analysis and groundwater analysis obtained during the previous investigations has been undertaken.

9.6.98 The GIR [32] include soil leachate analysis on a total of 16No. soil samples.no. samples were from made ground deposits, 4No. from weathered bedrock and a further 8No. from topsoil samples.

9.6.99 The study area is situated above Secondary A Aquifers, there are numerous water courses and springs within the study area, and in addition, there are abstraction licenses within the study area. On this basis leachate results will be screened against Freshwater Environmental Quality Standards (FEQS) or UK Drinking Water Standards (UKDWS), whichever is most conservative. In addition, priority hazardous substances (Ref) will be screened against their laboratory Limit of Detection (LOD). For ambient level concentrations of particular contaminants the catchment area has been defined as the Fal. Where hardness dependant FEQS values have been used, in the absence of site specific data the most conservative FEQS values have been adopted. Similarly, where particular FEQS are derived from assessment of site specific calcium and dissolved organic carbon data, in the absence of this data the most conservative bioavailable FEQS values have been adopted.

9.6.100 The results of the screening assessment indicate the following:

- The majority of heavy metals are below the applied screening criteria with the exception of copper, lead, and zinc which are discussed further below.
- Numerous concentrations of PAH compounds are recorded above the laboratory limit of detection which are discussed further below.
- Two samples indicated leachable levels of TPH fractions, this is discussed further below.

9.6.101 Elevated levels of copper were observed in excess of the applied FEQS of 1µg/l, ranging between 2.0µg/l to 22.0µg/l in 13 of 16No. samples of made ground, topsoil and weathered bedrock. The highest concentrations were observed in samples of made ground.

9.6.102 Elevated levels of lead were found in excess of the applied FEQS of 1.2µg/l (bioavailable) ranging between 2.0µg/l to 26µg/l in 14 of 16No. samples, 4No.of these samples were from the made ground soils while 10No. were from natural soils, including topsoil.

9.6.103 Elevated levels of zinc were found to be in excess of the applied FEQS of 16.7g/l (10.9µg/l+ ambient 5.8µg/l) ranging between 21 and 158µg/l in 4No. samples. 1No. sample was from the made ground soils and 3No. were obtained from natural topsoil or residual soils.

9.6.104 Numerous concentrations of PAH compounds have been detected above the LOD of 0.02µg/l. One sample of made ground from BH-R-041 at 0.45m bgl showed exceedances in all compounds except acenaphthylene and dibenzo(ah)anthracene. Other exceedances were noted for acenaphthene, acenaphthylene, naphthalene, pyrene, and fluoranthene, and a few exceedances were noted for benzo(a)anthracene, benzo(k)fluoranthene, and fluorene. Review of the soil descriptions for the samples with PAH exceedances does not indicate any obvious source of the PAHs. It is notable that those PAHs with higher molecular weights and/or higher organic carbon partition co-efficients are generally absent from the leachate testing, suggesting a lack of mobility in the soil environment. It is considered that the lack of indefinable source for the PAHs, their presence in the topsoil samples, natural ground samples as well made ground soils suggests that they may be derived from diffuse pollution, possibly from vehicle emissions in association with the nearby highway or from past historic activity in relation the areas past mining history. It is not considered that the PAH concentrations in the leachate are a significant risk to controlled waters.

9.6.105 Groundwater sampling and analysis was not undertaken as part of the recent investigations on site. However, the investigations undertaken during the 2004 works included a single round of sampling and analysis from installed boreholes along the scheme alignment. Samples were obtained from exploratory holes BH08, BH14, BH17, BH18, BH25 to BH29 inclusive and BH33 (Figure 9-5).

9.6.106 For the same reasons as detailed above in the discussion on the leachate testing the groundwater results will be screened against Freshwater Environmental Quality Standards (FEQS) or UK Drinking Water Standards (UKDWS), whichever is most conservative. In addition, priority hazardous substances (Ref) will be screened against their laboratory Limit of Detection (LOD).

9.6.107 The results of the screening indicate the following:

- The LOD for cadmium and lead fall above their respective FEQS screening criteria, albeit no concentrations above the LOD were recorded.
- The LOD for copper was above the FEQS, 5No concentrations of copper were recorded above the LOD, ranging between 10.0µg/l and 40.0µg/l.
- The LOD for lead was above the FEQS, 1 No. concentration of lead was recorded above the LOD at 50.0µg/l.
- All concentrations of zinc were recorded above the FEQS.

- The LOD for Total TPH, PAH and BTEX fractions were not exceeded, however the LODs provided are higher than those that would be expected in more recent analysis.
- All other contaminant concentrations fall below the applied screening criteria.

9.6.108 Review of the groundwater analysis indicates that the groundwater exhibits elevated levels of copper in samples from BH17, BH25, BH26, BH28, and BH29, an elevated level of lead from BH25 and elevated levels of zinc in all samples.

9.6.109 BH25, BH26, BH28, and BH29 lie between chainages 12+500m and 13+500m, BH17 lies at approximate chainage 9+700m. these areas are in proximity to recorded mine workings and mineral lodes, it is considered possible that that elevated levels of heavy metals in the groundwater may be representative of the impact of natural concentrations of these substances in the soils or manmade concentrations associated with mine waste or mining features. Nevertheless, it should be noted that the groundwater chemical data is in excess of 13 years old and as such it is unlikely to be representative of the baseline conditions on the site at present.

9.7 Consultation

9.7.1 As mentioned in Chapter 4, a scoping report was issued for the scheme. The Planning Inspectorate responded on behalf of the Secretary of State within the Scoping Opinion [67]. A summary of the responses relevant to the Geology and Soils assessment and the respective changes made to the scope of this chapter will be reported within the ES, which will accompany the DCO application.

9.7.2 The Environmental Records Centre for Cornwall and the Isles of Scilly and the CC Environmental Protection Department were also consulted separately and provided information on the following:

- Regionally Important Geological Sites (RIGS);
- Part II A designations;
- Any known remediation that has been completed/ on-going/ planned;
- Ground investigations factual and interpretative reports;
- Sites of potential concern under Part II A;
- Historical underground storage tanks;
- Part A and B IPPC processes;
- Storage and usage of radioactive materials;
- Private water supply locations within 1km of the scheme alignment;
- Details of aggregate resources within the county (land bank figures);
- Local waste management infrastructure within the county;
- Any known issues associated with known mining features.
- Any anecdotal evidence of contamination, land owner complaints etc.

9.7.3 The received information forms part of the baseline conditions.

9.8 Assessment assumptions and limitations

9.8.1 It is assumed that measures would be put in place during the construction of the scheme to control potential pollution incidents caused by accidental leaks and spills of fuels and oils stored and used on site for construction plant and machinery. A Construction Environmental Management Plan (CEMP) typically

controls this. Adherence to the CEMP will mitigate the risk to identified receptors, however, in order to reinforce particular requirements, particular measures are outlined within Section 9.9 Design, Mitigation and Enhancement Measures.

9.8.2 The Phase 1 ground investigations do not provide ground investigation data for the entire scheme. Nonetheless, the available ground investigation information is considered sufficient at preliminary design stage and to inform the environmental impact assessments. A phase 2 ground investigation will be undertaken to fill in gaps and inform the ES post PEIR.

9.8.3 It is assumed that prior to completion of construction, the areas adjacent to the scheme used for access, egress and other associated construction works are to be reinstated with turf and topsoil in keeping with the original land use.

9.8.4 The reuse of site won or imported materials to the scheme will be managed by a verification system applied via the Specification for Highway Earthworks Series 600, and only materials found suitable for use would be acceptable for construction works.

9.8.5 Professional judgement has been applied where necessary in assignment of sensitivity and magnitude of effects in line with definitions provided in Table 9-1 and 9-2.

9.8.6 The assessment of pollution release as a result of operational or construction activities and potential impacts on hydrogeology are covered in Chapter 7 Road Drainage and Water Environment.

9.8.7 There are a number of gaps in the baseline data and uncertainties that have been identified and these have been summarised within Table 9-18. The assessment will be updated following further investigation and incorporated in the Environmental Statement.

Table 9-18 Summary of gaps and uncertainties

Gaps and uncertainties	Description and implications
Missing GI at Nancarrow	During the Phase 1 GI some of the areas were inaccessible and proposed ground investigation was not undertaken. Information on the ground conditions will be unknown in these areas. The environmental assessment has been carried out using the information obtained from the Phase 1 GI. Assumptions have been made regarding the ground conditions within the areas not investigated. The Phase 2 GI will be undertaken to fill in the gaps and the assessment will be updated following the Phase 2 GI post submission of the PEIR.
Gaps in GI throughout the scheme alignment	The Phase 1 GI was undertaken before the announcement of the preferred route. Information on the ground conditions will be unknown in areas where the preferred route alignment has altered from the alignment used to scope the Phase 1 GI. The environmental assessment has been carried out using the information obtained from the Phase 1 GI. Assumptions have been made regarding the ground conditions within the areas not investigated. The Phase 2 GI will be carried out to obtain gaps in available GI information, particularly at proposed structures. This will also include additional groundwater monitoring installations. In addition, further soil sampling, groundwater sampling and subsequent chemical analysis will also be undertaken, and a period of ground gas monitoring will be undertaken.

Gaps and uncertainties	Description and implications
Missing groundwater monitoring data	Groundwater level monitoring data obtained during and following the Phase 1 GI is available for summer months only. The environmental assessment has been carried out using the information obtained from the Phase 1 GI. Assumptions have been made regarding the potential groundwater level fluctuations during the winter months. To understand the potential seasonal fluctuation in groundwater level monitoring shall be carried out during the winter months. The assessment will be updated following winter monitoring.
Mining investigation	Limited investigation of mining areas was undertaken during the Phase 1 GI. A mining risk assessment has identified mining risk areas throughout the scheme alignment. A geophysics survey and potential subsequent intrusive investigation shall be carried out to further inform the detailed assessment of mining hazard. The results of the mining investigations shall be incorporated into the assessment. This will inform the need for future detailed assessments, in particular, potential detailed hydrogeological assessments.

9.9 Design, mitigation and enhancement measures

9.9.1 This section provides a description of the inherent design, mitigation and enhancement strategy for the scheme. It describes measures relied upon within the assessment and discusses the assumed development of these mitigation measures.

Construction

Geology and geomorphology

9.9.2 There are no design, mitigation and enhancement measures considered for pre assessment over and above the standard engineering design process that have been carried out and will continue in accordance with DMRB HD22/08 Managing Geotechnical Risk [68]. This includes a Preliminary Sources Study Report, Phase 1 GI and geotechnical interpretive reporting (Ground Investigation Report). It also includes appropriate geotechnical design of embankments, cuttings, structures and pavements.

9.9.3 Development of preliminary design shall be informed by further Phase 2 ground investigation information. Where possible the scope of GI has been developed in anticipation of the requirement to mitigate or reduce certain potential effects on the geology and geomorphology, i.e. the presence of high risk mining areas.

9.9.4 Temporary works shall be appropriately designed by the temporary works designer. This will ensure mitigation of potential effects on the geology and geomorphology during construction.

Soils

9.9.5 There are no design, mitigation and enhancement measures considered for pre assessment over and above the standard engineering design process that has been carried out and will continue in accordance with DMRB HD22/08 Managing Geotechnical Risk [68]. This includes a Preliminary Sources Study Report, Phase 1 GI and Geotechnical Interpretive reporting. It also includes appropriate geotechnical design of embankments, cuttings, structures and pavements.

9.9.6 Development of preliminary design shall be informed by further Phase 2 ground investigation information. Where possible the scope of GI has been developed in anticipation of the requirement to mitigate or reduce certain potential effects on the geology and geomorphology, i.e. the presence of high risk mining areas.

9.9.7 Temporary works shall be appropriately designed by the temporary works designer. This will ensure mitigation of potential effects on the geology and geomorphology during construction.

Contaminated land

9.9.8 The information used to produce the baseline assessment indicates potential areas of contamination may be present across the scheme study area. Intrusive ground investigations and analysis of contaminated land and groundwater has been relatively limited to date and as such some risks remain unquantified. Mitigation measures can be adopted to limit the impact of these potential risks without further assessment, however, it is considered prudent to undertake further intrusive investigations in order determine the level of risk and therefore the scope of required mitigation measures. Nevertheless, the following section outlines the design, mitigation and enhancement measures incorporated into the scheme pre assessment.

9.9.9 Construction activities will be undertaken on site in line with current best practice and guidance as detailed in Section 9.9 Design, Mitigation and Enhancement Measures and in accordance with a Construction Environmental Management Plan (CEMP). On this basis constructional related receptors and sources would be managed to negate their impact on the environment.

9.9.10 As a minimum or outline scope the outline EMP will include:

- Dust control measures during the works, wheel washers for offsite movements, construction of appropriate temporary transport networks within the construction area, covering of loads during on site transport.
- Health and safety training, guidance notes and signs and suitable welfare facilities. Promotion of good hygiene practices implemented for the duration of the works with no smoking, eating, or drinking in the locale of excavations in potentially contaminated areas.
- A watching brief by a suitably qualified and experienced person should be undertaken for the duration of site works in areas of potential contaminated land or groundwater.
- The use of protective clothing and equipment; appropriate Personal Protective Equipment (PPE) provided to all construction workers. The assessment of risks to construction workers and the provision of appropriate PPE would be the responsibility of the contractor involved in the works.
- An Action Plan for safely dealing with unexpected contamination should be developed. This will include provisions to appoint a suitably qualified and experienced contaminated land practitioner to provide a watching brief and supervisory role should unexpected contamination be encountered. This role shall include assessment of the risks to the construction works and workers. In addition, measures shall be identified to minimise the spread or release of contamination by suitably storing contaminated materials and appropriate waste disposal procedures.
- Management of construction related waters and agreement and permitting with the Environment Agency with regards to release to controlled waters or

Service providers in relation to discharge existing drainage/sewerage infrastructure.

- Environmental monitoring throughout the construction period to ensure environmentally sound working practises are being adopted and adhered to.
- If piling is undertaken, provision for additional task related risk assessments to evaluate the risk to the environment and provide mitigation measures e.g. Foundation Works Risk Assessments for piling if undertaken.

9.9.11 In addition to the guidance provided in Section 9.9 Design, Mitigation and Enhancement Measures and the outline EMP, the management of materials, including handling, re-use and removal from site, should be undertaken in accordance with an agreed Material Management Plan for the scheme. This will provide a framework via which potentially contaminated soils can be managed safely so as to limit the risk to identified receptors during both the construction phase and also during the operational lifetime of the scheme.

Operation

Geology and geomorphology

9.9.12 There are no design, mitigation and enhancement measures considered for pre assessment over and above the engineering design process that is currently being carried and will continue in accordance with DMRB HD22/08 Managing Geotechnical Risk [68]. This includes appropriate geotechnical design of embankments, cuttings, structures and pavements to ensure long term operation of the highway assets.

Soils

9.9.13 There are no design, mitigation and enhancement measures considered for pre assessment over and above the engineering design process that is currently being carried out and will continue in accordance with DMRB HD22/08 Managing Geotechnical Risk [68]. This includes appropriate geotechnical design of embankments, cuttings, structures and pavements to ensure long term operation of the highway assets.

Contaminated Land

9.9.14 It is considered that the scheme will include measures to limit the risk to identified receptors during the operation since the design will be undertaken in line with current best practice, guidance and legislation.

9.9.15 The use of the CEMP and MMP throughout the construction process will prevent contamination being introduced into the environment and will prevent existing contamination being mobilised or pathways to contamination being present during operation.

9.9.16 Re-use of site won soils will be undertaken in line with a suitable earthworks specification which will include acceptability limits in relation to contaminant concentrations protective of human health and the wider environment.

9.9.17 It is assumed that operational maintenance of the scheme would be undertaken in accordance with best practice guidance and legislation and therefore the risk to maintenance workers would be reduced to an acceptable level or negated.

9.10 Assessment of effects – construction

9.10.1 This section presents the assessment of potential effects resulting from and during construction of the scheme on the geology and geomorphology, soils and land contamination. The potential effects of construction works on agricultural soils has been considered as part of Chapter 12, People and Communities of the PEIR and will be presented in due course within the Environmental Statement. The assessment of the effects on water resources, hydrogeology and flooding are considered in Chapter 10, Road Drainage and Water Environment.

Geology and geomorphology

Assessment of potential impact of construction of embankments

9.10.2 The construction of embankments is unlikely to result in significant consolidation of the soils due to the applied load of the embankment materials. Some insignificant consolidation may occur in the upper layers of the weathered bedrock, near the surface, particularly where it consists of cohesive materials, or in localised areas of alluvium associated with the watercourses or made ground. Any soft materials prone to consolidation that are encountered during construction works would be removed and replaced with competent materials to prevent differential settlements. These deposits are of little local geological/geomorphological interest, therefore their sensitivity is very low and the magnitude of impact is negligible, hence the significance of effect is considered **Neutral**.

9.10.3 There are no geologically protected sites within the scheme study area, therefore construction of embankments will not impact any geologically designated sites and hence the significance of effect is considered **Neutral**.

9.10.4 The construction of embankments over areas that may have been previously mined has the potential to accelerate the natural rate of subsidence/collapse of shallow underground mine workings.

9.10.5 Embankments would be constructed over or within the vicinity of the mining features listed in Table 9-19. The risk level posed by these mining features has been derived through a mining assessment carried out by Cornwall Consultants [52]. The results of this assessment and a short description of the mining hazard have been summarised within Table 9-19.

Table 9-19 Summary of mining features affected by embankment construction

Embankment	Chainage (m)	Mining feature	Hazard description	Risk level[1]
Chiverton Embankment	1+150 to 1+320	Suspected lode	Prospective unrecorded workings along surface outcrop of lode > Loose backfilled materials and/or voided workings	High risk
	1+820 to 1+890	Backfilled quarry	Loose backfilled materials within quarry > Potential adit workings from quarry face	High risk

Embankment	Chainage (m)	Mining feature	Hazard description	Risk level[1]
Journey's End Embankment	12+030 to 12+160	Suspected lode and fault	Prospective unrecorded workings along surface outcrop of suspected lode and fault > Loose backfilled materials and/or voided workings	High risk and medium risk
	12+080	Recorded mine shaft (10m from embankment toe)	Loosely backfilled/capped or uncapped mine shaft	High risk
		Suspected adit (10m from embankment toe)	Void potentially at shallow depth	High risk
	12+060	Suspected mine shaft (40m from embankment toe)	Loosely backfilled/capped or uncapped mine shaft	High risk
Notes [1] Risk level based on the findings and interpretation of the Cornwall Consultants mining review [52]				

9.10.6 The potential magnitude and the subsequent significance of effect associated with these mining features cannot be determined at this stage. In the absence of information to suggests otherwise, the assessment of the significance of effects associated with the mining hazard has assumed a worst case potential scenario. This assumes that all high risk mining zones derived by Cornwall Consultants are affected by the presence of shallow mine workings and the resulting significance of effect is considered to be **High Adverse**. However, it should be noted that this classification is based on limited information at the time of writing and that it is based on a liberal estimate.

9.10.7 Further mining specific ground investigation to be undertaken as part of the Phase 2 GI will be used to inform a detailed assessment of the mining hazard and subsequent requirements for remediation and stabilisation of mine workings and entrances.

9.10.8 Remediation and stabilisation of mine workings and entrances has the potential to impact the chemistry, turbidity and flow of groundwater and surface water. The significance of the effect cannot be determined without a clear understanding of the potential mine working/entrance stabilisation measures. Depending on the stabilisation measures a more detailed assessment, such as a Quantitative Groundwater Risk Assessment may also be required. The need for a detailed assessment will be determined following the Phase 2 GI. At this stage the significance of effect associated with the mining hazard cannot be determined and will be updated once further information is available.

9.10.9 The scheme alignment is underlain by a regionally important resource of interbedded sandstone and shale/slate. The construction of embankments would eliminate access to the deposits within the scheme footprint and in its direct vicinity. However, considering the limited extent of the impacted area, access to the vast majority of these resources will not be affected. Additionally, there are no Mineral Safeguarding Areas within the study area. This demonstrates that no mineral resource in the area will be sterilised by the scheme and the significance would be **Slight Adverse**.

9.10.10 Construction of embankments is unlikely to result in a reduction in the permeability of the ground relative to the expected natural permeability, and therefore no impact on the groundwater recharge and movement is anticipated. The groundwater has a medium sensitivity, however the magnitude of impact is considered to be negligible, resulting in a **Neutral** significance of effect.

9.10.11 The scheme alignment generally traverses a boundary between two watersheds. Several springs emerge along the flanks of this watershed boundary, flowing to the north and south. An assessment of potential impact of the affected embankments on the identified springs and headwater streams is presented in Chapter 10, Road Drainage and Water Environment.

Assessment of potential impact of construction of cuttings

The construction of cuttings would result in the excavation of weathered bedrock, becoming gradually less weathered with depth. The locations and depths of the proposed new exposures are shown on

9.10.12 Figure 9-8 and the strata affected for each cutting is summarised in Table 9-20.

Table 9-20 Summary of the bedrock geology to be exposed in cuttings

Strata	Chainage (m)		Cutting name affected
	From	To	
Porthtowan Formation	0+000	8+810	• Chiverton Cutting (0+600 to 0+950) • Four Burrows Earthworks 1 (2+850 to 3+100) • Hillview Cutting (5+100 to 5+850) • Nanteague Cutting (6+450 to 6+650 • Marazanvose Cutting (6+900 to 7+250) • Two Barrows Cutting (7+500 to 7+850) • Tolgroggan Earthworks (8+400 to 8+750)
Grampound Formation	8+810	13+720	• Zelah Earthworks 1 (8+950 to 9+200) • Zelah Earthworks 3 (9+400 to 9+500) • Trevalso Crossing (10+150 to 10+300) • Penglaze Cutting (11+400 to 11+600) • Quarry Retaining Wall (12+600 to 12+950)
Trendrean Mudstone	13+720	14+490	• Carland Cross Earthworks 3 (13+850 to 14+300)

9.10.13 There are no statutory or non-statutory geologically designated sites within the scheme study area, therefore construction of cuttings will have no impact on any geologically designated sites and the significance of effect is considered to be **Neutral**.

9.10.14 The scheme alignment is underlain by a regionally important resource of interbedded sandstone and shale/slate. The construction of cuttings would eliminate access to the deposits within the scheme footprint and in its direct vicinity. However, considering the limited extent of the impacted area, access to the vast majority of these resources will not be affected. Additionally, there are no Mineral Safeguarding Areas within the study area.

9.10.15 The sensitivity of the impacted mineral resources is considered to be medium due to their regional importance with some potential for replacement. The magnitude of impact is considered to be minor. This is because although the scheme may

result in the partial loss of these resources of regional importance, the loss is not considered significant considering the extent of the potential resource. Consequently, the effect of the construction of the cuttings on the mineral resources is considered to be **Slight Adverse**.

9.10.16 The construction of cuttings over areas that may have been previously mined has the potential to intersect mine workings/entrances and accelerate the natural rate of subsidence/collapse of shallow underground mine workings.

9.10.17 Cuttings would be constructed over or within the vicinity of the mining features listed in Table 9-21. The risk level posed by these mining features has been derived through a mining assessment carried out by Cornwall Consultants [52]. The results of this assessment and a short description of the mining hazard have been summarised within Table 9-21.

Table 9-21 Summary of mining features affected by cutting construction

Cutting	Chainage (m)	Mining feature	Hazard description	Risk level[1]
Nanteague Cutting	6+380 to 6+430	Suspected lode	Prospective unrecorded workings along surface outcrop of lode > Loose backfilled materials and/or voided workings	High and medium risk
Tolgroggan cutting and side road	8+150 to 8+250	Suspected lode and fault	Prospective unrecorded workings along surface outcrop of suspected lode and fault > Loose backfilled materials and/or voided workings	Medium risk
Tolgraoggan earthwork	8+600	Backfilled quarry (30m from crest of cutting)	Loose backfilled materials within quarry > Potential adit workings from quarry face	Medium risk
Trevalso Farm underpass cutting (north)	9+650 to 9+700 (side road north of A30)	Suspected lode	Prospective unrecorded workings along surface outcrop of lode > Loose backfilled materials and/or voided workings	High risk
Quarry Retaining Wall	12+650 to 12+780	Flooded quarry	Loose backfilled materials within quarry > Potential adit workings from quarry face > Instability of existing quarry face > Flooding due to groundwater flowing from quarry into cutting	Medium risk
Carland Cross cutting	13+950 to 14+120	Backfilled quarry within cutting face	Loose backfilled materials within quarry > Potential adit workings from quarry face	Medium risk

Notes
[1] Risk level based on the findings and interpretation of the Cornwall Consultants mining review [52]

9.10.18 The potential magnitude and the subsequent significance of effect associated with these mining features cannot be determined at this stage.

9.10.19 In the absence of information to suggests otherwise, the assessment of the significance of effects associated with the mining hazard has assumed a worst

case potential scenario. This assume that all high risk mining zones derived by Cornwall Consultants are affected by the presence of shallow mine workings and the resulting significance of effect is considered to be **High Adverse**.

9.10.20 Further mining specific ground investigation to be undertake as part of the Phase 2 GI will be used to inform a detailed assessment of the mining hazard and subsequent requirements for remediation and stabilisation of mine workings and entrances.

9.10.21 Remediation and stabilisation of mine working and entrances has the potential impact the chemistry, turbidity and flow of groundwater and surface water. The magnitude and the subsequent significance of the effect cannot be determined without a clear understanding of the potential mine working/entrance stabilisation measures. Depending on the stabilisation measures a more detailed assessment, such as a Quantitative Groundwater Risk Assessment may also be required. The need for a detailed assessment will be determined following the Phase 2 GI. At this stage the significance of effect associated with the mining hazard cannot be determined and will be updated once further information is available.

9.10.22 Where groundwater control measures are required to control the ingress of groundwater (e.g. Quarry Retaining Wall) the groundwater level may be affected. This may result in lowering of the groundwater level in proximity of the works. An assessment of potential impact of the affected cuttings on the identified surface water features and groundwater as a resource is presented in Chapter 10 Road Drainage and Water Environment.

Assessment of potential impact of construction of structures

9.10.23 The construction of the structures such culverts or underpasses will be undertaken as part of the embankment construction and therefore will have no additional impact on the underlying geology.

9.10.24 The construction of the attenuation ponds will require shallow excavations and removal of the topsoil, superficial deposits (if present) and weathered bedrock. It is unlikely that the construction of ponds will involve the removal of the regionally important mineral resource (sandstone bedrock). This regionally important resource would have a medium sensitivity, however considering the localised nature of these works and the extent of the proposed ponds, the magnitude of impact is considered negligible and the significance of effect **Slight Adverse**.

9.10.25 The construction of the structures will require construction of the foundations. Considering the underlying ground conditions these structures are likely to require shallow foundations and therefore only localised excavations will be required. There are no geologically protected sites within the scheme study area, therefore construction of structures will not impact on any geologically designated sites. The construction of structures would eliminate access to the regionally important mineral resource beneath the scheme alignment. However the impacted areas are limited and there are no Mineral Safeguarding Areas. There are also no structures that would be constructed over areas that may have been mined. Consequently, the regionally important resource would have a medium sensitivity and the magnitude of impact would be minor. Therefore, the significance of effect of the construction of the structures on the geology and geomorphology and mineral resources is considered **Slight Adverse**.

Soils

9.10.26 The potential effects of construction works on agricultural soils has been considered as part of Chapter 12, People and Communities and Chapter 10, Materials of this PEIR.

Land contamination

9.10.27 The construction of the scheme will introduce new receptors to potential contamination arising from the possible sources as identified in the baseline Conceptual Site Model presented in Section 9.6.70 to Section 9.6.85 and summarised in Table 9-14.

9.10.28 The review of the identified potential sources, receptors, and pathways and the plausible pollution linkages, as detailed in Table 9-22 to Table 9-25, allows for the assessment of the likely impacts of land contamination on the existing baseline conditions during the construction phase.

9.10.29 In addition to those sources identified during the baseline assessment and detailed in Table 9-14 the following sources of contamination would be present as a result of construction activities:

Table 9-22 Construction phase potential sources of contamination.

Potential Source	Potential Contaminants
On site	
Areas of unexpected/unknown contamination along the scheme.	Metals, hydrocarbons, asbestos, herbicides in soils and groundwater, ground gas
Site won or off site derived fill materials used in the scheme.	Metals, hydrocarbons, asbestos, ground gas.
Dust generated during construction from areas of made ground, mining waste, other contamination (unexpected/unknown)	Metals, hydrocarbons, asbestos.
Contaminated groundwater encountered during groundworks.	Heavy metals, hydrocarbons.
Mine workings treatment	Grout, mobilisation of possible heavy metals.

9.10.30 In addition to those receptors identified during the baseline assessment and detailed in Table 9-15, the following receptors would be introduced during the construction phase:

Table 9-23 Construction phase potential receptors.

Receptors	Discussion
Human:	
Construction workers 16 years of age upwards.	Short term duration for exposure during proposed works.

9.10.31 In addition to the pathways outlined during the baseline assessment and detailed in Table 9-16, the following additional pathways would be introduced during the construction phase.

Table 9-24 Construction phase potential pathways.

Pathway	Discussion
Human Health:	
Ingestion of soil and dust	Direct contact between construction workers and exposed soils and possibly groundwater on the scheme. Mobilisation of dust from soils on the scheme
Inhalation of soil dust	
Inhalation of gases and volatile organic contamination	
Dermal contact with soils and dust.	
Controlled Waters:	
Mobilisation of contaminants during the works.	Construction activities have the ability to introduce additional pathways between groundwater and surface water features via excavations, pumping etc. Pumping to ground or other receptor
Direct/indirect discharge	
Increased leachate generation.	Greater exposure of soils in excavations and earthworks to rainwater infiltration leading to increase leaching of potential contaminants.

9.10.32 Review of the likely pathways operating during the construction phase indicates a change from the baseline scenario whereby nearby residents and workers, and recreational users of the study site may be impacted by dermal, inhalation and ingestion pathways via dust generated from the scheme. Assessment of dust generation impact is covered in Chapter 5, Air Quality. However, the assessment of potential impact of potentially contaminated dust on humans is provided in this Chapter.

9.10.33 With regard to the other baseline source pathway receptor scenarios identified for nearby residents and workers, and recreational users it is not considered that the construction phase significantly alters these. For the same reasons as provided in the baseline assessment the pathways between potential sources and the receptors are not considered plausible and as such the source-pathway-receptor linkage is not present.

9.10.34 Review of the possible impact on maintenance workers indicates little change from the baseline scenario as a result of the construction phase. A plausible pollutant linkage still exists between maintenance workers and potential sources in relation to existing highways.

9.10.35 Similarly, it is not considered that the construction phase will result in a change in the pollution linkage for the existing users of the A30, or other highways in the scheme study area.

9.10.36 The construction phase does introduce a new potential pollutant linkage between construction workers and existing sources identified in the baseline scenario. In addition, the construction phase introduces new sources and pathways via which construction workers may be impacted.

9.10.37 The construction phase also introduces new sources and pathways in which Controlled waters may be impacted by construction phase activities.

9.10.38 On the basis of the above discussion, Table 9-17 presents the plausible pollutant linkages present during the construction phase for the scheme.

Table 9-25 Construction Source-Pathway-Receptor Linkages.

Sources	Pathways	Receptors	Comments
On Site **Made ground:** Existing road infrastructure Made ground identified during previous ground investigations **Historic Mining and Quarries** Mine waste used to fill/level areas. Backfilled mine workings with mine wastes (possible surface workings along lodes) Back filled quarries – unknown backfill with potential contamination. **Current or historic activities** Possible contamination associated with operation of A30 and other highways crossing the scheme alignment. Land use – filling stations, electrical distribution network, agriculture. Previous pollution incidents (recorded and un-recorded). ***Construction Phase:*** *Unexpected Contamination* *Site won or Imported soils* *Dust from exposed soils* *Contaminated Groundwater encountered during the works* *Mine workings treatment* **Off Site** **Made ground:** Possible made ground associated with the existing road infrastructure crossing the scheme alignment.	**Human Health** Ingestion of soil and dust Inhalation of soil and dust Inhalation of gasses and volatile organic contamination Dermal contact with soils, dust.	**Human Health** Maintenance workers on highways or other land that crosses the scheme alignment. ***Construction Phase:*** *Nearby residents and workers* *Construction workers*	**Human Health** Made ground, mining waste or backfilled workings, and potential current contaminative processes are considered likely to be present in locations in the study site. Maintenance workers on existing highways may be directly exposed to potential contaminated made ground. *Nearby residents and workers may be impacted by dermal, ingestion and inhalation routes via dust generated during the construction works.* *Construction workers involved in the Scheme may come into direct contact with contaminated soils and made ground along the scheme. Significant levels of contamination are not expected based on the baseline information; however, there is a possibility of encountering unexpected contamination along the scheme. Similarly, they may be impacted by contact with contaminated groundwater in excavations or cuttings.*
	Controlled Waters Leaching of contaminants, vertical and horizontal migration within the subsurface.	**Controlled Waters** Groundwater beneath the scheme alignment (Secondary A Aquifers) Surface water features	**Controlled Waters** Migration of contaminants from spills or leaks or via leaching of soil based contamination is considered plausible.

Sources	Pathways	Receptors	Comments
Possible made ground associated with private developments, farm land. **Historic Mining and Quarries** Mine waste used to fill/level areas. Backfilled mine workings with mine wastes (possible surface workings along lodes) Back filled quarries – unknown backfill with potential contamination **Current or historic activities** Possible contamination associated with operation of A30 and other highways crossing the scheme alignment. Land use – filling stations, smithy's, electrical distribution network, horticulture, agriculture. Previous pollution incidents (recorded and un-recorded). Soakaway drainage as possible contamination pathways.	Direct discharge into surface waters via run off or from groundwater seepage/springs	Water Abstractions	Surface water features are present within the scheme, direct discharge of contamination possible as is indirect migration of contamination. Source protection zones related to abstractions exist beneath the scheme. These are considered likely to be impacted by any contamination present. *Direct release of construction related contaminants (fuels etc) into the groundwater is considered possible. It is considered that this will be assessed in Chapter 13 Road Drainage and Water Environment.* *Increased surface water run-off from potentially contaminated soils and impact on surface water receptors. It is considered that this will be assessed in Chapter 13 Road Drainage and Water Environment.* *Mobilisation of contamination as a result of excavations and directly discharged into ground or surface water features as part of dewatering, mine works treatment.* *Introduction of grout in mine works treatment.*

Potential impact of existing contaminated land on nearby residents and workers

9.10.39 It is considered that during the construction works, nearby residents and workers may be exposed to contaminated dust. The following pathways are considered to be plausible:

- Dermal contact with contaminated dust;
- Ingestion of contaminated dust;
- Inhalation of contaminated dust.

9.10.40 On the basis of the above it is considered that exposure would be to dust indoors and outdoors, the most sensitive receptor would be a young female present in a residential property exposure to dust generated. On this basis screening against criteria for Residential without plant uptake used previously under the baseline assessment is likely to be most appropriate to assess the risk. This identified that in general levels of contamination were below the applied screening criteria with the exception of single exceedances for axenic and lead present in made ground and topsoil.

9.10.41 In the absence of mitigation measures, there would be a risk to nearby residents and workers from dust generated during the construction works. The most sensitive receptor would be a female resident; on this basis the sensitivity of the receptor would be high. However, adoption of the mitigation measures (CEMP) described within Section 9.9 would limit the generation of dust, and as such it is considered that the impact would be that there would be no change from the baseline scenario. On this basis, the effect of construction generated dust on the identified receptor is considered to be **Neutral.**

Potential impact of existing contaminated land on construction workers

9.10.42 It is considered that during the construction works, construction workers are likely to come into direct contact with site soils and possible perched or shallow groundwater in the areas of the identified sources. The exposure period for these receptors is considered to be short term (acute) on the basis they would only be exposed during the construction phase, and only whilst works were being undertaken in areas identified as potential sources. The following pathways are considered likely to be plausible during the construction works:

- Dermal contact with contaminated soils, surface water and shallow groundwater;
- Ingestion of contaminated soils and dust, surface water and shallow groundwater;
- Inhalation of vapours and gases from soils or groundwater;
- Inhalation of dust from soils.

9.10.43 Published generic screening criteria for the assessment of human health impacts from contaminated land are based on long term (chronic) exposure models and are therefore not suitable for the assessment of short term (acute) scenarios. Nevertheless, the use of screening criteria for residential with plant uptake is considered to provide a suitably conservative approach in the absence of specific acute scenario screening criteria.

9.10.44 Review of the existing soils contamination testing presented as part of the baseline assessment indicates in general levels of contaminants in the sampled made ground and natural soils are below conservative screening criteria for

protection of human health. Exceedances were noted in a sample of made ground for arsenic and lead, and arsenic in a sample of topsoil. On the basis of the chemical testing undertaken to date is considered that the soils across the scheme have a generally low potential for contamination, however it is considered there is a risk of isolated areas of contaminated soils existing across the scheme.

9.10.45 The results of leachate analysis and limited groundwater sampling undertaken to date indicates a potential for the groundwater to be impacted by hydrocarbons and heavy metals.

9.10.46 The chemical testing undertaken on site to date has been relatively limited in in relation to the site extents and the likely potential sources. On this basis it is considered that there is a possibility that further areas of contaminated soils may be present throughout the scheme that have not been identified to date but that may pose a risk to construction workers.

9.10.47 On the basis of the chemical analysis undertaken throughout the scheme to date it is considered that in the absence of mitigation there is a risk to construction workers during the development from soil and groundwater contamination. It is considered that the most sensitive receptor would be a working age female construction worker, but that exposure would be over a short duration and on this basis the sensitivity of the receptor has been assessed as low. Adoption of the mitigation measures detailed in the CEMP and MMP will provide sufficient mitigation to reduce the impact on the receptor an acceptable level. On this basis, the construction workers are considered to be a low sensitivity receptor, however the works would have negligible impact and therefore the significance of effect is considered to be **Neutral.**

Potential impact of unexpected contamination on construction workers

9.10.48 Considering the past mining history of the study area and scheme there is a potential risk of encountering areas of unexpected contamination (outside of that identified on the basis of the baseline results) during the construction works.

9.10.49 In relation to the assessment of impact of unexpected contamination on construction workers (human health) it is considered that the most sensitive receptor would be a working age female construction worker, but that exposure would be over a short duration and on this basis the sensitivity of the receptor has been assessed as medium. Adoption of an Action Plan described within Section 9.9, if and when unexpected contamination is encountered will provide sufficient mitigation to reduce the impact on the receptor an acceptable level. On this basis, the construction workers are considered to be a medium sensitivity receptor, however the works would have a negligible impact and therefore the impact significance is considered to be **Slight Adverse.**

Potential impact of existing contaminated land on groundwater and surface water quality

9.10.50 It is considered that the construction of the scheme will have the potential to disturb soils and potentially groundwater, which may increase the mobility of any contamination present within the site soils. Site works may introduce preferential pathways for contamination to migrate within the subsurface (e.g. service and drainage corridors, grouting of mine workings etc).

9.10.51 The potential receptors to this contamination are detailed in Table 9-15 and summarised below:

- Groundwater in the Secondary A Aquifer underlying the scheme.
- Surface water features near or passing beneath the scheme as detailed in paragraph 9.6.38 to paragraph 9.6.39.

9.10.52 The sensitivity of the groundwater is considered to be high since although it has been classified as a Secondary A two active source protection zones are present in the study site and under the scheme.

9.10.53 The sensitivity of the River Kenwyn is considered to be high given the WFD classification of Good.

9.10.54 The sensitivity of the Zelah Brook is considered to be high given the WFD classification of Good.

9.10.55 The sensitivity of the Upper River Allen is considered to medium given the WFD classification of moderate.

9.10.56 The review of baseline conditions has indicated the presence of leachable levels of heavy metals, PAHs and TPH, however, in general limited contamination has been observed in the soil samples. Groundwater sampling and analysis has indicated elevated levels of heavy metals were present previously (in 2004) however the data is not considered to reflect the current regime due to its age. From review of the baseline information it is considered that there is a risk to groundwater, albeit relatively minor.

9.10.57 The construction activities have the potential to increase mobility of potential contamination by introducing additional pathways, and also introducing additional sources. However, the impact arising from construction activities is likely to be temporary, the anticipated level of contamination it is considered to be relatively low. In addition, the implementation of design mitigation and best practise during construction described within Section 9.9 means that the impact would likely be negligible on the both the groundwater and surface waters. On this basis, the significance of effect on the groundwater is **Slight Adverse** and the significance of impact on the surface waters is **Slight Adverse.**

Potential Impact of Unexpected Contamination on Controlled Waters

9.10.58 Similarly, to the risk to construction workers there is a risk that encountering unexpected contamination may impact on the underlying groundwater, surface water features, and possibly abstraction points.

9.10.59 The groundwater (and therefore groundwater abstraction points) is considered to be a high sensitivity receptor whilst the surface waters are high to medium sensitivity dependant on the WFD classification.

9.10.60 In order to mitigate the potential effects of encountering unexpected contamination an Action Plan will be formulated and included within the CEMP. With the implementation of these mitigation measures the magnitude of impact is considered to be at worst minor in relation to the risk to controlled waters receptors. The impact significance is therefore considered to be **Slight Adverse** for groundwater receptors, and **Slight Adverse** for surface water receptors.

9.11 Assessment of effects – operation

9.11.1 This section presents the assessment of potential effects resulting from operation of the scheme on the geology and geomorphology, soils and land contamination. The potential effects of construction works on agricultural soils has been considered as part of Chapter 12, People and Communities of this PEIR and will be presented in the Environmental Statement to follow. The assessment of the effects on water resources and flooding are considered in Chapter 13, Road Drainage and Water Environment.

Geology and geomorphology

Assessment of potential impact of embankments during operation

9.11.2 The scheme alignment is underlain by a regionally important resource of interbedded sandstone and shale/slate. The operation of embankments would eliminate access to the deposits within the scheme footprint and in its direct vicinity. However, considering the limited extent of the impacted area, access to the vast majority of these resources will not be affected. Additionally, there are no Mineral Safeguarding Areas within the study area. This demonstrates that no mineral resource in the area will be sterilised by the scheme and the significance would be **Slight Adverse**.

9.11.3 During the operational phase, it is unlikely that the embankment would result in any further consolidation of the soils due to the applied load of the embankment materials. Therefore, there is unlikely to be a further significant reduction in the soils permeability and consequent localised changes to the groundwater movement. Consequently, the effect of the construction of the earth embankments on the geology is considered to be **Neutral**.

9.11.4 During the operation phase the embankments may have an impact on water flow due to the presence of springs/seepages beneath embankments. Issues associated with drainage and flooding are considered in Chapter 13, Road Drainage and Water Environment.

Assessment of potential impact of cuttings during operation

9.11.5 The operation of the cuttings could locally impact hydrological and hydrogeological regime within the scheme area.

9.11.6 Cuttings would result in the formation of new exposures of geological/ geomorphological interest. The new exposures would have a medium sensitivity and the magnitude of the impact would be minor, therefore the significance of effect of operation on the new geological / geomorphological features is considered to be **Slight Beneficial**.

9.11.7 The scheme areas where cuttings would be required would be equipped with drainage the purpose of which would be to control groundwater level and collect groundwater issues from the slopes formed within the rock. This is likely to impact the groundwater flow direction and levels. An assessment of potential impact of proposed cuttings on the identified surface water features and groundwater abstraction is presented in Chapter 13 Road Drainage and Water Environment.

Assessment of potential impact of operation of structures

9.11.8 The operation of the structures such bridges, culverts and underpasses will have no additional impact on the underlying geology with a **Neutral** significance of effect.

Soils

9.11.9 The assessment of the soils adjacent to the scheme to be affected by spray or air borne pollutants has been assessed within Chapter 5, Air Quality.

Land contamination

9.11.10 The operation of the scheme will introduce new receptors to potential contamination arising from the possible sources as identified in the Conceptual Site Model presented in Section 9.6.70 to Section 9.6.85 and summarised in Table 9-14.

9.11.11 The review of the identified potential sources, receptors, and pathways and the plausible pollution linkages, as detailed below, allows for the assessment of the likely impacts of land contamination on the existing baseline conditions during the operational phase.

9.11.12 In addition to those sources identified during the baseline assessment and detailed in Table 9-14 the following sources of contamination would be present as a result of operational activities:

Table 9-26 Operational phase potential sources of contamination.

Potential Source	Potential Contaminants
On site	
Imported or site won construction materials	Metals, hydrocarbons, asbestos, herbicides, ground gas

9.11.13 In addition to those receptors identified during the baseline assessment and detailed in Table 9-15, the following receptors would be introduced during the operational phase:

Table 9-27 Operational phase potential receptors.

Receptors	Discussion
Human:	
Maintenance workers on the scheme, retained A30, and other highways crossing the scheme and study area.	Regular and possible long term (albeit intermittent) exposure to the potential contamination sources identified in the previous section.
Users of the scheme, including motorists, cyclists, pedestrians, horse riders etc.	These receptors are considered to be at a low risk due to the transient nature of their likely exposure to the potential contamination sources.

9.11.14 In addition to the pathways outlined during the baseline assessment and as detailed in Table 9-16, the following additional pathways would be introduced during the construction phase.

Table 9-28 Operational phase potential pathways.

Pathway	Discussion
Human Health:	
Ingestion of soil and dust	Direct contact between maintenance workers and imported or site won construction materials. Inhalation of gasses confined in scheme infrastructure. Mobilisation of dust from soils on the scheme
Inhalation of soil dust	
Inhalation of gases and volatile organic contamination	
Dermal contact with soils and dust.	
Controlled Waters:	
Leaching of contaminants, vertical and horizontal migration.	Leaching of contamination introduced into the scheme during construction.

9.11.15 Review of the likely pathways operating during the operational phase indicates a change from the baseline scenario whereby nearby residents and workers, and recreational users of the study site may be impacted by dermal, inhalation and ingestion pathways via dust generated from operational maintenance works on the scheme. However, an assessment of this impact is covered in Chapter 5 Air Quality and as such no further assessment on this is provided in this Chapter.

9.11.16 With regards to the other baseline pathway scenarios identified for nearby residents and workers, and recreational users it is not considered that the operational phase significantly alters these. For the same reasons as provided in the baseline assessment the pathways between potential sources and the receptors are not considered to be plausible and as such the source-pathway-receptor linkage is not present.

9.11.17 It is not considered that the operational phase will result in a change in the pollution linkage for the existing users of the A30, or other highways in the Study site. Similarly, it is not considered that the operational phase will result in a new pollution linkage for users of the scheme, for the same reasons as they were not considered to be at risk from the existing baseline conditions.

9.11.18 Review of the possible impact to maintenance workers working on the retained A30 and other nearby highways indicates little change from the baseline scenario as a result of the operational phase. A plausible pollutant linkage still exists between maintenance workers and potential sources in relation to existing highways. However, a new source-pathway-receptor linkage is introduced should the construction of the scheme introduce additional contamination from offsite sources or re-use contaminated site won material then maintenance workers working on the operational scheme will be exposed during their works.

9.11.19 The operational phase will also introduce new sources and pathways in which Controlled waters may be impacted if contaminated site won or imported materials are used in the construction.

9.11.20 On the basis of the above discussion, Table 9-29 presents the plausible pollutant linkages present during the construction phase for the scheme.

Table 9-29 Operational source-pathway-receptor linkages.

Sources	Pathways	Receptors	Comments
On Site **Made ground:** Existing road infrastructure Made ground identified during previous ground investigations **Historic Mining and Quarries** Mine waste used to fill/level areas. Backfilled mine workings with mine wastes (possible surface workings along lodes) Back filled quarries – unknown backfill with potential contamination. **Current or historic activities** Possible contamination associated with operation of A30 and other highways crossing the scheme alignment. Land use – filling stations, electrical distribution network, agriculture. Previous pollution incidents (recorded and un-recorded). ***Operational Phase:*** *Site won or Imported construction materials* **Off Site** **Made ground:** Possible made ground associated with the existing road infrastructure crossing the scheme alignment. Possible made ground associated with private developments, farm land. **Historic Mining and Quarries** Mine waste used to fill/level areas.	**Human Health** Ingestion of soil and dust Inhalation of soil and dust Inhalation of gasses and volatile organic contamination Dermal contact with soils, dust.	**Human Health** Maintenance workers on highways or other land that crosses the scheme alignment. ***Operational Phase:*** *Maintenance workers on the scheme*	**Human Health** Made ground, mining waste or backfilled workings, and potential current contaminative processes are considered likely to be present in locations in the study site. Maintenance workers on existing highways may be directly exposed to potential contaminated made ground. *Maintenance workers on the scheme may come into direct contact with contaminated soils and made ground along the scheme that remains or from site won or imported materials used in the scheme construction.*
	Controlled Waters Leaching of contaminants, vertical and horizontal migration within the subsurface.	**Controlled Waters** Groundwater beneath the scheme alignment (Secondary A Aquifers) Surface water features Water Abstractions	**Controlled Waters** Migration of contaminants from spills or leaks or via leaching of soil based contamination is considered plausible. Surface water features are present within the scheme, direct discharge of contamination possible as is indirect migration of contamination. Source protection zones related to abstractions exist beneath the scheme. These are considered likely to be impacted by any contamination present.

Sources	Pathways	Receptors	Comments
Backfilled mine workings with mine wastes (possible surface workings along lodes) Back filled quarries – unknown backfill with potential contamination **Current or historic activities** Possible contamination associated with operation of A30 and other highways crossing the scheme alignment. Land use – filling stations, smithy's, electrical distribution network, horticulture, agriculture. Previous pollution incidents (recorded and un-recorded). Soakaway drainage as possible contamination pathways.			*Introduction of contaminated fill materials and potential leaching impact on underlying groundwater, nearby surface water features and abstraction points.*

Potential impact of existing contaminated land on maintenance workers

9.11.21 Table 9-29 indicates that in the operational phase there is a risk that maintenance workers on the scheme are likely to come into dermal contact with potentially contaminated site soils and possibly shallow groundwater. However, review of the baseline assessment indicated that the current investigations show generally low levels of soil contamination across the scheme. Using conservative screening criteria (residential without plant uptake) it was shown that the current conditions on site are unlikely to present a risk to human health in relation to current maintenance workers, and by extension to new maintenance workers involved in the scheme.

9.11.22 It is considered that the most sensitive receptor in terms of maintenance workers would be a working age female, involved in maintenance of the scheme for a working life. The sensitivity of the maintenance worker receptor would likely be high, however based on the investigation findings to date the impact would be classified as no change and thus the significance would be classified as ***Neutral*.**

Potential impact of construction materials on maintenance workers

9.11.23 A risk has been identified whereby contaminated site won materials may be used in the scheme, or that contaminated imported materials from offsite sources may be introduced into the scheme. Maintenance workers might be exposed to these materials during their works on the scheme and therefore in the absence of mitigation measures a source-pathway-receptor linkage may be present. However, for the reasons stated in paragraph 9.11.21 above, the existing soils across the scheme that may be re-used as fill are not considered to present a risk to human health in relation to Maintenance Workers on the basis of the chemical analysis undertaken to inform the baseline assessment. In addition, mitigation measures will be implemented in line with the details presented in Section 9.9 in relation to encountering unexpected contamination (differing from the baseline) and also it is assumed that as part of the mitigation measures, site won, or imported materials will be managed by a verification system applied by a suitable earthworks specification. This would include chemical limits to determine whether materials would be acceptable for use as construction materials.

9.11.24 On this basis despite the maintenance worker representing a high sensitivity receptor, the impact of construction materials would be no change and as such the significance of this effect would be **Neutral.**

Potential Impact of Construction Materials on Controlled Waters

9.11.25 Review of the operational phase has indicated that in the absence of mitigation measures a risk to controlled waters may exist from re-use of contaminated site won materials or the import of contaminated materials curing the construction phase. Contaminants may leach from materials and migrate vertically and horizontally, impacting groundwater, surface waters and abstraction points.

9.11.26 However, it is assumed that as part of the mitigation measures, site won, or imported materials will be managed by a verification system applied by a suitable earthworks specification. This would include chemical limits to determine whether materials would be acceptable for use as construction materials.

9.11.27 On this basis despite the groundwater being classified as a medium sensitivity receptor, and particular surface water features being classified as a high

sensitivity receptor, the impact of construction materials would be no change and as such the significance of this effect would be **Neutral.**

9.12 Monitoring

9.12.1 This section provides a description of monitoring to inform the mitigation for any likely significant adverse residual effects.

9.12.2 The residual effects of the scheme on the geology and soils have all been assessed as slight beneficial to slight adverse, except for the residual effect of the scheme on potential shallow mine workings and entrances. Therefore, at this stage, this section of the assessment is not relevant and no monitoring has been proposed as mitigation. Additional ground investigation, including groundwater level monitoring is being carried out, however this is part of the development of the engineering design.

9.12.3 The residual effect of the scheme on potential shallow mine workings and entrances has been assessed as **High Adverse**. This assessment is based on a preliminary assessment of the hazard informed by desk based information. Further ground investigation has been proposed as a mitigation measure to further inform the assessment and the design of any potential mitigation measures. This does not currently include any monitoring, however monitoring of possible remedial/stabilisation measures may be required if the further investigation confirms the presence of shallow mine workings and entrances beneath the scheme alignment. The updated assessment and description of monitoring will be included within the Geology and Soils chapter of the ES.

9.13 Summary

9.13.1 A summary of the assessment of geology and soils is presented within Table 9-30 below.

Table 9-30 Summary of assessment

With scheme									
Item	**Description of potential impact**	**Embedded design, mitigation and enhancement measures**	**Sensitivity /value of receptor**	**Duration of impact**	**Magnitude of potential impact**	**Significance of potential impact**	**Additional mitigation**	**Residual magnitude of potential impact**	**Residual significance of potential impact**
Assessment of effects due to construction									
1	Consolidation of soils due to the applied load of embankment materials	Stage 0 to 3 design development, including PSSR, GI, GIR	Very low	Long term	Negligible	**Neutral**	Earthworks construction mitigation, e.g. removal soft soils	Negligible	**Neutral**
2	Damage to geologically protected sites	None	Medium	Long term	No change	**Neutral**	None	N/A	**Neutral**
3	Subsidence/collapse of shallow underground mine workings due to construction within mining areas	Stage 0 to 3 design development, including PSSR, GI, GIR	Medium	Short term initial impact, but could occur repeatedly over long term	Major	**High adverse**	Mining specific ground investigation to be carried out	Major (mining specific ground investigation not carried out at the time of writing)	**High adverse** (mining specific ground investigation not carried out at the time of writing)
4	Removal or limit access to resource within a Mining Safeguarding Area	None	High	Long term	No change	**Neutral**	None	N/A	**Neutral**

With scheme									
Item	**Description of potential impact**	**Embedded design, mitigation and enhancement measures**	**Sensitivity /value of receptor**	**Duration of impact**	**Magnitude of potential impact**	**Significance of potential impact**	**Additional mitigation**	**Residual magnitude of potential impact**	**Residual significance of potential impact**
5	Removal or limit access to regionally important resource	None	Medium	Long term	Minor	**Slight adverse**	None	Minor	**Slight adverse**
6	Reduction in permeability of the ground	Stage 0 to 3 design development, including PSSR, GI, GIR	Medium	Long term	Negligible	**Neutral**	None	Negligible	**Neutral**
7	Flow of springs, seepages and headwater stream	Assessed within Chapter 10 Road Drainage and Water Environment							
8	Lowering of groundwater level in proximity of cuttings	Assessed within Chapter 10 Road Drainage and Water Environment							
9	Excavation of cuttings into bedrock	Stage 0 to 3 design development, including PSSR, GI, GIR	Low	Long term	Moderate	**Slight beneficial**	None	Moderate	**Slight beneficial**
10	Excavations for attenuation ponds	Stage 0 to 3 design development, including PSSR, GI, GIR	Medium	Long term	Negligible	**Neutral or slight adverse**	None	Negligible	**Neutral or slight adverse**

With scheme									
Item	**Description of potential impact**	**Embedded design, mitigation and enhancement measures**	**Sensitivity /value of receptor**	**Duration of impact**	**Magnitude of potential impact**	**Significance of potential impact**	**Additional mitigation**	**Residual magnitude of potential impact**	**Residual significance of potential impact**
11	Excavations for shallow foundations	Stage 0 to 3 design development, including PSSR, GI, GIR	Medium	Long term	Negligible	**Neutral or slight adverse**	None	Negligible	**Neutral or slight adverse**
12	Effects on agricultural soils	Assessed within Chapter 12, People and Communities							
13	Exposure of air borne pollutants to construction workers	Assessed within Chapter 5 Air Quality							
13	Exposure of existing contamination to construction workers	Stage 0 to 3 design development, including PSSR, GI, GIR CEMP MMP	Medium	Short term	Negligible	**Neutral or slight adverse**	None	Negligible	**Neutral or slight adverse**
14	Exposure of unexpected contamination to construction workers	Stage 0 to 3 design development, including PSSR, GI, GIR CEMP MMP	Medium	Short term	Negligible	**Neutral or slight adverse**	None	Negligible	**Neutral or slight adverse**
15	Existing contamination	Stage 0 to 3 design development,	Medium	Short term	Negligible	**Neutral or slight adverse**	None	Negligible	**Neutral or slight adverse**

With scheme									
Item	**Description of potential impact**	**Embedded design, mitigation and enhancement measures**	**Sensitivity /value of receptor**	**Duration of impact**	**Magnitude of potential impact**	**Significance of potential impact**	**Additional mitigation**	**Residual magnitude of potential impact**	**Residual significance of potential impact**
	affecting groundwater	including PSSR, GI, GIR CEMP MMP							
16	Existing contamination affecting surface waters	Stage 0 to 3 design development, including PSSR, GI, GIR CEMP MMP	High	Short term	Negligible	**Slight adverse**	None	Negligible	**Slight adverse**
17	Unexpected contamination affecting groundwater	Stage 0 to 3 design development, including PSSR, GI, GIR CEMP MMP	Medium	Short term	Negligible	**Neutral or slight adverse**	None	Negligible	**Neutral or slight adverse**
18	Unexpected contamination affecting surface waters	Stage 0 to 3 design development, including PSSR, GI, GIR CEMP MMP	High	Short term	Negligible	**Slight adverse**	None	Negligible	**Slight adverse**
Assessment of effects due to operation									

With scheme									
Item	**Description of potential impact**	**Embedded design, mitigation and enhancement measures**	**Sensitivity /value of receptor**	**Duration of impact**	**Magnitude of potential impact**	**Significance of potential impact**	**Additional mitigation**	**Residual magnitude of potential impact**	**Residual significance of potential impact**
19	Limit access to regionally important resource	Stage 0 to 3 design development, including PSSR, GI, GIR	Medium	Long term	Minor	**Slight adverse**	None	Minor	**Slight adverse**
20	Limit access to resource within a Mining Safeguarding Area	Stage 0 to 3 design development, including PSSR, GI, GIR	High	Long term	No change	**Neutral**	None	No change	**Neutral**
21	Flow of springs, seepages and headwater stream	Assessed within Chapter 10 Road Drainage and Water Environment							
22	Lowering of groundwater level in proximity of cuttings	Assessed within Chapter 10 Road Drainage and Water Environment							
23	Soils adjacent to the scheme to be affected by spray or air borne pollutants	Assessed within Chapter 5 Air Quality							
24	Exposure of existing contamination to maintenance workers	Stage 0 to 3 design development, including PSSR, GI, GIR CEMP	High	Short term	No change	**Neutral**	None	No change	**Neutral**

With scheme									
Item	**Description of potential impact**	**Embedded design, mitigation and enhancement measures**	**Sensitivity /value of receptor**	**Duration of impact**	**Magnitude of potential impact**	**Significance of potential impact**	**Additional mitigation**	**Residual magnitude of potential impact**	**Residual significance of potential impact**
		MMP Appropriate PPE							
	Exposure of construction materials on maintenance workers	Stage 0 to 3 design development, including PSSR, GI, GIR CEMP MMP Appropriate PPE	High	Short term	No change	**Neutral**	None	No change	**Neutral**
	Exposure of construction materials on controlled waters	Stage 0 to 3 design development, including PSSR, GI, GIR CEMP MMP	High	Short term	No change	**Neutral**	None	No change	**Neutral**

Further Work

9.13.2 It should be noted that at this stage the information is preliminary, and is based mostly on the 2017 scheme design, as described in Chapter 2. Further EIA work is currently being undertaken to confirm the scale and significance of predicted environmental impacts arising from the scheme design. The final EIA work will be reported within the ES, which will accompany the DCO application to be made in Summer 2018.

9.13.3 Further intrusive investigations have recently been completed (Phase 2) to provide supplementary information on the ground conditions across the scheme. Information obtained from these investigations, including the results of supplementary soils and groundwater chemical analysis will be utilised to further define the assessment of baseline conditions as part of the ongoing EIA work. Further definition of the baseline conditions will allow greater accuracy in the assessment of potential risks during and after construction.

9.13.4 In addition, further investigation of the potential for historic mine workings and associated features across the scheme is proposed to be undertaken during Spring 2018. This work will initially involve geophysical investigations across areas of potential higher mining risk with supplementary intrusive investigations to follow if required.

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Chapter 10 Materials

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10 Materials

10.1 Introduction

10.1.1 This chapter provides an assessment of the likely significance of the environmental effects from the use of material resources and the generation and management of waste resulting from the scheme.

10.1.2 It should be noted that the effects on geology and soils, and the potential for land contamination, has been addressed in Chapter 9 (Geology and Soils) of this Environmental Statement and the effects on climate change have been addressed in Chapter 11 (Climate Change).

10.1.3 For the purposes of this assessment, 'Materials' are defined as comprising the:

- use of material resources; and
- generation and management of waste.

10.1.4 The assessment focuses mainly on the construction phase of the scheme as this is primarily where potential significant effects of materials and waste are more likely to arise.

10.1.5 Operational effects, in terms of resource use and waste generation, have been considered, however the effects are dependent on the maintenance regime and the need to replace materials throughout the lifetime of the structure. This has been assessed in Section 10.12.

10.1.6 The assessment has been conducted in accordance with the guidance set out in the DMRB Interim Advice Note (IAN) 153/11 "Guidance on the Environmental Assessment of Material Resources"[1]. This is considered to provide the most up to date guidance and good practice for the assessment of the effects of material resources and waste.

10.1.7 The estimated cost for the scheme is greater than £300,000, which is the threshold included in the guidance for assuming that the potential exists for environmental effects from the use of materials and generation of waste. Given the scale of the development and the large quantity of materials likely to be required, the Scoping Report recommended a detailed level of assessment be undertaken.

10.1.8 The assessment of environmental effects associated with the use of material resources and the generation and management of waste resulting from the construction and operation of the scheme has taken into account the following:

- Types and quantities of materials associated with the construction of the scheme;
- Cut and fill balance;
- Types and quantities of waste arisings associated with the construction of the scheme;
- Movement of materials during construction (both to and from the scheme);
- Temporary storage of materials during construction; and
- Management of waste.

[1] Interim Advice Note 153/11 Guidance on the Environmental Assessment of Material Resources, 2011 http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian153.pdf

Material Resources

10.1.9 Material resources include both primary raw materials, such as aggregates and minerals, and secondary manufactured products. Many material resources would originate off site and some, such as excavated soils, would arise on site.

10.1.10 Road schemes require significant quantities of both primary raw materials and secondary manufactured products. The production, sourcing, transport, handling, storage and use of these materials, as well as the disposal of any surplus, have the potential to adversely affect the environment. The key impacts associated with the use and consumption of materials in relation to the scheme are addressed in Sections 10.12. The consumption of significant quantities of materials is likely to result in direct and indirect impacts on the environment. This includes greenhouse gas emissions associated with the transportation of materials, which has been considered in Chapter 11.

Generation and Management of Waste

10.1.11 In considering material resources use and waste management, it is important to define when, under current legislation and understanding, a material is considered to be a waste. The definition of waste is important because the classification of substances as waste is the basis for the formulation of waste management and the application of controls to protect the environment and human health.

10.1.12 Material excavated and reused within the scheme area / planning boundary is not classed as waste, subject to it being suitable for its intended use.

10.1.13 The EU Waste Framework Directive (Directive 2008/98/EC) includes a common definition of ‘waste’, which is ‘any substance or object which the holder discards or intends or is required to discard’, with the term ‘discard’ including the disposal, recovery or recycling of a substance.

10.1.14 Waste for disposal is classed as hazardous, non-hazardous or inert, depending on the level of harm to human health, and / or the environment. Once a material has become waste, it remains waste until it has been fully recovered and no longer poses a potential threat to the environment or to human health, at which point it is no longer subject to the controls and other measures required by the Directive.

10.1.15 The generation of large quantities of waste in road schemes has the potential to impact on available waste management infrastructure through occupying landfill space, limiting short-term use of available waste storage and impacts of the scheme upon relevant waste policies and plans.

10.2 Legislative and Policy Framework

Legislation

EU Waste Framework Directive 2008/98/EC

10.2.1 The EU Waste Framework Directive 2008/98/EC2 provides the overarching legislative framework for the collection, transport, recovery and disposal of waste, and includes a common definition of waste, as provided in 10.1.14. It lays down measures to protect the environment and human health by preventing or reducing

[2] European Commission, 2016. Directive 2008/98/EC on Waste (EU Waste Framework Directive)

the adverse effects of the generation and management of waste, and by improving the efficiency and reducing the overall impacts of resource use.

10.2.2 The Directive also mandates the Waste Hierarchy which requires that where waste is unavoidable, products and materials should, 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 but only if none of the above offer an appropriate alternative solution.

The Waste (England and Wales) (Amendment) Regulations 2014

10.2.3 Directive 2008/98/EC has now been transposed in England by the Waste (England and Wales) Regulations 2011 (S.I. 2011 No. 988) (as amended).

10.2.4 In addition to the above, the following legislation relating to material resources and waste management will also be taken into account:

a. The Controlled Waste (England and Wales) Regulations 2012.
b. The Hazardous Waste (England and Wales) Regulations 2005.

EU Landfill Directive 1999/31/EC

10.2.5 The EU Landfill Directive 1999/31/EC[3] sets stringent requirements for the landfilling of wastes. The Directive aims to prevent or reduce negative effects on the environment from the landfilling of waste, as far as is practicably possible, and introduces stringent technical requirements for waste and landfills as a disposal option through:

- Setting minimum standards for the location, design, construction and operation of landfills;
- Setting targets for the diversion of Biodegradable Municipal Waste from landfill;
- Controlling the nature of waste accepted for landfill; and
- Defining the different categories of waste (hazardous waste, non-hazardous waste and inert waste) and applies to all landfills, defined as waste disposal sites for the deposit of waste onto or into land. The requirements of the Directive were transposed into national legislation through the Landfill (England and Wales) Regulations 2002 (as amended) and subsequently re-transposed as part of the Environmental Permitting (England and Wales) Regulations 2016 (as amended).

10.2.6 There are also a number of primary legislative instruments in the UK on waste listed below which enact a wide range of secondary legislation that governs the storage, collection, treatment and disposal of waste:

- The Landfill (England and Wales) (Amendment) Regulations 2005
- The List of Wastes (England) Regulations 2005
- The Environmental Permitting (England and Wales) Regulations 2016
- Environmental Protection Act 1990;
- The Environment Act 1995;
- The Finance Act 1996;
- Waste Minimisation Act 1998;
- The Waste and Emissions Trading Act 2003; and

[3] European Commission, 1999. Directive 1999/31/EC on Landfill of Waste (EU Landfill Directive)

- The Clean Neighbourhoods and Environment Act 2005.

National Policy

National Planning Policy for Waste 2014

10.2.7 The National Planning Policy for Waste[4] sets out the detailed waste planning policies for England and will be considered in conjunction with the National Planning Policy Framework, the National Waste Management Plan for England[5] and National Policy Statements for Waste Water[6] and Hazardous Waste[7].

National Policy Statement for National Networks (NN NPS) 2014

10.2.8 The NN NPS[8] requires that evidence of appropriate mitigation measures (incorporating engineering plans on configuration and layout, and use of materials) during both design and construction needs to be presented together with the arrangements for managing any wastes that are produced. It specifically states, at Paragraph 5.42 that:

'The applicant should set out the arrangements that are proposed for managing any waste produced. The arrangements described should include information on the proposed waste recovery and disposal system for all waste generated by the development. The applicant should seek to minimise the volume of waste produced and the volume of waste sent for disposal unless it can be demonstrated that the alternative is the best overall environmental outcome.'

10.2.9 The NN NPS identifies that the government policy on waste is intended to protect the environment, and human heath, by producing less and using it as a resource wherever possible. Where this is not possible, the NN NPS identifies that waste management regulation ensures waste is disposed of in a way that is least damaging to the environment and to human health and utilising the waste hierarchy. This includes consideration of the ability for the waste from the development to be dealt with appropriately by waste infrastructure, without having an adverse effect on the capacity of existing waste management facilities to deal with other waste arisings in the area. The National Planning Policy for Waste sets out detailed waste planning policies. It should be read in conjunction with the NPPF and the Waste Management Plan for England.

Waste Prevention Programme for England 2013

10.2.10 The Waste Prevention Programme is a requirement of the revised Waste Framework Directive (2008/98/EC). The Waste Prevention Programme[9] sets out the roles and actions for government and others to reduce the amount of waste produced in England.

[4] Department for Communities and Local Government, 2014. National Planning Policy for Waste
[5] Department for Environment Food & Rural Affairs, 2013. Waste Management Plan for England
[6] HM Government, 2012. National Policy Statement for Waste Water
[7] Department for Environment Food & Rural Affairs, 2013. National Policy Statement for Hazardous Waste
[8] Department for Transport, 2014. National Policy Statement for National Networks
[9] Department for Environment, Food & Rural Affairs, 2013. Waste Prevention Programme for England

Local Policy

Cornwall Local Plan (2016)

10.2.11 The Cornwall Local Plan[10] was formally adopted on 22 November 2016 and provides an overarching planning policy framework for Cornwall up to 2030. Policies relevant to this chapter include:

- Policy 17 Minerals – general principles
- Policy 18 Minerals safeguarding
- Policy 19 Strategic waste management principles
- Policy 20 Managing the provision of waste management facilities

10.2.12 The Plan takes into consideration the Waste Hierarchy and Policy 19 notes "the Council will ensure that any likely impact on existing waste facilities is acceptable and does not prejudice the implementation of the waste hierarchy and/or the efficient operation of such facilities".

Cornwall Minerals Plan

10.2.13 The Cornwall Minerals Plan[11] provides existing policy on minerals. The chapters that are most applicable to this project are Chapter 9, Aggregates and Chapter 10, Secondary Aggregates and Recyclable Material. Cornwall Council is preparing a Minerals Safeguarding Development Plan Document to identify areas of mineral resource which will be safeguarded for future use. An interactive map is available which identifies the proposed minerals safeguarding areas.

Guidance

Internal Advice Note (IAN) 153/11 – Guidance on the Environmental Assessment of Material Resources

10.2.14 The assessment of the environmental effects associated with the use of material resources and the generation and management of waste resulting from the construction of the scheme has been undertaken in accordance with the guidance provided within the Interim Advice Note (IAN) 153/11 – Guidance on the environmental assessment of material resources.

10.2.15 Reference has also been made to the following guidance relating to material resources and wastes:

- Interim Advice Note (IAN) 125/15 Supplementary Guidance for Users of DMRB Volume 11 'Environmental Assessment;
- Interim Advice Note (IAN) 153/11 Guidance on the Environmental Assessment of Material Resources;
- DMRB Volume 11, Section 3 Part 3, Disruption Due to Construction. This covers the effect on people and on the natural environment which can occur, mainly during construction works; and
- Definition of Waste: Development Industry Code of Practice, Version 2 (Contaminated Land: Applications in Real Environments (CL:AIRE) 2011).

[10] Cornwall Council, 2016. Cornwall Local Plan
[11] Cornwall Council, 1998. Cornwall Minerals Plan

South West Regional Waste Strategy 'From Rubbish to Resource' (2004)

10.2.16 The strategy[12] is a non-statutory Regional Waste Strategy which aims to ensure that by the year 2020 over 45% of waste is recycled and reused and less than 20% of waste produced in the region will be landfilled.

Highways England Sustainable Development Strategy (2017)

The strategy sets out Highways England's approach for sustainable development which includes a vision for increasing efficiency in resource use and ensuring recycled materials are reused for the highest value purpose. The strategy sets out ambitions to:

- Push towards a "circular" approach to resource management;
- Work with suppliers to find new ways to deliver a more resilient and adaptive network; and
- Work to achieve security of supply.

Best Practice

10.2.17 The Pollution Prevention Guidelines provide practical advice and guidance for the prevention of pollution during construction and demolition projects. The guidance explains what is required by law and describes good practice measures to reduce the risks of a pollution incident.

10.2.18 Although Pollution Prevention Guideline 6 'Working at Construction and Demolition Sites' was withdrawn on 14 December 2015 and is no longer maintained by the Environment Agency, such guidance continues to provide useful pollution prevention guidance on site.

Site Waste Management Plan

10.2.19 A Site Waste Management Plan (SWMP) will be prepared for the scheme as part of the outline Environmental Management Plan (EMP). This will be presented in the Environmental Statement, and implemented by the Contractor during construction. The SWMP will set out how the resulting waste will be managed during the construction of the scheme.

10.2.20 Related guidance for the SWMP includes the following by Waste & Resources Action Programme (WRAP):

- WRAP SWMP template; and
- WRAP Designing out Waste: a design team guide for Civil Engineering.

10.2.21 A Materials Management Plan (MMP) will be prepared for the scheme as part of the outline EMP. This will also be implemented by the Contractor during construction and will set out how building materials would be managed during the construction of the scheme.

Strategic Targets

10.2.22 Targets for the use and management of material resources have been identified based on a review of the aforementioned policy documents and Highways England's own targets. These have been listed in Table 10-1.

[12] South West Regional Assembly, 2004. South West Regional Waste Strategy 'From Rubbish to Resource'

Table 10-1 Targets for the use and management of material resources

Policy document	Target
EU Waste Framework Directive	• Waste should be managed without endangering human health and harming the environment • 70% of C&D waste (excluding naturally occurring waste) should be prepared for re-use, recycling and recovery
National Policy Statement for National Networks	• Arrangements should be set out for managing any waste produced, including information on the proposed waste recovery and disposal system for all waste generated
National Planning Policy for Waste	• The likely impact of the development on existing waste management facilities and areas allocated for waste management is acceptable and does not prejudice the implementation of the waste hierarchy / efficient operation of such facilities • The handling of waste arising from the construction and operation of development maximises reuse/recovery opportunities, and minimises off-site disposal
Waste Prevention Programme for England 2013	• Design should incorporate the removal of causes of waste early on
Cornwall Minerals Safeguarding Development Plan	• To ensure the development doesn't adversely impact on Cornwall's minerals industry
Cornwall Local Plan	• The likely impact of the development on existing waste management facilities and areas allocated for waste management is acceptable and does not prejudice the implementation of the waste hierarchy / efficient operation of such facilities

10.3 Study Area

10.3.1 The study area comprises the anticipated maximum physical extent of the scheme, as well as the locations of waste management facilities and associated transportation networks within the county of Cornwall that may be impacted by the scheme.

10.3.2 Many material resources would originate offsite, but others would arise onsite during construction, such as excavated soil and rock or recycled elements of existing roads. The latter is included in the study area.

10.3.3 It is outside the scope of the guidance to assess the indirect environmental effects associated with the extraction of raw materials and the manufacture of products which occur off-site. The guidance recognises that these stages of a material's life cycle are likely to have already been subjected to an environmental assessment. These effects are therefore not addressed in this chapter. It is also outside the scope of this chapter to undertake an assessment of greenhouse gas emissions associated with the use and transportation of materials. Chapter 14 includes an

assessment of the reasonable worst case scenario carbon emissions associated with the construction and operation of the scheme.

10.4 Potential Impacts

10.4.1 For material resource use, the potential environmental effects are associated with the extraction and transportation of primary raw materials, the sourcing of secondary products and their subsequent transport to and use during construction. There are also potential environmental effects associated with the site won material, such as the requirement to transport, store and possibly process any materials during construction.

10.4.2 For waste materials, the potential environmental effects are associated with the production, movement, transport, processing and disposal of arisings from site to alternative sites or landfill during construction. The scheme has the potential to generate large amounts of Construction, Demolition and Excavation (CDE) waste which may affect the capacity of Cornwall's waste management infrastructure which, in its current state, is considered by Cornwall Council and set out in the Local Plan to be at risk of not meeting demand during the Plan period.

10.4.3 The impacts during the scheme's operation are likely to be associated with the maintenance of the pavement and structures, and are not anticipated to be significant.

10.5 Assessment Methodology

10.5.1 This section sets out the methods that will be used to undertake the material resources assessment, with reference to published standards, guidelines and best practice.

10.5.2 The assessment of the environmental effects associated with the use of material resources and the generation and management of waste resulting from the construction of the scheme will be undertaken in accordance with guidance provided within the IAN 153/11.

10.5.3 There is currently no specific defined methodology for assessing the environmental significance of a material resource or for determining the magnitude of effect on such a resource. The scheme's Scoping Report states that the IAN 153/11 would be used as guidance for the assessment. The guidance, alongside the use of professional judgement and emerging best practice, will be used to assess environmental value, magnitude of effect and the significance of environmental effects from the use of material resources.

10.5.4 It was specified at Scoping that a Detailed level of assessment would be required under IAN 153/11.

Identification of Baseline

10.5.5 The existing baseline conditions have been identified as the receptors which have the potential to be impacted by the material resources and the waste arisings associated with the scheme.

10.5.6 The baseline conditions have been informed by desk based studies and information from ground investigations, including (but not limited to):

- Ground investigations associated with the scheme;

- Cornwall Local Plan;
- Phase 1 Habitat Survey Report;
- Local development policies and topic papers; and
- Traffic Surveys Report.

10.5.7 In order to identify the baseline conditions, data will also be collected from Highways England and members of the design team on the materials which are likely to be used during each stage of the scheme, and the waste that is likely to arise. This has been presented in Section 10.12.

Assessment of Construction Impacts

10.5.8 The Simple Assessment comprises the assembly of data and information that is readily available to address potential effects identified at the Scoping level, to reach an understanding of the likely environmental effects to inform the final design, or to reach an understanding of the likely environmental effects that will identify the need for Detailed Assessment.

10.5.9 A Simple assessment for the Materials chapter was carried out at Scoping with the information available at the time. The results are presented in the Environmental Study Report for PCF Stage 2. It was specified in the Scoping Report that a Detailed level of assessment is required.

10.5.10 For the purposes of assessing the effects associated with materials use and waste, the Detailed Assessment is a quantitative exercise which aims to identify and quantify the following:

a. The types and quantities of materials required for the project;
b. Details of the source/origin of materials, site-won materials to replace virgin materials, materials from secondary/recycled sources or virgin/non-renewable sources;
c. The cut and fill balance;
d. The types and quantities of forecast waste arisings from the project, including the identification of any forecast hazardous wastes;
e. Surplus materials and waste falling under regulatory controls;
f. Waste that requires storage on site prior to re-use, recycling or disposal;
g. Waste to be pre-treated on site for re-use within the project;
h. Wastes requiring treatment and/or disposal off site;
i. The impacts that will arise from the issues identified in relation to materials and waste;
j. A conclusion about the magnitude and nature of the impacts; and
k. The identification of measures to mitigate the identified impacts.

10.5.11 The Detailed Assessment will be completed in accordance with IAN 153/11. It will utilise the data gathered at the Simple Assessment level along with additional information collated to quantify the materials required for the project, and forecasts the quantities and types of waste that will be produced.

10.5.12 The Detailed Assessment will also include identification of how the use of material resources conforms to high level strategy targets outlined in the following policy documents, where relevant (this list is not currently exhaustive):

- EU Waste Framework Directive 2008/98/EC;
- National Policy Statement for National Networks (NN NPS)

- National Planning Policy Framework 2012[13];
- National Planning Policy for Waste[14];
- Waste Prevention Programme for England 2013[15]; and
- Cornwall Minerals Safeguarding Development Plan Document[16].

Assessment of Operational Impacts

10.5.13 The environmental impacts associated with material resource demand and waste generation during the scheme's operation are not considered to be significant. The impacts are dependent upon the maintenance regime.

10.5.14 The assessment aims to identify the potential environmental impacts, based on the likely maintenance regime.

Significance Criteria

10.5.15 The Design Manual for Roads and Bridges (DMRB) HA 205/08 advice note has been used to inform the significance criteria for the scheme.

10.5.16 The first stage of the assessment is an evaluation of the value (sensitivity) of the material resource or feature, based on an assessment of the quality, scale, rarity and the services provided. The value of the material resources along the alignment of the scheme is determined on the basis of the descriptions described from Table 2.1 of the HA 205/08. and provided in Table 10-2.

10.5.17 The value of the receptor is dependent on its capacity to provide materials or dispose of waste (i.e. the capacity of available waste management infrastructure).

Table 10-2 Environmental Value (or Sensitivity)

Value/Sensitivity	Typical descriptors
Very High	Very high importance and rarity, international scale and very limited potential for substitution.
High	High importance and rarity, national scale, and limited potential for substitution.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution.
Low	Low or medium importance and rarity, local scale.
Negligible	Very low importance and rarity, local scale.

10.5.18 The second stage is an evaluation of the magnitude of impact that the scheme is likely to have on the receptor. The magnitude of the impact has been determined on the basis of the descriptions derived from Table 2.2 of the HA 205/08., and are provided in Table 10-3.

[13] Department for Communities and Local Government, March 2012. National Planning Policy Framework. Accessed online: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf
[14] Department for Communities and Local Government, October 2014. National Planning Policy for Waste. Accessed online: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/364759/141015_National_Planning_Policy_for_Waste.pdf
[15] Defra, December 2013. Waste Prevention Programme for England. Accessed online: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/265022/pb14091-waste-prevention-20131211.pdf
[16] Cornwall Council, June 2017. Cornwall Minerals Safeguarding Development Plan Document. Accessed online: https://www.cornwall.gov.uk/media/26858615/minerals-safeguarding-dpd-submission-document-main-section.pdf

Table 10-3 Magnitude of Impact

Magnitude of Impact	Typical 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 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 of one or more characteristics, features or elements (Beneficial).
No Change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

10.5.19 The final stage of the assessment combines the value (sensitivity) of the receptor and the magnitude of impacts to arrive at a level of significance. The significance will be derived in accordance with Table 4-3 in Chapter 4**.**

10.5.20 Chapter 4 provides a detailed overview of the general approach to EIA.

10.6 Baseline Conditions

10.6.1 The baseline environment is comprised of receptors which have been identified based on the likely impacts set out in IAN 153/11. A list of the receptors which have the potential to be impacted by the scheme is provided in Table 10-4 with the relevant phase of the scheme.

Table 10-4 Receptors with the potential to be impacted by the phases of the scheme

Receptor	Phase
Primary Material Sources (on-site)	Construction
Imported Material Sources (off site)	Construction / operation
Construction Waste Management Infrastructure	Construction
Storage of Materials	Construction
Local traffic networks	Construction / operation

High level strategy targets

10.6.2 The high level strategy targets have been documented in Table 10-1 and provide both quantitative targets and general measures which the project should meet.

10.6.3 The targets are set out in legislation and policy documents which means that the local authority and / or the developer is statutory obliged to meet the targets. The sensitivity of these targets is therefore considered to be low.

Primary Material Sources (on-site)

10.6.4 As set out in Chapter 9 Soils and Geology, the scheme alignment is predominantly underlain by Devonian bedrock of the Gramscatho Basin Succession, comprising predominantly clastic sedimentary rocks formed from mud and sand produced by erosion and deposited in a deep marine environment.

10.6.5 The scheme alignment transects the thrust fault separating the Gramscatho Basin Succession and the Looe Basin Succession to the north. The Looe Basin Succession, comprising a shallow water facies of variable siliciclastic mudstones, siltstone and sandstones with internal structures representing strong water movements. The geology of the area is summarised in Table 9-3 of Chapter 9 Soils and Geology.

10.6.6 There are no Regionally Important Geological Sites (RIGS) of geological or geomorphological significance within the Soils and Geology buffer zone (250m radius) of the proposed alignment.

10.6.7 A Mineral Safeguarding Development Plan Document (DPD) is currently under development by Cornwall Council. An interactive map of the proposed Minerals Safeguarding Areas is available online[17]. There are no proposed minerals safeguarding areas along the section of the A30 between Chiverton and Carland Cross, however there are some proposed areas adjacent to other sections of the A30.

10.6.8 A Ground Investigation Report (GIR) was prepared for the Scheme in September 2017 following the site investigations that took place between January and March 2017. The GIR notes that the preliminary site investigations identified widespread generic assessment criteria (GAC) exceedances for lead and zinc, and recommended that further sampling of soils and surface water, with subsequent risk assessment, should be undertaken for these substances.

10.6.9 The GIR notes there is the potential that onsite material is not suitable for re-use on site, and that further analysis is required to develop and inform earthwork specification for the use of site won material.

10.6.10 At the time of writing, further site investigation was underway. A Geotechnical Design Report is expected to be produced following completion of the second round of site investigation, and is expected to provide recommendations for material re-use. This will be presented in the full Environmental Statement.

[17] Cornwall Council Interactive Map, accessed January 2018 at: https://map.cornwall.gov.uk/website/ccmap/?zoomlevel=1&xcoord=178566&ycoord=54274&wsName=ccmap&layerName=Proposed%20mineral%20safeguarding%20areas:Proposed%20minerals%20safeguarding%20areas%20M18%20South%20Crofty%20shafts%20

10.6.11 For the purpose of the assessment at this stage, and without the additional information required, the sensitivity of the primary material sources (on-site) is considered to be medium.

Imported Material Sources (off-site)

10.6.12 The scheme would require both primary raw materials, such as stone and soil, and manufactured construction materials such as concrete, bricks, wood, bitmac and steel.

10.6.13 The imported manufactured material would be sourced from established suppliers who regularly provide materials for similar sized projects. The suppliers have not yet been determined, but the Contractor would ensure that they are suppliers with adequate resources to meet the quantitative needs of the scheme, without having a negative influence on their resources. Where possible, materials would be provided from local sources. The sensitivity of the manufactured material sources is considered to be low.

10.6.14 The sensitivity of the raw material sources has been determined through the availability of minerals in Cornwall.

10.6.15 The main raw materials currently available in Cornwall are granite (for aggregates and building stones), china clay, slate and sandstone. Cornwall has over 110 sites permitted for mineral working[18]. The scheme would require imported raw materials for the cut and fill balance, to construct the new carriageways, and to undertake the required improvement works to the existing carriageway.

10.6.16 The Cornwall Local Plan (2016) notes that it is necessary to maintain a sufficient supply of minerals, and provides a breakdown of the available minerals in the county. Table 10-5 provides a breakdown of the status of mineral groups.

Table 10-5 Status of Mineral Groups in Cornwall County

Mineral	Status
Primary crushed rock aggregate	No need to allocate further sites for extraction.
Primary hard rock aggregate	Capable of meeting demand beyond Plan period. No need to allocate further sites for extraction.
China Clay	Reserves anticipated to provide supply for almost 60 years.
High Specification Aggregates (HSA) used for skid resistant road surfaces	Shortage in Cornwall. Most material required is imported from outside Cornwall.
Metal	Unable to report due to commercial confidentiality

[18] Cornwall Council, 2011. Minerals Issues Paper. [online] Accessed 18/05/2017[19] Cornwall Council, 2016. Minerals, Waste and Renewable Energy. [online] Accessed 18/05/2017.

10.6.17 The availability of primary aggregates in Cornwall is considered to be high, however the availability of high specification aggregates (HSAs) which is used for skid resistant road surfaces (and has the potential to be required for this scheme) is low. Based on this, and that the availability of metal is unknown, the sensitivity of off-site raw material sources is considered to be medium.

Construction Waste Management Infrastructure (off-site)

10.6.18 Waste management within Cornwall has traditionally been heavily reliant on landfill disposal[19].There is increasing recognition that the landfilling of waste is unsustainable. Furthermore, landfill disposal is becoming increasingly expensive and capacity is becoming exhausted.

10.6.19 In January 2012, Cornwall Council commissioned a study to estimate existing and planned local waste management capacity, including landfill. The report states that the total licensed capacity for CDE waste is as follows:

- 105,529 tonnes for recycling / reuse (aggregate) – annual license; and
- 549,095 tonnes for landfill void space (total not annual capacity).

10.6.20 The Cornwall Local Plan (2016) states that waste production associated with the CDE industries is expected to increase by approximately 230,000 tonnes per annum for the remainder of the Plan period. In order to manage the increase in waste, the Plan states that additional waste management infrastructure is required.

10.6.21 Table 10-6 provides the future waste management infrastructure requirements for CDE waste, as provided in the Local Plan.

Table 10-6 Waste Management Infrastructure Requirements

Waste stream	Recycling / re-use	Landfill
Construction, demolition and excavation waste	Approximately 377,000 tonnes / annum	Approximately 659,000m^3 in total

10.6.22 A list of sites currently known to recycle/recover CDE waste has been provided by Cornwall Council and has also been extracted from the Environment Agency's Waste Data Interrogator (WDI). The WDI also identifies quantities of material accepted at each facility in 2016. This information is listed in Table 10-7 and presented on Figure 10-1.

Table 10-7 Waste management facilities known to recycle CDE waste.

Site	Company	Processed materials in 2016 (tonnes)
Bangor's Landfill	Cormac Ltd	3080
Blackhill Quarry	R S & R Aggregates Ltd	Not available
Carnsew Quarry	Colas	256
De Lank Quarry	De Lank British Granite	Not available
Dean Quarry	Shire Oaks Quarries Ltd	Not available
Greystone Quarry	Aggregate Industries	Not available
Hayle Recycling Yard	CIB Lello Plant Hire	Not available

[19] Cornwall Council, 2016. Minerals, Waste and Renewable Energy. [online] Accessed 18/05/2017.

Site	Company	Processed materials in 2016 (tonnes)
Helsbury Quarry Depot	Cormac Ltd	7871
Herniss Farm	Nick Ferris Skip Hire	8308
Melbur Works	Maen Karne	Not available
Parc an Chy	T H Douce and Sons	Not available
Roodscroft	Brunel Recycling Ltd	52609
Royal Kenwyn Yard, Shortlanesend	Active Demolition	Not available
St Mary's Depot	Cormac Ltd	3730
Tiscott Recycling Depot	Cormac Ltd	1196
Torrey Canyon Depot	Cormac Ltd	11687
Trethennal Manor Farm	Maen Karne Aggregates Limited	7505
Tremanor Farm	Mr Leslie Paull And Mrs Tessa Paull	25042
Pendarves Equestrian Centre	Robert Weedon	89842
Land Adjacent To Rossmore	Maen Karne Aggregates Ltd	22455
Morcom Construction Ltd	Morcom Construction Ltd	1718
John Orchard And Company	Orchard J	550
Fraser Metals (Bodmin)	Sims Metal U K Ltd	75.93
Roy Rundle Car & Commercial Repairs	Lionel Roy Rundle & Janet Ann Rundle	28.432
Methrose Metal Recycling Site	Orchard H	96.14
T Ware & Sons	Mrs Jennifer Ware, Thomas Mark Ware And Harry Lee Ware	1533
Wheal Alfred Metal Recycling Ltd	Mr Michael John Harris	2505
Beta Works	Sims Group U K Limited	115.365
Bangors Recyling Depot	Cormac Solutions Ltd	3079.85
Higher Brynn Wood Recycling Facility	Suez Recycling And Recovery U K Ltd	103.66
Dave Peat Waste Ltd	Dave Peat Waste Limited	3525.19
Kestle Quarry W T S	Coad Mark	2112
Bowithick Waste Transfer Station	Hoskin Kenneth	327.935
Higher Trevibban Farm	Lakeside Recycling Limited	52691
Dubbers Restoration Area	Imerys Minerals Limited	2823.94
Wilco's Waste Management Ltd	Wilco's Waste Management Ltd	2508.59
Land Adjacent To Parc-an-chy Mine	Douce Andrew Ward	16189.31
G Climo & Sons	Mr George Climo And Mr Daniel Climo	57.77
Lean M R F	Viridor Waste Management Ltd	13483.92
St Mary's Recycling Depot	Cormac Solutions Limited	3729.8
Trengongeeves Recycling Depot	Cormac Solutions Limited	5034.79
Torrey Canyon Recycling Depot	Cormac Solutions Ltd	11686.6
Tiscott Recycling Depot	Cormac Solutions Ltd	1196

Site	Company	Processed materials in 2016 (tonnes)
T J Nankervis	Nankervis T J	742.5
Carnsew Quarry	Colas Limited	256.02
Treeve Farm	C I B Lello Plant Hire Ltd	21266
Herniss Farm Waste Transfer Station	Nick Ferris Skip Hire Ltd	8308
The Waste Transfer Station	John Jago Construction Ltd	1519.55
Pool Waste Transfer Station	Suez Recycling And Recovery U K Ltd	225.98
Masters Skips Ltd	Masters Skips Ltd	2096.98
Valley View Transfer Station	Farrow P	4258.4
Tregongeeves Waste Transfer Station	Suez Recycling And Recovery U K Ltd	14247.99
Buildings & Yard At Kennards House	Maen Karne Aggregates Limited	4360
Newham Depot	Biffa Environmental Municipal Services Limited	51
The Scrap Yard	Jonathan Potts Ltd	1160
Helsbury Quarry Recycling Depot	Cormac Solutions Limited	7871
Launceston H W R C And R T S	Suez Recycling And Recovery U K Ltd	53
Chypraze Farm	Kyle-Milward J S	4667
Maen Karne Transfer Station	Maen Karne Aggregates Ltd	3400
Glebe Quarry Transfer Station	Glebe Quarry Limited	8813
St Erth Household Waste Recycling Centre	Suez Recycling And Recovery U K Ltd	55
Roodscroft Transfer Station	Roods Environmental Services Ltd	1360
Specialist Skip Hire Ltd	Specialist Skip Hire Ltd	8398
Gwel - An - Mor Luxury Resort	Landish Developments (Feadon Farm) Limited	7971
Land North Of Thornmere	Dennis Mark	33187
Trebant Farm	W I Scott Ltd	12595
Polvenna Farm	Callestick Farm Ice Cream Limited	572.4
Lean Quarry Landfill Site	Viridor Waste Management Ltd	14683
Roodscroft Landfill Site	Roods Landfill Ltd	51249

10.6.23 The capacity of each of these sites to accept additional waste is not currently known, however the waste processed in 2016 amounted to a total of 572,120 tonnes. As set out in the Local Plan and the figures set out in Table 10-, additional facilities are required to manage the projected waste during the Plan period. As such, the sensitivity of the construction waste management infrastructure (off-site) is considered to be **high.**

Storage of Materials

10.6.24 The storage of materials at contractor construction compounds along the scheme during construction will be assessed as part of the Environmental Statement.

Local road network

10.6.25 The scheme would require the transportation of materials and waste to and from the site. The section of the A30 that the scheme is due to replace experiences congestion and delays throughout the year, particularly in the summer months when traffic flows increase due to tourist traffic.

10.6.26 The number of Heavy Goods Vehicle (HGV) and Light Duty Vehicle (LDV) movements on the local road network, and resulting additional traffic required during construction will be assessed in the Environmental Statement.

10.6.27 The A30 and surrounding roads currently undergo congestion, particularly during peak times. The sensitivity of the local road network is therefore considered to be **high**.

10.7 Consultation

10.7.1 An overview of consultation undertaken to date on the scheme has been provided in Chapter 4 Section 9.

10.7.2 Cornwall Council has provided the following information:

- a list of currently licensed waste facilities which accept CDE waste; and
- information on planning applications for proposed waste facilities in Cornwall.

10.7.3 Further consultation on the topic has not been undertaken to date.

10.8 Assessment Assumptions and Limitations

10.8.1 The assessment of material resources and waste arising from construction is still a developing area; detailed assessment guidance is therefore not yet available on some aspects of the assessment process. This limitation has been considered and the IAN 153/11 has formed the basis for the assessment.

10.8.2 The construction of the scheme will be carried out in accordance with normal good working practice, which will be set out in the Outline EMP. This will include the environmental measures that will be adopted during the construction phase, such as the Site Waste Management Plan.

10.8.3 The quantities of materials to be used for construction of the scheme, the sources from where they would be obtained and their mode of transport is yet to be finalised and have been estimated based on the scheme design as described in Chapter 2 of this PEIR. The quantities of the waste likely to arise have also been estimated on this basis, and it is considered that the quantities would not be significantly different to lead to a greater magnitude of effect.

10.8.4 Whilst limitations exist, it is considered that the assessment of material resources and waste arising from construction is sufficiently robust according to the guidelines set out in the IAN 153/11 and for the purposes of this PEIR.

Assessment and Baseline Gaps

10.8.5 Table 10-8 provides an overview of gaps and uncertainties associated with the Materials chapter at the time of writing.

Table 10-8 Gaps and uncertainties

Gaps and Uncertainties	Description
Confirmation of types and quantities of materials required for the scheme and estimated waste arisings	To be developed pending further ground investigation
Earthworks strategy including requirements for shortfall	To be developed as part of EIA
Off-site material sources and suppliers	To be confirmed by the contractor at detailed design stage
Measures for transporting materials and waste to and from site including any access or haul roads	To be confirmed by the contractor at detailed design stage
Measures incorporated into the design to ensure sustainable use of resources and minimisation of waste arisings	An Outline Site Waste Management Plan will be produced as part of the Outline EMP
Whether any invasive species would need to be removed from site	An Outline Invasive Species Management Plan will be produced as part of the Outline EMP

10.9 Design, Mitigation and Enhancement Measures

Design

10.9.1 The initial scheme design had an approximate cut-fill shortfall based on all earthwork slopes being at 1:2. This lead to a 200,000m^3 shortfall.

10.9.2 The design of the scheme was examined and it was established that by altering the cut from 1:2 to 1:2.5 slopes along the scheme, the shortfall that was encountered could be reduced.

10.9.3 On this basis, the high level earthworks volumes can be calculated as follows:

- Approximate shortfall based on all earthworks at 1:2 is 200,000m^3
- To be conservative, a bulking factor of 5% has been assumed for compaction, and a factor of 5% has been assumed for wastage; these are assumed to balance out. Bulking during transportation could be higher (average site wide value could be ~30% based on anticipated material types)
- Of the cut volume, it is assumed that 97% will be suitable with only 3% unsuitable (alluvium at watercourses etc.), so the approximate increased shortfall total is 225,000m^3
- Assuming a similar length of slackening to 1:2.5 as was to 1:3, the approximate increased shortfall total is 275,000m^3
- Including areas where cutting slopes can be slackened to 1:2.5, the approximate reduced shortfall total is 175,000m^3
- With the majority of slopes slackened to accommodate the 300mm of topsoil, the assumed topsoil surplus would be approximately 100,000m^3 and as a result the approximate increased shortfall total is 275,000m^3
- It is assumed the topsoil surplus of 100,000m^3 can be lost on site in the essential landscaping areas and within the junctions
- Including the approximate cut volumes from the numerous drainage ponds of 125,000m3, the final approximate reduced shortfall total is 150,000m^3.

10.9.4 From an initial review it was concluded that approximately 120,000m^3 of additional material could be won from NFH and approximately 100,000m^3 of additional material from Penny-come quick. On this basis it can be assumed that this shortfall of 150,000m^3 could be won from site in these areas with no import unless required to suit the programme.

Construction Mitigation

10.9.5 Construction of the scheme would take account of normal good practice measures to reduce resource use and the generation of waste. Wherever possible, site won materials would be used in construction. Site won materials would only be reused on site if assessed as being suitable for reuse without causing unacceptable impacts on the end users and the environment. A specification for suitable material to be used in construction would be developed, in accordance with the Specification for Highway Works. Where appropriate, testing shall be undertaken during construction to confirm that the materials used meet the specification requirements which have been developed in line with the CL:AIRE Code of Practice.

10.9.6 It is necessary to remove some unsuitable and excess materials from site. A Site Waste Management Plan would be produced to detail the estimated quantities of waste material and the opportunities for reuse, recycling, recovery or disposal.

10.9.7 To limit the quantities that are disposed of to landfill the materials would be sorted/processed and where necessary treated and the materials disposed of or reused as appropriate for the particular waste stream. The pre-treatment of waste material prior to disposal is a requirement of the waste regulations. By minimising the quantity of materials to be disposed of offsite the associated HGV movements would be minimised.

Table 10-9 Proposed mitigation measures

Project Activity	Potential impacts associated with material resource use/ waste management	Description of mitigation measures	How the measures will be implemented, measured and monitored
Site clearance	Waste disposal	Identify opportunities for reuse, recycle, recover	Materials to be sorted and where practical disposed of to recycling facilities. Site Waste Management Plan to implement, measure and monitor.
Earthworks	Use of primary resources Waste disposal	Reuse of materials in earthworks. Limit disposal and movements	Design to maximise the earthworks balance. Site Waste Management Plan to implement, measure and monitor.
Pavement planings	Waste disposal	Reuse as sub base in footpaths. Reuse in pavement construction. Reuse elsewhere.	Design to maximise the earthworks balance. Site Waste Management Plan to implement, measure and monitor.

10.10 Assessment of Effects

10.10.1 This section assesses the potential effects of the materials used and waste generated during the construction and operation phase of the scheme.

Construction effects

10.10.2 A variety of different materials would be required for the construction phase of the scheme. The scheme would be designed to prevent where possible the volumes of both the imported construction materials and the waste taken off site by reusing or recycling the available existing materials along the scheme.

10.10.3 The types and provisional estimated quantities of materials required for the construction and operational phase of the scheme are listed in Table 10-10, and are based on the information currently available.

Table 10-10 Material resources required

Project Activity	Material resources required for the project	Quantities of material resources required	Additional information on material resources
Site remediation/ preparation/ earthworks	Topsoil	100,000m^3	Sourced from site
Site construction:			
• Cut and fill	General fill, including earth embankments (mainline and side roads)	400,000m^3	Sourced from material won on site
• Installation of pavement - mainline and side roads	Base, binder, and surface course.	Not available at this stage	Sourced from local suppliers
• Installation of roundabouts	Base, binder, and surface course.	Not available at this stage	Sourced from local suppliers
• Installation of bridges	Concrete, steel / aluminium parapets	Not available at this stage	Sourced from local suppliers
• Installation of other manufactured products	Drainage, kerbs, trees, traffic signs, safety barriers, lighting, etc.	Various quantities relative to road length and necessary safety measures.	Sourced from local suppliers
• Installation of small span structures	Culvert piping	Not available at this stage	Sourced from local suppliers
Operation and maintenance of asset	No significant material resources required	No significant material resources required	Sourced from local suppliers

10.10.4 Current earthworks estimations predict a shortfall of 150,000m^3 of primary raw material associated with the construction of the scheme. As set out in Paragraph 10.9.4, it is considered that the majority of this can be won from on-site.

10.10.5 Imported materials would be required for the construction and operation of the scheme.

Primary material sources (on-site)

10.10.6 The earthworks to be undertaken for the new road and bridges would involve cutting into existing topography and the construction of embankments to accommodate infrastructure that is elevated above the main carriageway (i.e. bridges).

10.10.7 The source of the primary material to be used from on-site sources is considered to be of medium importance as this is within the physical scope of the scheme and there are no proposals in place to safeguard the material, however further assessments are required to identify suitability of materials for reuse. For the purposes of the assessment at this stage, it has been assumed that the material would be suitable for reuse. The sensitivity of the material resources on-site is considered to be medium.

10.10.8 The magnitude of effect on the source of primary materials is considered to be **moderate adverse**. The significance of effect on the source of raw materials is therefore considered to be **moderate adverse**.

Primary material sources (off-site)

10.10.9 There is a net import of secondary construction materials required for the scheme, which could potentially have an effect on material sources. The Contractor would work to ensure that materials are imported from established local or regional suppliers who regularly provide materials for commercial projects. The sensitivity of the source of secondary construction materials is considered to be low. The quantities of the common construction materials required, however, are relatively large in the context of the material suppliers and therefore the magnitude of effect is assessed to be **moderate adverse**. The significance of effect from construction on the material sources is considered to be **slight adverse**.

10.10.10 The sensitivity of the source of raw materials for construction is considered to be medium due to the lack of availability of HSA, a product commonly used for road construction. It is currently assumed that the shortfall in cut / fill balance will be won from on-site sources. If any additional material is required, a suitable and local quarry will be identified and its capacity to provide material for the scheme will be assessed.

Types and quantities of waste arisings

Waste and material management infrastructure off-site

10.10.11 It is proposed that all materials arising from construction would be managed in accordance with the waste hierarchy defined within the Waste Framework Directive.

The types and provisional estimated quantities of waste arisings associated with the construction phase of the scheme are listed in

10.10.12 Table 10-11 Estimated waste arisings.

Table 10-11 Estimated waste arisings

Project Activity	Waste arisings from the project	Quantities of waste arisings	Additional information on waste arisings
Site remediation/ preparation/ earthworks	Vegetation surface strip, kerbs, trees, traffic signs, safety barriers, lighting etc.	Not available at this stage	Likely to be a combination of local recycling facilities, disposal at an inert or non-hazardous landfill site.
Demolition	Bridge demolition – concrete, steel beams, metal parapets	Not available at this stage	Likely to be a combination of local recycling facilities, disposal at an inert or non-hazardous landfill site.
Site construction	Surface planings	Not available at this stage	Likely to be a combination of local recycling facilities, disposal at an inert or non-hazardous landfill site.
Operation and maintenance of asset	No significant waste arisings	Not available at this stage	Likely to be a combination of local recycling facilities, disposal at an inert or non-hazardous landfill site.

10.10.13 Site clearance works would include the clearance of existing trees, safety barriers, concrete kerbs, lighting columns and traffic signs. The materials would be segregated and appropriately recycled on site or disposed of at an appropriate waste handling facility.

10.10.14 Several existing structures would require demolition. Materials that may be won during the demolition works, and which may potentially be reused, are set out below:

- Bituminous pavement material;
- Aggregate sub-base;
- Fill and landscaping material;
- Reinforced concrete and concrete;
- Masonry and brickwork; and
- Reinforcement and structural steelwork.

10.10.15 Where possible, demolition materials proposed for reuse would be appropriately processed to meet specification requirements.

10.10.16 Earthwork estimates predict a shortfall of approximately 150,000m^3 of earthwork material. It is considered that this figure will be accurately calculated once detailed

design information is available, yet it is likely that there will not be an excess for disposal at an off-site waste management site.

10.10.17 The amount of waste likely to arise throughout the construction of the scheme is yet to be confirmed, however it is assumed that there will be a net import of materials to site which will result in less waste generation. The magnitude of effect on off-site waste management infrastructure is considered to be **minor adverse**. The significance of effect is **slight adverse.**

Local road network

10.10.18 All site won material from site will be moved around using on site haul roads and not the local or A30 existing network.

10.10.19 The movement of construction materials to and from the site however would impact upon the local road network, the sensitivity of which is considered to be high. It is considered that additional vehicles on the road network associated with the construction of the scheme is anticipated to be less than 200 AADT, the DMRB criteria for traffic flow changes. The movement of site won material between different sections of the scheme will be undertaken using the haul roads, not the local road network thereby preventing impact on the existing road and A30 network.

10.10.20 Potential disruption to traffic is likely to occur at various points along the route, in particular where construction works would be carried out online. This has been discussed further in Chapter 12.

10.10.21 Given the potential disruption to traffic likely to occur the magnitude of impact is considered to be **major adverse**.

10.10.22 The significance of effect from the transportation of materials is therefore assessed as **large adverse**.

High level strategy targets

The strategic targets set out in Table 10-1 will be assessed based on the outcomes of the assessment of construction impacts in the Environmental Statement when further information is available. A preliminary assessment has been provided in Table 10-.

Table 10-12 Assessment of Strategic Targets

Policy document	Target	Preliminary assessment of scheme against target
EU Waste Framework Directive	Waste should be managed without endangering human health and harming the environment	The management of waste will be undertaken in accordance with standard pollution prevention guidelines
	70% of C&D waste (excluding naturally occurring waste) should be prepared for re-use, recycling and recovery	Management of waste will be in accordance with the Waste Hierarchy. Quantities of waste to be confirmed in the Environmental Statement.
National Policy Statement for	Arrangements should be set out for managing any waste	Management of waste will be in accordance with the Waste Hierarchy.

Policy document	Target	Preliminary assessment of scheme against target
National Networks	produced, including information on the proposed waste recovery and disposal system for all waste generated	Quantities of waste to be confirmed in the Environmental Statement.
National Planning Policy for Waste	The likely impact of proposed development on existing waste management facilities and areas allocated for waste management is acceptable and does not prejudice the implementation of the waste hierarchy / efficient operation of such facilities	Quantities of waste and proposed use of waste management facilities to be confirmed in the Environmental Statement.
	The handling of waste arising from the construction and operation of development maximises reuse/recovery opportunities, and minimises off-site disposal	Quantities of waste and proposed use of waste management facilities to be confirmed in the Environmental Statement.
Waste Prevention Programme for England 2013	Design should incorporate the removal of causes of waste early on	It is assumed that the design will incorporate a consideration of waste arisings. Measures to be confirmed in the Environmental Statement.
Cornwall Minerals Safeguarding Development Plan	To ensure the development doesn't adversely impact on Cornwall's minerals industry	It can be assumed that the shortfall of cut / fill material required can be won from Nancarrow and Penny-come-quick, with no import of materials required. To be confirmed in the Environmental Statement.
Cornwall Local Plan	The likely impact of proposed development on existing waste management facilities and areas allocated for waste management is acceptable and does not prejudice the implementation of the waste hierarchy / efficient operation of such facilities	Quantities of waste and proposed use of waste management facilities to be confirmed in the Environmental Statement.

Operation Effects

10.10.23 The scheme has limited potential to generate an effect during the operational phase, as there are no requirements to import or export materials or to generate waste on a day to day basis.

10.10.24 Roads are subject to a periodic maintenance regime. Volume 7 of the DMRB requests that all new roads are built to a 40-year design life, which can only be achieved if the highway is maintained. Maintenance is needed using a 10 year cycle of interventions, which are likely to be:

- Year 10, minor intervention. Remove and replace the surface course;

- Year 20, major intervention. Remove and replace surface course, replace kerbs, upgrade drainage system. Replace road signs. Patch the binder and road base selectively.
- Year 30, minor intervention as year 10; and
- Year 40, major intervention as year 20.

10.10.25 The maintenance works would involve export of surface course planings and damaged kerbs etc. At this stage, the location for the disposal of these materials is not known, however, it is likely that road planings would be recycled and other materials processed off site for reuse. Import of materials would be required to replace the surface course and damaged kerbs etc. At this stage the source of these materials is not known, however, it is likely to be from local suppliers.

10.10.26 The import and export of construction materials during maintenance works would involve significantly lower quantities of materials than during construction and would therefore have a lower impact on source sites and sites receiving the material. The facilities are likely to be established facilities and are therefore considered to have a **low to medium** sensitivity. Subject to further investigation as part of the EIA, the quantities of materials would be relatively small and therefore the magnitude of impact is assessed to be **minor adverse**. The significance of effect from operation is therefore **slight adverse**.

10.10.27 Table 10- provides an overview of the potential impacts associated with each stage of the scheme.

Table 10-13 Detailed Assessment Reporting Matrix

Project Activity	Potential impacts associated with material resources / waste arisings	Description of the impacts
Site remediation / preparation	Generation of waste and associated impacts on off-site waste management infrastructure	Adverse, potentially long-term, indirect
Demolition	Generation of waste and associated impacts on off-site waste management infrastructure	Adverse, long-term, indirect
Site construction	Transportation of materials and waste Depletion of on-site resources	Adverse, short-term, indirect
Operation and maintenance of asset	No significant impacts anticipated	No significant impacts anticipated

10.11 Monitoring

10.11.1 Procedures would be adopted by the Contractor prior to construction to control the use of materials and further reduce the impact. This will be documented in the Site Waste Management Plan (SWMP) for the scheme which would form part of the EMP. The SWMP will detail the estimated quantities of waste material and the opportunities for reuse, recycling, recovery or disposal.

10.11.2 Materials would be responsibly sourced (i.e. must have a certified provenance, traceability and sustainability) where possible, in order to reduce the impact on the highways network and material resources. Responsible sourcing is defined in

BS8902 – Responsible sourcing sector certification schemes for construction projects – Specification as:

"*the management of sustainable development in the provision or procurement of a product*"

10.11.3 Where sustainable development is further defined as:

"an enduring, balanced approach to economic activity, environmental responsibility and social progress".

10.11.4 In order to comply with responsible sourcing principles, the Contractor would, for example:

- Refer to standard BES 6001 - The Responsible Sourcing of Construction Products.
- Ensure suppliers are certified by the Forest Stewardship Council (FSC) or Programme for the Endorsement of Forest Certification (PEFC).

10.12 Summary

10.12.1 The likely significance of environmental effects from the use of material resources, and the generation and management of waste, resulting from the construction and operation of the scheme are summarised in Table 10-5.

10.12.2 Where materials are initially unable to meet the assessment criteria they would either be treated to make them suitable for use or, as a last resort, disposed of off-site as waste. Effective treatment would offset the need for imported material resources and minimise the requirements for disposal.

10.12.3 During the construction phase, standard best construction practice would be adopted. The EMP will set out the controls for material storage.

10.12.4 This approach for managing materials is consistent with the waste hierarchy defined in the Waste Framework Directive (Directive 2008/98/EC). Adopting the waste hierarchy would significantly reduce the amount of material requiring off-site disposal and hence minimise potential impacts relating to movement of materials both on to and off the site.

10.12.5 The assessment demonstrates that the significance of adverse environmental effects with mitigation in place is generally slight adverse. However, during construction the importation of materials and associated traffic movements could potentially result in short term, localised, large adverse effects particularly relating to increased heavy goods vehicle movements. Detailed traffic management would be required to mitigate the movement of materials during construction.

10.12.6 During the operational phase there would be no significant effects anticipated associated with material resources.

Table 10-514 Summary of significance of effect

Receptor	Significance of effect
Material source	Slight adverse
Off-site waste management infrastructure	Slight adverse
Local traffic network (construction/operation)	Large adverse/Slight adverse

Further Work

10.12.7 It should be noted that at this stage the information is preliminary and is based on the 2017 scheme design, as described in Chapter 2. A list of missing information has been provided in Table 10-6. Further EIA work is currently being undertaken to confirm the scale and significance of environmental impacts arising from the scheme design. The final EIA will be reported within the ES, which will accompany the DCO application to be made in Summer 2018.

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Preliminary Environmental Information Report

Chapter 11 Noise and Vibration

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11 Noise and Vibration

11.1 Introduction

11.1.1 This chapter of the PEIR describes the findings of the noise and vibration assessment and the likely environmental impacts of the scheme, during both construction and operation.

11.1.2 A description is given of the baseline noise climate, assessment methodology, results and conclusions for the 'Detailed' assessment approach as described in DMRB HD 213/11.

11.2 Legislative and policy framework

Legislation

Land Compensation Act

11.2.1 The Land Compensation Act[1] Part 1 entitles property or land owners to compensation if their property has been reduced in value as a result of a public project such as a new or improved highway.

Noise Insulation Regulations

11.2.2 The Noise Insulation Regulations (NIR)[2] define the conditions under which dwellings are eligible for noise insulation to control internal noise levels. The conditions relate to the level of traffic noise at the façade, the increase in noise levels as a result of the highway, and the contribution of the new or altered project to the noise level received at the façade. In summary, noise insulation qualification criteria require that:

- the facade noise threshold of 68dB$L_{pA10,18h}$ is met or exceeded;
- there must be a noise increase of at least 1dB(A) compared to the prevailing noise level immediately before the construction of a highway or an additional carriageway were begun;
- the noise caused by traffic on new or altered roads makes an effective contribution of at least 1dB(A); and
- the property is 300 metres or less from the nearest point on the carriageway of a highway to which the Regulations apply.

Road Investment Strategy

11.2.3 The Road Investment Strategy for the period 2015/16 – 2019/20[3] was presented to Parliament pursuant to section 3 of the Infrastructure Act 2015. To ensure more is done to limit the impact that the Strategic Road Network and its users have on the environment, the Department for Transport has ring fenced £300 million in an Environment Fund to deliver improved environmental performance, including noise.

[1] HMSO , (1973), Land Compensation Act, HMSO
[2] HMSO (1988), Noise Insulation (Amendment) Regulations, HMSO
[3] Department for Transport (2015), The Road Investment Strategy: for the 2015/16 – 2019/20 Road Period

11.2.4 One of the KPI targets is to mitigate at least 1,150 Noise Important Areas[4] by the end of the first Road Period, to help improve the quality of life of around 250,000 people living and working near the network. It should be noted that the scheme encompasses a number of Noise Important Areas, which are identified as locations of particular sensitivity to noise impacts.

National Policy

11.2.5 The Government's noise policy is set out in the Noise Policy Statement for England (NPSE)[5]. In legislative and policy terms, noise is taken to include vibration.

11.2.6 Government noise policy sets three aims, which are to be met within the context of the government policy on sustainable development:

- to avoid significant adverse impacts on health and quality of life;
- to mitigate and minimise adverse impacts on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life.

11.2.7 The same three aims are also reflected in:

- National Planning Policy Framework (NPPF)[6]; and
- Planning Practice Guidance – Noise (PPG-Noise)[7].
- the National Policy Statement for National Networks (NN NPS)[8] (Department for Transport (DfT), 2014).

11.2.8 PPG-Noise provides guidance on the application of Government noise policy. PPG-Noise notes that unacceptable adverse effects on health and quality of life due to noise exposure (set at a level higher than significant adverse impacts on health and quality of life) should be ‘prevented'.

11.2.9 Thresholds for identifying policy adverse effect levels[9] are not clearly defined numerically in any Government document; rather they are to be established specifically for each scheme and context. The values adopted for this assessment are discussed later in this Chapter.

11.2.10 The thresholds adopted to identify noise policy adverse effect levels have been applied following the precedent set on recent major infrastructure schemes.

11.2.11 In addition to Government noise policy, the scope and methodology for this assessment has also taken account of relevant guidance, particularly DMRB HD213/11 as described below.

[4] Noise Important Areas (IAs): These are where the 1% of the population in England that are affected by the highest noise levels from major roads are located according to the results of Defra's strategic noise maps
[5] Department for Environment Food and Rural Affairs (2010), Noise Policy Statement for England (NPSE)
[6] Department for Communities and Local Government (2012), National Planning Policy Framework, http://www.communities.gov.uk/publications/planningandbuilding/nppf
[7] Department for Communities & Local Government (2014), Planning Practice Guidance – Noise, http://planningguidance.communities.gov.uk/blog/guidance/noise/noise-guidance/
[8] Department for Transport (2014), National Policy Statement for National Networks (NN NPS)
[9] Adverse effects, significant adverse effects and unacceptable adverse effects on health and quality of life

Local Policy

The Truro and Kenwyn Neighbourhood Development Plan 2015-2030 (adopted)

11.2.12 The Neighbourhood Development Plan (adopted) covers part of the area of the scheme. This Plan states the importance of environment and local setting but does not specifically refer to noise and vibration. However, it refers generally to The Cornwall Local Plan and the NPPF and it is stated that the Neighbourhood Development Plan must align with the regional and national policies on matters of environmental controls with regard to development planning.

The Cornwall Local Plan Strategic Polices 2010-2030 (adopted 2016)

11.2.13 The Cornwall Local Plan sets out a number of requirements which relate to noise and vibration control with regard to development:

- Policy 12: 'Design' - notes that development proposals will be required to protect individuals and property against 'unreasonable noise and disturbance'.
- Policy 13: 'Development Standards' - expects development design to avoid or mitigate adverse impacts from noise (and other impacts) during construction and operation.
- Policy 16 'Health and wellbeing' - requires that development protects and alleviates risk to people and the environment by avoiding harmful effects and health risks - including those from noise.

11.2.14 This assessment incorporates these local and regional policy requirements in relation to noise and vibration impacts.

Guidance

DMRB – Environmental Assessment, Volume 11, Section 3, Part 7

11.2.15 The DMRB is the regulatory standard for the design of a new road or improvements to an existing road. In particular, Volume 11 Section 3 Part 7: HD 213/11 Revision 1 sets out the method for assessing noise and vibration associated with road traffic. HD 213/11 provides guidance on the selection of the scheme assessment area and the relevant assessment years. The assessment presented in this PEIR has been based upon these procedures.

Calculation of Road Traffic Noise

11.2.16 HD 213/11 requires that road traffic noise is calculated under the method described in Calculation of Road Traffic Noise[10] (CRTN). This describes a procedure for determining the level of noise from the highway based upon the traffic flow parameters, road surface, propagation distance, screening, intervening ground cover and topographical features between the highway and receptor. This is the accepted methodology to quantify traffic noise levels for use with highway noise assessment procedures.

WebTAG environmental impacts worksheets

11.2.17 The Department for Transport's Transport Analysis Guidance (TAG) can used to present the results of a transport scheme appraisal as part of a business case.

[10] DEPARTMENT OF TRANSPORT WELSH OFFICE (1988), Calculation of Road Traffic Noise, HMSO

The noise assessment takes the form of an analysis[11] of noise levels with and without a proposed highway scheme to calculate the monetised impacts of noise. This will be undertaken at a later stage of assessment but has not been carried out as part of the PEIR.

BS 5228-1:2009+A1:2014 and BS 5228-2 Code of Practice for noise and vibration on construction and open sites

11.2.18 BS 5228-1[12] provides guidance on the assessment and control of noise and vibration from construction operations. The Standard contains detailed information on noise reduction measures and promotes the 'best practicable means' approach to control noise and vibration to minimise the impact on local residents and construction workers. A methodology for predicting construction noise is included. The Standard also provides criteria for vibration disturbance to people.

BS ISO 4866: 2010 Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures

11.2.19 BS ISO 4866[13] provides guidance and methodologies for the measurement and effects of vibration upon buildings.

BS 8233: 2014 Guidance on sound insulation and noise reduction for buildings

11.2.20 BS 8233[14] provides advice for the control of noise in and around buildings and guidance criteria for noise levels inside new buildings.

Cornwall Council Public Health and protection - Guidance Note: Noise and Dust Control on Construction and Demolition Sites

11.2.21 This guidance note[15] provides information regarding the expectations of the Council with regard to control of construction noise and vibration emissions, hours of working and working practices.

11.3 Study area

11.3.1 The determination of the operational assessment study area has been based on the HD 213/11 guidance. For the ‘Detailed’ level of assessment used for this study, HD 213/11 requires that a quantitative noise impact study is made for all noise sensitive properties within 600m of the scheme. Also, sections of existing roads within 1 km of the scheme that are predicted to be subject to a change in noise level of more than 1dB(A) as a result of the scheme at the ‘baseline’ year (or 3dB in the ‘future’ year), are also assessed[16] within a 600m calculation area.

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[11] Department for Transport (2017) https://www.gov.uk/government/publications/webtag-environmental-impacts-worksheets

[12] BRITISH STANDARDS INSTITUTION (2014) BS 5228-1:2009+A1:2014 and BS 5228-2:2009+A1:2014 Code of Practice for Noise and Vibration Control on Open Construction Sites

[13] BRITISH STANDARDS INSTITUTION (2010) BS ISO 4866: 2010, Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures, British Standards Institution

[14] BRITISH STANDARDS INSTITUTION (2014) BS 8233 Guidance on sound insulation and noise reduction for buildings, British Standards Institution

[15] Cornwall Council Public Health and protection (2010) - Guidance Note: Noise and Dust Control on Construction and Demolition Sites

[16] The more sensitive test is the 1dB change in the baseline year.

The terms ‘baseline’ and ‘future’ years are used in HD 213/11 for the noise assessment. These are defined as follows in Paragraph 3.8 of the guidance:

‘For an assessment of permanent noise and vibration impacts, the baseline year is taken as the opening year of the road project’…..’*The future assessment year for operation is typically the 15th year after the opening year of the road project, but in some circumstances this may occur before the 15th year. For example, inspection of the traffic model outputs may highlight that the greatest traffic flows do not occur in the 15th year*.’

11.3.2 Existing roads subject to a change of 1dB(A) or more were identified by forecast traffic changes arising from the scheme. HD 213/11 notes that a change in noise level of 1dB is associated with an increase in flow by at least 25% or decrease by 20% in the scheme opening year. The area for which these detailed quantitative calculations are made is defined as the calculation area (HD 213/11).

11.3.3 DMRB HD 213/11 requires consideration of potential noise impacts on existing roads outside the study area[17], where traffic increases are forecast to be greater than 25% in the short-term. These are described as 'affected' links. This assessment will be carried as part of the ES but has not been included in this PEIR.

11.3.4 The study area for the construction assessment comprises noise-sensitive properties within approximately 300m from the proposed works. BS 5228 notes that the prediction results should be treated with caution at distances greater than this.

11.4 Potential Impacts

11.4.1 The construction works would include grade separated junction works at three locations: Chiverton, further east at Chybucca and at the eastern end of the scheme at Carland Cross. Works at these locations will potentially affect noise sensitive receptors for a longer period than the mainline sections of the scheme construction. Away from the junctions, the new or improved carriageway works would progress more rapidly along the scheme, and hence would be alongside any one receptor location for a shorter period. The Environmental Study Report conducted at PCF Stage 2 indicated that there would be potential for significant noise effects at properties close to the works for the options assessed. The same would apply to the preferred scheme considered in this assessment. Only where dwellings are very close to the works, typically less than 30m, is there likely to be potential for vibration impacts depending on the particular plant machinery used.

11.4.2 Operational noise impacts would be greatest where the scheme would be aligned closer to nearby noise sensitive receptors than the existing highway. Where the distance between the highway and receptor is halved (or even closer), there is the potential for significant adverse effects. Minor changes in alignment, particularly where the receptors are some distance from the existing highway, would be less likely to result in impacts as the proportionate change in distance would be small. Conversely, there are locations where the scheme would be substantially further from receptors such that there is the potential for significant beneficial effects.

[17] i.e. 1km from the scheme, including existing routes that are being bypassed or improved.

11.5 Assessment Methodology

Value of Receptor

11.5.1 In addition to residential receptors, the guidance for noise assessment in HD 213/11 identifies a range of non-residential properties as noise sensitive, which should also be considered in the assessment. These include hospitals, schools, community facilities and designated[18] areas. Figure 11.1 shows the residential and non-residential assessment locations used for the assessment.

Magnitude of Impacts

Construction noise

11.5.2 Noise and vibration assessment from the construction of the scheme has been determined using BS 5228. This standard provides information on the prevention and control of construction noise and vibration, and includes a procedure for predicting construction noise. Calculations of noise levels at selected receivers have been based on typical noise levels for construction processes (mainly taken from BS 5228). Calculations also take account of propagation distance, details of the intervening ground cover, topography and screening.

11.5.3 Construction noise predictions are based on the expected programme and construction methods. Where necessary, assumptions have been made with the advice of the scheme design engineers regarding aspects of the construction process. These construction method assumptions are considered to be sufficiently representative for this assessment.

Construction vibration

11.5.4 Ground-borne vibration during the construction of the scheme may potentially arise due to the use of compactors and/or rollers. Piling may occur, associated with structures, but rotary bored piling has been assumed rather than percussive, such that potential vibration effects would be minimised. Impacts at sensitive receptors will be dependent on their proximity to the works and the intervening ground conditions.

11.5.5 The effects in terms of community response are expected to be governed mainly by the type of activities undertaken although public liaison and prior notice of potential impacts are also important factors. Effects in terms of cosmetic or structural damage to buildings may also be of concern where buildings are exposed to levels of vibration much higher than the lowest perceptible levels.

11.5.6 BS 5228–2:2009+A1:2014 provides a methodology for predicting typical levels of vibration from certain types of construction activities, based on case study data and empirical models. This will be used in the ES to consider the likelihood that vibration from the works may exceed the thresholds for perception and disturbance. For the PEIR, detailed information on construction plant that would generate vibration is limited, but an assessment of the likelihood of vibration effects has been made based on the types of plant machinery that would be used.

[18] e.g. green space designated because of its tranquillity

Operational noise

11.5.7 Geographical Information Systems (GIS) have been used to construct a three-dimensional noise model of the prescribed calculation area for the scheme. The model includes highways, terrain data, buildings and other structures that might screen or reflect noise, and types of ground cover.

11.5.8 For each road link in the model, data on traffic flow, speed[19], proportion of heavy goods vehicles (HGVs) and road surface type[20] were obtained for inclusion into the model. Once the data was complete and the inputs checked, noise level calculations were carried out according to the CRTN methodology. Traffic noise levels were calculated across a grid of receptor positions over the calculation area, and contours of noise level exposure were established. Additional calculations were also conducted at specific assessment locations to represent noise sensitive receptors (e.g. residential properties). The study area and calculation area according to HD 213/11 are defined in Paragraph 11.3.1 and Figure 11.1.

11.5.9 The traffic data used in the model were those forecasted under the Do-Something and Do-Minimum scenarios in the year[21] 2023 and those in the future assessment year, i.e. the year of maximum projected traffic flow within 15 years of opening – in this case, the design year (2038).

11.5.10 The noise prediction model was used to calculate noise levels within the noise calculation area, at a height of 4m above local ground, in terms of the free-field $L_{pA10,18h}$ index in accordance with CRTN methodology, as required by HD 213/11.

11.5.11 The $L_{pA10,18h}$ index represents the arithmetic mean of all the hourly values of L_{A10} during the period between the hours of 06:00 and 24:00. The CRTN procedure is based upon empirical noise data with a slightly positive wind vector component blowing downwind from source to receptor. The CRTN prediction therefore assumes an adverse wind component to represent a typical worst case scenario. The additional advice given in HD 213/11 has been adopted regarding CRTN procedures. These include revisions to vehicle classification, traffic data and corrections due to road surface.

11.5.12 For the purposes of this assessment, the $L_{pA10,18h}$ results are converted to the corresponding L_{Aeq} scale for daytime noise, i.e. $L_{Aeq,16h}$ (see Glossary in Appendix 11.1). This provides a direct comparison with the quantitative L_{Aeq} criteria described later for assessing significance with respect to the Government's noise policy (NPSE). The $L_{Aeq,16h}$ scale has also been adopted for traffic noise assessment as part of the Government's WebTAG methodology for environmental impacts assessment.

11.5.13 Baseline noise survey results (see Section 11.3 and Appendix 11.2) will be used to provide indicative information to validate the predicted noise climates, across

[19] The traffic speeds for the assessment were determined for each section of highway following the procedure given in Interim Advice Note 185/15 which provides supplementary advice to users of DMRB Volume 11, SECTION 3, PART 1 (HA207/07) and PART 7 (HD213/11). The note provides advice on the assessment of link speeds and generation of speed-bands for use with scheme noise assessments.
[20] Taken from the Highways England Pavement Management System database.
[21] HD 213/11 Para 3.6 notes that: '*For an assessment of permanent noise and vibration impacts, the baseline year is taken as the opening year of the road project*.'

the study area. This data was not available for the PEIR, but will be included in the ES.

11.5.14 As part of the procedure for a Detailed Assessment, HD 213/11 requires that the magnitude of the noise impact is reported using a suggested scale of magnitude to describe the increase or decrease in noise level associated with the scheme. The magnitude scale is described in more detail in the section on assessment criteria (Paragraph 11.5.33).

11.5.15 To simplify reporting, the assessment has focused on the long term noise effects (i.e. with-scheme 2038 (Do-Something) vs without-scheme 2023 (Do-Minimum) as required by DMRB HD213/11. The Do-Minimum 'future assessment' year (i.e. design year) was also considered to determine whether any significant effects identified are a consequence of traffic growth or changes to the road surface.

11.5.16 In addition, traffic noise nuisance reporting tables are also stipulated in HD 213/11 for a Detailed assessment. The noise nuisance level is presented in percentage bands relating to the change in percentage of people 'bothered' by the noise change.

11.5.17 For the Do-Minimum scenario, the change in 'steady state' nuisance between the baseline and future years is reported. For the Do-Something scenario, it is the highest increase in nuisance that occurs between the baseline and future assessment years for each dwelling that is reported (or the least beneficial reduction in noise) in accordance with HD 213/11 methodology.

11.5.18 Eligibility for sound insulation measures under the Noise Insulation Regulations 1975 (as amended 1988) has been considered to identify residential dwellings that potentially qualify under the Regulations.

Night-time noise

11.5.19 HD 213/11 Detailed Assessment also requires that a night-time noise assessment is carried out. The L_{night} descriptor is used to represent the noise level at dwellings between the hours of 23:00 and 07:00. Method 3 from the Transport Research Laboratory (TRL) report *'Converting the UK traffic noise index $L_{pA10,18hr}$ to EU noise indices for noise mapping'*[22] was used for predicting L_{night} noise levels. Method 3 uses daily traffic flow data converting predicted daytime noise levels ($L_{pA10,18h}$) to night-time noise levels. This method was appropriate as there was nothing considered to be unusual in the proportionate traffic flow volumes for this route between daytime and night-time.

11.5.20 For the night-time noise assessment, only dwellings with a noise level over 55dB$L_{night,outside}$ are considered (as specified in HD 213/11). The assessment of impact magnitude for night-time noise follows the same method as the daytime.

Assessment scenarios

11.5.21 The assessment scenarios were those specified in HD 213/11 for the 'baseline' and 'future' years.

[22] Abbott, PG & Nelson PM (2002), PR/SE/451/02, Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping, TRL

11.5.22 In this case the future year is 15 years after opening, i.e. the scheme design year (2038). These traffic data were included in the noise model to produce predictions for the following scenarios:

- Do-Minimum (without the scheme) 'baseline' year at completion of scheme construction (2023);
- Do-Minimum (without the scheme) 'future' year (design year) (2038);
- Do-Something (with the scheme) 'baseline' year at the completion of scheme construction (2023); and
- Do-Something (with the scheme) 'future' year (design year) (2038).

11.5.23 The Do-Minimum 2038 design year scenario was considered to determine the extent to which impacts are a consequence of traffic growth.

Assessment of Significance

Approach to assessment of effects – all sources and receptors

11.5.24 The method for identifying likely significant effects of noise and vibration from construction and operation of the scheme, as required by the EIA Regulations, draws on best practice from other major infrastructure projects, and is aligned with DMRB HD213/11 and Government noise policy.

11.5.25 Taking Government noise policy (Defra 2010) and PPG-Noise (DCLG, 2014) together, they are based on the premise that once noise becomes perceptible, the effect on people in dwellings and other receptors used by people (for example schools and hospitals) increases as the total level of noise increases. Government policy and practice guidance defines four levels of effect on health and quality of life in increasing severity:

- No effect;
- Adverse effect;
- Significant adverse effect; and
- Unacceptable adverse effect.

11.5.26 The Government noise policy NPSE and PPG-Noise also note that thresholds should be set to define the onset of these levels of effect, namely:

- Lowest Observed Adverse Effect Levels (LOAEL) to identify the onset of adverse impact on health and quality of life;
- Significant Observed Adverse Effect Levels (SOAEL) to identify the onset of significant impacts on health and quality of life; and
- Unacceptable Adverse Effect Levels (UAEL) to identify the onset of unacceptable impacts on health and quality of life.

11.5.27 Policy notes that these thresholds should reflect the nature of the noise source, the sensitivity of the receptor and the local context. Assessment criteria for this study are defined in a later section (Paragraph 11.5.33).

Significant adverse effect on health and quality of life

11.5.28 The EIA Regulations require the identification of 'likely significant effects'. Where the calculated noise or vibration indicates a significant adverse impact on health and quality of life (i.e. the noise level exceeds the relevant SOAEL threshold – see Table 11-6), then this is assessed as a likely significant observed adverse

effect at each receptor. For example, such noise levels would disrupt activities indoors, as described in the assessment framework given in PPG-Noise.

Adverse effects on health and quality of life

11.5.29 In line with best practice, DMRB HD213/11 and previous projects, this assessment also identifies likely significant effects where the calculated noise or vibration is only an adverse impact on health and quality of life. Specifically, this describes a situation when the construction or operational noise is greater than the relevant LOAEL but is less than the SOAEL.

11.5.30 In this case, the basis for the likely significant effect is the change in noise caused by the scheme options and the number of dwellings in a community that are subject to the change. With regard to PPG-Noise, such likely significant effects relate, for example, to a change in the outdoor “acoustic character” of an area due to a noise increase, or decrease as a result of the scheme.

11.5.31 Table 11-1 summarises how noise levels in terms of Government noise policy and change in noise levels (in terms of DMRB HD213/11) have been used to identify likely significant effects.

Types of receptor - detailed approach to assessment

11.5.32 The assessment approach considers a range of receptors and effects. Additional detail on the assessment methodologies for the assessment of each of the following types of receptor is described in Appendix 11.3:

- Residential receptors: direct effects – individual dwellings;
- Residential receptors: direct effects – communities;
- Non-residential receptors: direct effects;
- All above receptors: indirect effects - i.e. those effects not resulting directly from the scheme itself, such as changes in noise on existing roads due to construction traffic, or additional traffic on existing roads due to operation of the scheme.

Table 11-1: Noise and Vibration Assessment Approach to Address Both the EIA and Government Policy Requirements

	Perception	Government policy		EIA		Mitigation	
		Effect	Action	Assessment	Effect	Project	Receptor
← Increasing level of noise or vibration	not noticeable	no observed effect	no specific measures required	special cases	no adverse effect	special cases	none
	noticeable and not intrusive	no observed adverse effect	no specific measures required				
	Lowest observed adverse effect level – LOAEL						
	noticeable and intrusive	observed adverse effect	mitigate and reduce to a minimum	noise level change as indicator of impact/effect magnitude + contextual significance criteria	change or absolute level may cause adverse effect on acoustic character. May be considered significant in EIA terms on a community basis	maximise mitigation as far as sustainable	none
	Significant observe adverse effect level – SOAEL						
	noticeable and disruptive	significant observed adverse effect	avoid	exceeding SOAEL is a significant effect	significant adverse effect on each receptor	maximise mitigation as far as sustainable. Prevent UAELs where possible	noise insulation
	noticeable and very disruptive	unacceptable adverse effect	prevent	exceeding UAEL is a significant effect			potentially re-house where noise is from the scheme

Assessment criteria

11.5.33 Assessment criteria have been established that respond to the requirements of:

- Government policy, set out in NPSE, NPPF, NN NPS and PPG- Noise;
- DMRB HD213/11;
- Relevant regulations, guidance and standards; and
- Best practice as set by previous relevant projects.

Construction noise assessment criteria

11.5.34 Potential adverse effect thresholds in Government policy terms have been established based upon the ABC Method described in BS5228-1:2009+A1:2014. These thresholds, shown in Table 11-2, have been used to establish assessment criteria for monthly average construction noise levels.

Table 11-2: Thresholds of Potential Effects of Construction Noise at Residential Buildings in Terms of Government Policy

Effect threshold (residential)	Threshold value, 1m in front of the relevant façade
Lowest observed adverse effect level (LOAEL)	• day 65dB$L_{pAeq,daytime}$ • evening 55dB$L_{pAeq,1hr}$ • night 45dB$L_{pAeq,1hr}$
Significant observed adverse effect level (SOAEL)	• day 75dB$L_{pAeq,daytime}$ • evening 65dB$L_{pAeq,1hr}$ • night 55dB$L_{pAeq,1hr}$
Note: Day is 07:00 to 19:00, evening is 19:00 to 23:00 and night is 23:00 to 07:00	

11.5.35 Where the monthly average construction noise level at the receptor is between the lowest and the significant observed adverse effect levels, the threshold of potential adverse effect in EIA terms is evaluated in accordance with Table 11-3.

Table 11-3: Threshold of Potential Significant Effect at Dwellings According to ABC Method in BS 5228–1:2009 + A1:2014 (potential significance in EIA terms)

Assessment category and threshold value period	Threshold value, dB(A)		
	Category A	Category B	Category C
Night-time (23:00 – 07:00)	45	50	55
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
Other: Weekday evenings (19:00 – 23:00) Saturdays (13:00 – 23:00) Sundays (07:00 – 23:00)	55	60	65
Category A: threshold value to use when ambient noise levels (rounded to the nearest 5dB) are less than these values Category B: threshold value to use when ambient noise levels (rounded to the nearest 5dB) are the same as Category A values Category C: threshold value to use when ambient noise levels (rounded to the nearest 5dB) are higher than Category A values.			

11.5.36 The adverse impact threshold is determined at a dwelling using the existing ambient noise level, rounded to the nearest 5dB. This is then used to determine

the assessment category: A, B or C, which defines the adverse noise impact threshold. The predicted construction noise level is then compared to the appropriate noise impact threshold level. If the L_{Aeq} construction noise level exceeds the appropriate noise impact threshold level shown in Table 11-3, then an adverse impact with the potential to cause a significant effect is identified.

11.5.37 For example, for a site exposed to an existing ambient noise level of 68dB(A), this would be rounded to 70dB(A). An ambient level of 70dB(A) is higher than the Category A value of 65dB(A), therefore the Category C value of 75dB(A) would apply as a threshold for potential significant effect.

11.5.38 Having established if there is a potentially significant effect using the ABC method, the final assessment of significance is made using professional judgement. This is evaluated by considering various other factors described in Appendix 11.2, such as the expected duration of the activity.

11.5.39 For non-residential receptors, significant effects would be evaluated on a receptor-by-receptor basis, using established noise impact criteria for the type of receptor and professional judgement based on the factors described in Appendix 11.2.

Construction vibration assessment criteria

11.5.40 BS 5228–2:2009+A1:2014 indicates that the threshold of perception in residential environments corresponds with a Peak Particle Velocity (PPV) of 0.3mm/s. The Standard also states that a complaint is likely where levels occur above 1.0mm/s PPV at residential properties but this exposure can be tolerated if prior warning and explanation has been given to residents. Levels of vibration of 10mm/s PPV and above are likely to be intolerable for any more than a very brief exposure to this level.

11.5.41 The overall significance of the effect is assessed using professional judgement by considering not only the criteria above but also other factors, such as the duration of exposure and the particular characteristics of the source.

11.5.42 Guidance on the impact of vibration on people in buildings is presented in BS6472:2008 Part 1[23], which assesses the impact of vibration using the vibration dose value (VDV). This indicator takes into account how people respond to vibration in terms of frequency content, vibration magnitude and the number and duration of vibration events during an assessment period. For the PEIR, information on construction plant that would generate vibration is limited, but an assessment of the likelihood of vibration effects has been made based on the types of plant machinery that would be used. For the ES, when more detailed construction information is available, vibration from the operation of the scheme and all construction will be assessed using the criteria presented in Table 11-4.

[23] BRITISH STANDARDS INSTITUTION (2008), BS 6472-1 *Guide to evaluation of human exposure to vibration in buildings Part 1: Vibration sources other than blasting,* British Standards Institution

Table 11-4 Thresholds of Likely Effects of Vibration for Residential Buildings (derived from BS 6472-1: 2008)

Threshold (residential)	Impact classification	Vibration exposure(1)	
		VDV daytime (07:00 – 23:00) (m/s1.75)	VDV night time (23:00 – 07:00) (m/s1.75)
Lowest observed adverse effect level (LOAEL)	minor	0.2	0.1
-	moderate	0.4	0.2
Significant observed adverse effect level (SOAEL)	major	0.8	0.4
Note (1) Determined at the worst location on a normally loaded floor (usually the centre of the floor)			

11.5.43 For non-residential buildings, the following worst case multiplying factors are applied to the daytime VDV criteria, consistent with BS6472-1 2008 Guide to evaluation of human exposure to vibration in buildings (1Hz to 80Hz). Vibration sources other than blasting (BSI, 2008):

- offices – factor of 2; and
- workshops – factor of 4.

11.5.44 Risk of damage to buildings from groundborne vibration is assessed using the criteria in Table 11-5. The criteria are derived from British Standard BS7385, Part 2 '*Evaluation and measurement for vibration in buildings – Guide to damage levels from groundborne vibration*' (BSI, 1993). This ensures there is no risk of the lowest damage category ('cosmetic') being exceeded, as defined in BS ISO 4866:2010 *Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures* (BSI, 2010). However, effects in terms of even cosmetic damage to buildings would occur only for vibration exposures much higher than the lowest perceptible levels.

Table 11-5: Vibration Impact Criteria for Buildings (conservative criteria below which there is no risk of cosmetic damage)

Category of building	Peak particle velocity[1] (mms^{-1})	
	Transient[2] vibration	Continuous[3] vibration
Potentially vulnerable building	6	3
Structurally sound buildings	12	6
Notes: [1] At the building foundation [2] Transient relative to building response e.g. from percussive piling [3] Continuous relative to building response e.g. from vibratory piling, vibrating rollers		

Operational noise assessment criteria

11.5.45 Adverse effect levels have been set in Table 11-6 in accordance with Government noise policy (NPPF, NPSE, and PPG-Noise) and with regard to the guidance from

the World Health Organisation (Guidelines for Community Noise[24]; and WHO Night Noise Guidelines for Europe[25], the Noise Insulation Regulations 1975 (as amended), and best practice from other projects.

Table 11-6: Thresholds of Likely Effects of Operational Noise at Residential Buildings in Terms of Government Policy

Effect threshold (residential)	Threshold value (free-field unless stated)
Lowest observed adverse effect level (LOAEL)	• Day 50dB$L_{pAeq,16hr}$ (equivalent to 52dB$L_{pA10,18hr}$) • Night 40dB$L_{pAeq,8hr}$
Significant observed adverse effect level (SOAEL)	• Day 68dB$L_{pA10,18hr}$ at the façade of a property (equivalent to 63dB$L_{pAeq,16hr,}$ freefield) • Night 55dB$L_{pAeq,8hr}$

11.5.46 The magnitude of the impact and effect caused by long term change in noise levels attributable to the scheme, where the overall 'end state' (i.e. operational noise level of the completed scheme), is between the lowest and the significant observed adverse effect levels, is evaluated in accordance with Table 11-7 (i.e. between the SOAEL and LOAEL).

11.5.47 DMRB, HD213/11 provides a basis for evaluating the magnitude of the impact and effect caused by noise change both in the short-term and long-term. This assessment has focused on the long term change as this is the likely worst case considering traffic growth. This is also consistent with DMRB, HD213/11 that notes:

"In terms of permanent impacts… In the long-term, a 3dB(A) change is considered perceptible. Such increases in noise should be mitigated if possible".

11.5.48 The focus on long-term effects also relates to the evidence that underpins DMRB, HD213/11. This evidence shows that the reported sensitivity to small changes in noise levels (less than 3dB(A)) may be coloured by factors other than noise at the time a new road opens.

Table 11-7: Classification of Magnitude of Noise Impact on Residential Communities in the Long-Term Under HD 213/11, Where the 'end-state' of Overall Exposure is Between LOAEL and SOAEL

Noise change [dB(A)]	Magnitude of impact in the long-term
0	No change
0.1 – 2.9	Negligible
3.0 – 4.9	Minor
5.0 – 9.9	Moderate
10.0 +	Major

[24] WORLD HEALTH ORGANISATION (1999), Guidelines for Community Noise, World Health Organization
[25] WORLD HEALTH ORGANISATION (2009), Night Noise Guidelines for Europe, WHO, Bonn: WHO, regional Office for Europe, 2007

11.5.49 Where the overall exposure is greater than the relevant significant observed adverse effect level (SOAEL), then there is increasing risk of likely health effects associated with long term (permanent) exposure.

11.5.50 Some areas in the scheme noise study area already have a designated status as being exposed to high levels of road traffic noise (i.e. Noise Important Areas). It is considered appropriate to give greater weight to noise change where the existing baseline noise level is already high, i.e. in excess of the relevant SOAEL. This is to reflect the consideration of health effects. In these situations, the magnitude of the impact and effect caused by change in noise levels attributable to the scheme is shown in Table 11-8.

Table 11-8: Classification of Magnitude of Noise Impact and Effect on Residential Communities in the Long-Term Under DMRB, Where the Baseline Noise Level is Greater Than SOAEL

Noise change [dB(A)]	Magnitude of impact in the long-term
0	No change
0.1 – 0.9	Negligible
1.0 – 2.9	Minor
3.0 – 4.9	Moderate
5.0 +	Major

11.5.51 A minor impact (3dB or greater) is taken as an indicator of a potential significant effect for noise exposures between the LOAEL and SOAEL (Table 11-7). For areas exposed to higher noise levels (above SOAEL), a small impact (1dB or greater) may be taken as an indicator of potential significance with the magnitude of impact and effect being evaluated using Table 11-8. The final assessment is based upon the indicated potential significance, as described above, and consideration of additional factors described in Appendix 11.3, which include the number of dwellings in a community affected.

11.5.52 For non-residential buildings, the assessment considers the noise and vibration exposure at each receptor and the receptor's generic sensitivity. Table 11-9 summarises the assessment criteria used for assessment on a likely worst case basis.

Table 11-9: Noise Impact Screening Criteria at Non-Residential Receptors (construction and operation)

Description	Impact (screening) criterion		Outcome	Reference
	Day 0700-2300	Night 2300-0700		
Places of meeting for religious worship; courts; cinemas; lecture theatres; museums; and small Auditoria or halls	50dB$L_{pAeq,T}$ and a change >3dB	--	disturbance	BS8233: 2014, EFAs Acoustics Performance Standards[1], HTM08-01[2], WHO guidelines
Schools; colleges; hospitals*; hotels*; and libraries	50dB$L_{pAeq,T}$ and a change >3dB	*45dB$L_{pAeq,T}$ [3] and a change >3 dB	disturbance and sleep disturbance*	
Offices	55dB$L_{pAeq,T}$ and a change >3dB	--	disturbance	BS 8233

Notes:

[1] Based on an internal level of 35dB$L_{pAeq,T}$ consistent with Education Funding Agency (EFA) (2012) and BS8233 etc. Equivalent external level assumes 15 dB for a partially open window

[2] Department of Health (2013)

[3] Based on an internal level of 30dB$L_{pAeq,T}$ consistent with BS8233, WHO guidelines etc. Equivalent external level assuming 15 dB for a partially open window.

11.6 Baseline Conditions

11.6.1 Noise or vibration sensitive locations have been identified for inclusion in the assessment; (see Appendix 11.2). Baseline noise survey locations will be agreed with Cornwall Council and will be carried out at sufficient locations to represent noise sensitive areas alongside the scheme. The noise survey will be performed in accordance with the 'Shortened measurement procedure', described in paragraph 43 of CRTN (survey procedures and locations are described in Appendix 11.2. These surveys were not completed at the time of producing this PEIR but the results will be included within the ES accompanying the DCO.

11.6.2 It is assumed that local noise conditions would not change substantively between the survey period and the commencement of proposed works.

11.6.3 The baseline noise conditions (i.e. Do-Minimum) for the operational traffic assessment have been determined by the CRTN noise prediction model for a forecast traffic scenario of 2023. This has provided a detailed coverage of noise levels across the entire calculation area.

11.6.4 HD 213/11 states that prediction is the preferred approach for establishing the Do-Minimum baseline noise conditions, which are then directly comparable with the noise levels predicted in the same way for the Do-Something future assessment year.

11.6.5 Figure 11.1 shows the locations of the noise receptors (dwellings and other noise sensitive properties) and their proximity to the existing A30 and the surrounding roads. The predicted traffic noise level contours for the baseline year (i.e. Do-Minimum 2023 for the noise assessment) are also shown so the relative baseline noise exposures of the different sensitive receptors can be seen. Noise Important Areas (NIA) are shown to identify dwellings in areas of relatively high noise exposure recognised by Defra.

11.6.6 The following sections summarise the sensitive receptor locations across the scheme area, the locations are described using the chainage references for the scheme alignment. Figure 11.1 shows the location of dwellings and other buildings within the study area. The following sections should be read with reference to Figure 11.1.

Chainage: east of 0+000.000 – 4+000.000

11.6.7 Approximately 300m south of Chiverton Cross junction, there is a dwelling (Burra Burra Farm) approximately 40m from the A30 on the eastern side at chainage 0+400.000. Approximately 300m west of this location is the Trevarth Holiday Park with Chiverton Caravan and Touring Park immediately to the north. Around the existing junction itself, there are dwellings within 100m of the junction, e.g Burrow Farm to the north, and Highfield to the south (Highfield is within NIA 3254). Around chainage 0+700.000, where the proposed new Chiverton Junction would be located just north of the existing alignment, there are a small number of isolated dwellings within 200m of the existing A30 (e.g. The Stables, The Barn). The Church of St Peter and Mithian Church Hall are just to the west of these properties.

11.6.8 Moving northeast (chainage 1+400.000), Holly Tree Cottage is located approximately 500m northwest of the A30 with other dwellings nearby (Silverdene). Approximately the same distance away from the A30 on the south side is Lands Vue House (dwelling). Closer to the A30 at 1+500.000, just south of the proposed new Chiverton Junction, is a single dwelling (Roscarnick Farm House).

11.6.9 Further northeast there is a group of dwellings between 400 - 600m from the A30 (e.g. Poltaire, Littledown, Burleigh Croft). Fourburrow Farm House, at about chainage 2+250.000, is directly alongside the A30 on the north side (within NIA 13097). Moving northeast, Pendale Farm and a small group of other dwellings are situated about 500m from the A30. At chainage 4+000.000 where the B3284 joins the A30 there is a dwelling (Callestick Vean Bungalow) approximately 80m from the A30 on the north side.

Chainage: 4+000.000 – 7+500.000

11.6.10 North of the proposed Chybucca grade separated junction is Creegmeor Farm approximately 250m from the A30. Hillview Farm (chainage 5+000.000) is located approximately 350m south of the A30 along the B3284. The scheme would be aligned closer to this dwelling at about 250m distance.

11.6.11 Further northeast at chainage 5+500.500 there is a group of dwellings which are approximately 600m south of the A30 (e.g. Rosedale and Fenton Cottage), the scheme alignment would be about 100m closer here. North of the A30 at about the same chainage are a group of dwellings setback from the A30 within the range 15-150m, the closest being (Lower Tresawen). The scheme alignment would be about 100m further away from these properties than the existing A30.

11.6.12 Nanteague Farm is situated approximately 250m on the south side of the A30 at chainage 6+250.000; the scheme alignment would be about 100m closer here.

11.6.13 Moving northeast to chainage 7+000.000, a number of dwellings around the Marazanvose Farm group of dwellings are located close to, or directly alongside the A30 (within NIA 3291). Elmsleigh is the closest of these to the A30 on the

north side. Just beyond chainage 7+250.000 on the south side is the NFH group of properties, the closest dwelling here (The Villa) being about 100m from the A30. The wedding venue associated with the farm is about 200m from the A30.

Chainage: 7+500.000 – 11+000.000

11.6.14 At chainage 8+000.000 there are two isolated dwellings approximately 100m to the north of the A30 (Merton Lodge, St Freda); Hill House is 30m to the south of the A30 here. Around chainage 8+500.000 about 100m north of the A30 are a group of six dwellings at Zelah Lane Farm. Tolgroggan Farm is 500m southeast of the A30 at about the same chainage.

11.6.15 Moving northeast towards to the village of Zelah, the closest dwellings on the northwest side of the A30 are approximately 100m from the road. Beyond Zelah, Henver Cottage on Henver Lane is about 10m from the A30 (within NIA 3292). There are also three other dwellings on Henver Lane within about 125m of the A30; the proposed alignment would move further from these properties here. Trevalso Farm is approximately 150m southwest of the A30 here at chainage 9+500.500.

11.6.16 At chainage 10+500.500, Mount Pleasant Farm is 25m northwest of the A30 with Tregorland directly alongside the road on the opposite side (Tregorland and Zelah Hill Cottage are within NIA 3293 here).

11.6.17 Further east, Penny-Come-Quick (dwelling) at chainage 11+000.000 is located about 15m south of the A30. The proposed A30 alignment would be about 200m south of the current position to the south of this property. Honeycombe Farm is located about 350m south of the existing A30 at this same chainage and would therefore be close to the proposed realignment.

Chainage: 11+000.000 – 14+000.000

11.6.18 Just beyond chainage 11+000.000 Penglaze (dwelling) is located about 150m north of the A30.

11.6.19 Further east at chainage 12+000.000, Treworrian Manor is located 60m to the north of the A30. A little further on, also on the north side, Racland House and Fourwinds (within NIA 3294) are 30m from the road. Directly south of this position, Ennis Farm is 600m south of the A30.

11.6.20 At chainage 12+500.500, Higher Ennis Farm is located 400m to the south of the A30. The proposed alignment would be approximately 100m south of the existing A30 here, and hence closer to this property.

11.6.21 At chainage 13+500.000, Carland Cross Cottages and Rosehill Farm are 75m and 125m respectively to the south of the existing A30.

11.7 Consultation

11.7.1 Cornwall Council has been consulted to agree the methodology and survey locations. The Planning Inspectorate were consulted during the scoping stage and provided an opinion. These responses have been considered and included, where appropriate, in this chapter.

11.8 Assessment Assumptions and Limitations

Construction

11.8.1 Detailed construction information was not available at the time of the construction noise and vibration assessment. Appropriate assumptions have been made as to the type and number of construction plant and the intensity and duration of the construction processes for this PEIR. These data have been taken from similar highway construction works where construction method data was available. The assumptions are shown in Appendix 11.4 and are considered suitable to represent the types works and associated impacts for this scheme assessment.

11.8.2 It is likely that a number of short term activities would be required to be undertaken during extended working hours and sometimes at night. These primarily relate to works to, or on existing transport corridors (such as safety-critical aspects of bridge works) in order to reduce the impact on existing roads. From the information available at the time of the assessment, the potential for effects from these activities would be limited given the short duration of such works.

11.8.3 It is assumed that traffic will not be diverted away from the existing A30 highway boundaries onto other roads during the construction works. It is also assumed that construction traffic will generally only access the works via the existing A30 or other major roads, rather than minor roads around the scheme. Hence, given the available information at this PEIR stage, it is assumed construction traffic noise impacts would be negligible relative to existing traffic on the A30 and surrounding major roads. When further construction methodology details are available, this will be reviewed for the ES.

Operation

11.8.4 Road traffic flows and speeds used in the assessment were provided by the project traffic engineers for all of the scenarios listed in Paragraph 11.5.21.

11.8.5 Low noise surface would be laid on all new and altered roads in the scheme. It is assumed that, in the absence of the scheme, all sections of the existing A30 in the study area would be surfaced with low noise surface by the Do-Minimum future year (2038). Landscape earthworks proposed for the scheme to reduce visual and landscape impact (refer to Chapter 7) are assumed as an integrated part of the permanent scheme. These features would reduce wayside noise.

11.8.6 It is assumed that noise insulation would be offered where future noise levels exceed the noise level trigger value of 68dB$L_{pA10,18hr}$ (façade noise level) and the other requirements referred to in the Noise Insulation Regulations 1975 (as amended) (NIR). Confirmation of qualification for noise insulation would be made by the responsible authority before the scheme comes into operation, based on built information in accordance with the NIR.

Assessment and Baseline Gaps

11.8.7 The assessment of construction noise and vibration effects has been based on the typical construction stages and processes for a highway scheme. Where necessary, assumptions have been made with the advice of the scheme design engineers regarding aspects of the construction process. When scheme contractors have developed a full construction method statement, more detailed

information on programme and processes will be available. However, the current construction method assumptions are considered to be representative of the type and intensity of the works, and are suitable for this PEIR.

11.8.8 At the point of producing this PEIR, it was not possible to complete the baseline noise survey to include the data in this assessment. When the data is available, it will be used to provide indicative information to validate the predicted results which will be presented in the ES accompanying the DCO. As noted in Paragraph 11.6.4, HD 213/11 states that the preferred approach for establishing baseline noise conditions is to use predicted data across the calculation area, hence it has been possible to carry out the operational assessment in the absence of the survey data at this assessment stage. Similarly, the baseline noise level at receptors where construction noise has been predicted has been taken from the baseline traffic noise prediction data.

11.8.9 DMRB HD 213/11 requires consideration of potential noise impacts on existing roads outside the study area, where traffic increases are forecast to be greater than 25% in the short-term. These are described as 'affected' links. This assessment will be carried as part of the ES but has not been included in this PEIR.

11.8.10 The effects of noise and vibration on ecological receptors have not been included in this PEIR, but will be considered as part of the ES. This is a requirement of the NN NPS.

11.9 Design, Mitigation and Enhancement Measures

Construction Mitigation

11.9.1 The construction noise and vibration assessment assumes that the works would be undertaken following the principles and processes set out in the Outline Environmental Management Plan (EMP) to be provided with the ES.

11.9.2 Best Practicable Means (BPM) is assumed as incorporated mitigation to control construction noise in the form of low noise emission plant and processes (as specified in BS 5228 Annex B - Noise sources, remedies and their effectiveness).

11.9.3 BPM would include noise and vibration control at source - for example:

- the selection of quiet and low vibration equipment, review of construction programme and methodology to consider quieter methods (including non-vibratory compaction plant, where required), location of equipment on site, control of working hours[26] (to be set out in the OEMP), the provision of acoustic enclosures and the use of less intrusive alarms, such as broadband vehicle reversing warnings; and
- screening - for example local screening of equipment, perimeter hoarding or the use of temporary stockpiles.

11.9.4 If situations arise where despite the implementation of BPM, the noise exposure exceeds the criteria defined in the Outline Environmental Management Plan (EMP), the main contractors may offer:

[26] With regard to previously referenced Cornwall Council Guidance Note: Noise and Dust Control on Construction and Demolition Sites

- noise insulation; or ultimately
- temporary re-housing.

11.9.5 As set out in section 11.10 of this chapter, further mitigation could be detailed as required in the local environmental management plans following dialogue with local authorities. Cornwall Council have recommended a Section 61 (of the Control of Pollution Act 1974) application to agree appropriate controls and protocols.

Operation Mitigation

11.9.6 To avoid significant observed adverse effects from the scheme, minimise as far as sustainable other likely significant adverse effects from the scheme and reduce existing and future significant observed adverse effects, the incorporated noise mitigation described in Table 11-10 is envisaged. This has been integrated into the landscape and visual mitigation design. Equivalent or enhanced mitigation would be developed during detailed design of the scheme. As noted, a low noise surface would be also incorporated as part of the scheme.

11.9.7 To ensure that additional mitigation is practicable and sustainable, the provision has been subject to the following tests:

- consideration of noise benefit compared to cost of the mitigation;
- engineering practicability;
- other environmental effects potentially caused by the mitigation (for example landscape or visual effects); and
- stakeholder engagement and consultation responses.

Table 11-10: Envisaged noise mitigation measures* for operation of the scheme

Location (See Figure 11.4)	Indicative chainage	Indicative barrier length (m)	Total barrier height (m)	Description
Marazanvose / NFH area	6+850.000 to 7+400.000	550	2.5	1.8m Cornish Hedge on 0.7m bund

* In addition, a low noise surface would be also incorporated as part of the scheme.

11.10 Assessment of Effects

11.10.1 The assessment approach for construction and operation considers a range of receptors and effects as descried in Table 11-1. The following assessment sections are divided as follows:

- Residential receptors: direct and indirect effects exceeding the SOAEL – individual dwellings;
- Residential receptors: direct and indirect effects between the LOAEL and SOAEL – communities;
- Non-residential receptors: direct and indirect effects.

11.10.2 Additional detail on the assessment methodologies for each of these types of receptor is described in Appendix 11.3.

Construction Effects

Noise

11.10.3 For the purposes of assessment, the principle construction activities have been considered and divided into the following five phases associated with the overall work:

- site clearance and site enabling works;
- earthworks;
- structures;
- drainage; and
- surfacing.

11.10.4 These represent distinct activities with potentially different levels of noise impact. Appendix 11.4 describes the plant machinery assumed for the assessment.

11.10.5 Table 11-11 identifies the daytime potential significance thresholds respectively based on the BS5228 ABC method as described in Paragraph 11.5.34. The baseline traffic noise prediction model has been used to estimate the ambient noise levels at each receptor location. The appropriate ABC method assessment category for each location has been determined from the predicted ambient noise level at the façade (taken from the baseline noise level prediction for 2023).

11.10.6 The table also presents predicted monthly construction noise levels at each receptor (see Figure 11.1 for receptor locations for the construction assessment). These have been predicted using the methodology described in Paragraph 11.5.2. Where the cell is highlighted, the ABC potential significance threshold is exceeded. Where the highest predicted value exceeds the SOAEL of 75dBL$_{pAeq,daytime}$ for construction noise (Table 11-2), this is indicated with bold font.

Table 11-11: Daytime Construction Noise Assessment at Residential Locations

Location (see Figure 11.1)	ABC method threshold (day) (BS 5228)	Range of predicted monthly daytime construction noise levels* dBL$_{Aeq, day}$
C1 Highfield	75	47-**76**
C2 The Stables	65	48-66
C3 The Gatehouse	70	49-68
C4 Roscarnick Farm	70	59-**76**
C5 Holly Tree Cottage	65	44-61
C6 Callestick Vean Bungalow	70	44-71
C7 Hillview Farm	65	43-60
C8 Nanteague Farm	65	47-64
C9 Elmsleigh	75	63-**78**
C10 NFH Villa	65	56-71
C11 Zelah Lane Farm	65	49-68
C12 2 Church Lane	65	48-66
C13 Henver Lane Cottage	70	66-**82**
C14 2 Tregorland	70	51-68
C15 Pennycomequick	70	61-**76**

Location (see Figure 11.1)	ABC method threshold (day) (BS 5228)	Range of predicted monthly daytime construction noise levels* $dBL_{Aeq, day}$
C16 Honeycombe Barn	65	62-**80**
C17 Raglan House	75	52-68
C18 1 Carland Cross Cottages	70	56-70

* Noise level includes correction for façade acoustic reflection (i.e. noise level at 1m from façade). Where the cell is highlighted, the ABC potential significance threshold is exceeded. Where the highest predicted value exceeds the SOAEL of 75$dBL_{pAeq,daytime}$, this is indicated with bold font.

Residential receptors: direct effects exceeding the SOAEL – individual dwellings

11.10.7 The SOAEL of 75 $dBL_{pAeq,daytime}$ is exceeded in some months at the following construction assessment receptors. Nearby receptors which are expected to experience similar noise levels to the assessment receptors are shown in parentheses. These are assessed as **temporary significant** effects above the SOAEL.

- C1 Highfield (also The Annex and Burrow Farm);
- C4 Roscarnick Farm;
- C9 Elmsleigh (also Barn Wyn, Treffry Cottage, 1 The Cottages, Ranger Barn);
- C13 Henver Lane Cottage (also Henver Cottage);
- C15 Pennycomequick; and
- C16 Honeycombe Barn (also Honeycombe House and residential Caravan).

11.10.8 The phases resulting in the highest noise levels are generally structures and/or earthworks. The activities associated with the structures phase will take place only in particular parts of the scheme and so affect only some of the receptors. It is assumed all other activities take place across the length of the scheme.

11.10.9 The greatest exceedance of the SOAEL is at receptor C13 Henver Lane Cottage some 25m from the centre of works. The predicted noise levels are representative of those at a further residence (Henver Cottage) located at a similar distance from the works. At these properties, all phases except for the site clearance are predicted to result in noise levels above the SOAEL.

11.10.10 The next greatest exceedance of the SOAEL is at receptor C16 Honeycombe Barn/House. This is due to it being in close proximity to the construction works (25m typical worse-case). The phases predicted to result in the noise levels exceeding the SOAEL are earthworks, drainage and surfacing. Exceedances at other receptors are predicted to be between 75 and 80$dBL_{Aeq, day}$.

11.10.11 The provision of noise insulation, that includes additional ventilation as needed to enable windows to be kept closed, would avoid temporary significant observed adverse effects due to noise inside the dwellings that would otherwise occur. Specific mitigation, including eligibility for noise insulation, would be included, where relevant, in the Outline EMP.

Residential receptors: direct effects between LOAEL and SOAEL – communities

11.10.12 In locations with lower existing noise levels (between the LOAEL and SOAEL), construction noise effects are likely to be caused by changes to noise levels outside dwellings. These may be considered by the local community as an effect

on the acoustic character of the area and hence be perceived as a change in the quality of life.

11.10.13 With regard to noise outside dwellings, the assessment of temporary effects takes account of construction noise relative to existing noise levels.

11.10.14 Receptor C10 NFH Villa is predicted to result in a noise level up to 6dB(A) above the ABC threshold for potential significant effects. This receptor is some 80m from the centre of works. The main dwelling at the NFH properties, which is some 150m from the centre of works, is predicted to be subject to noise levels typically 4dB(A) less than those predicted at NFH Villa and so, in some months, is also predicted to result in a noise level above the ABC threshold for potential significant effects[27]. Based on this result and the additional assessment criteria described in Appendix 11.3, such as the magnitude and duration of impact, the likely effects are assessed as **temporary significant** at this location.

11.10.15 Receptor C11 Zelah Lane Farm is predicted to result in a noise level up to 3dB(A) above the ABC threshold for potential significant effects. It is anticipated noise levels up to this level would also be experienced at the following residential receptors: Zelah Lane Farm Annexe, Trolgroggan Bungal, Chapel Cottage, The Nook Zelah Lane and The Chapel which are a similar distance from the works. Due to the number of dwellings in this community which are affected at this level of impact, the likely effects are assessed as **temporary significant**.

11.10.16 Receptors C2 The Stables, C12 2 Church Lane and some of the nearby properties to these are predicted to experience up to a 1dB(A) exceedance of the ABC criteria due to some of the phases. Due to the numbers of dwellings in these communities which are affected, the likely effects are assessed as **temporary significant**.

11.10.17 C6 Callestick Vean Bungalow is also predicted to result in up to a 1dB(A) exceedance of the ABC criteria due to some of the phases however as it is a single property in the affected area, the likely effects are assessed as not significant in this area on community basis.

11.10.18 Specific mitigation would be included, where needed, in the Outline EMP.

11.10.19 The ABC threshold is also exceeded in some months at other construction assessment receptors which have been discussed and assessed in the previous section (individual dwellings where the SOAEL is predicted to be exceeded).

Residential receptors: indirect effects

11.10.20 There are no indirect effects associated with the construction activities.

Non-residential receptors: direct effects

11.10.21 Mithian Church Hall is a community facility located some 100m from the works and is anticipated to experience similar noise levels to C3 The Gatehouse. Assuming a 10-15dB(A) reduction for a partially open window the range of predicted monthly construction noise levels inside would be 34-58dB$L_{Aeq,\ day}$. The highest of these internal noise levels assumes the lowest attenuation value for a partially open window. This would, therefore, in some months, exceed the BS8233 guidance upper limit of 35dB$L_{Aeq,T}$ for places of worship which is also

[27] The noise effects on the wedding venue are discussed in the non-residential effects section below.

considered to be applicable to this hall. The baseline indicates an existing ambient noise level of 58dB$L_{Aeq,day}$ outside which would result in noise levels inside exceeding the BS8233 guidance limit assuming the same loss for a partially open window. However, given the impact level of the construction works, the likely effects at this receptor are assessed as **temporary significant.**

11.10.22 The Church of St Peter is located some 160m from the works and is predicted to experience monthly construction noise levels of 47-65dB$L_{Aeq, day}$ at the façade. Assuming a 10-15dB(A) reduction for a partially open window the range of predicted monthly construction noise levels inside would be 32-55dB$L_{Aeq,day}$. This would, therefore, in some months, exceed the BS8233 guidance upper limit of 35dB$L_{Aeq,T}$ for places of worship. The baseline indicates an existing ambient noise level of 52dB$L_{Aeq,day}$ outside, which would result in noise levels inside exceeding the BS8233 guidance limit assuming the same loss for a partially open window. However, given the impact level of the construction works, the likely effects at this receptor are assessed as **temporary significant**.

11.10.23 The NFH wedding venue is some 180m from the proposed works and includes several barns and an outside space. The predicted monthly construction noise level is 50-66dB$L_{Aeq,day}$. Therefore, during some of the months it is predicted the noise level will exceed the BS8223 guideline range of 50-55dB$L_{Aeq,T}$ for external amenity space. Assuming a 10-15dB(A) reduction for the façade of one of the barns, the range of predicted monthly construction noise levels inside would be 35-56dB$L_{Aeq,day}$. This would, in some months, exceed the BS8233 guidance upper limit of 40dB$L_{Aeq,T}$ for a use as a ballroom/banqueting hall. The baseline noise predictions indicate an existing ambient noise level of 48dB$L_{Aeq,day}$ outside which is anticipated to meet the BS8233 guidance limits for restaurants (internal) and for an external amenity space. The likely effects of noise from the construction works reaching the barn and external wedding venue areas, is assessed as **temporary significant**.

11.10.24 Trevarth Holiday Park is some 350m from the works at the nearest point. The predicted monthly construction noise level is 41-58dB$L_{Aeq, day}$. Therefore during some of the months it is predicted the noise level will exceed the BS8223 guideline range of 50-55dB$L_{Aeq,T}$ for external amenity space. The baseline indicates an existing ambient noise level of 54dB$L_{Aeq,day}$ which would meet the upper BS8233 limit. The likely effects at this receptor are assessed as **temporary significant**.

Non-residential receptors: indirect effects

11.10.25 There are no indirect effects associated with the construction activities.

Vibration

11.10.26 It is likely that vibratory rollers would be used for the earthworks and surfacing. Vibration could affect residential receptors that are in close proximity to the boundary of the works, although this would be for a short duration at this closest position. It is estimated that there is the potential for significant effects from vibratory compaction at properties within approximately 30m of the works boundary, i.e. the following assessment locations:

- C1 Highfield;
- C6 Callestick Vean Bungalow;
- C16 Honeycombe Barn;

- C4 Roscarnick Farm;
- C9 Elmsleigh;
- C11 Zelah Lane Farm; and
- C13 Henver Lane Cottage.

11.10.27 The latter four of these receptor locations are also near to piling works associated with the structures phase, although a rotary bored piling has been assumed rather than a percussive method.

11.10.28 The vibration levels at these receptors will be assessed by the contractor when more detailed information is available, and if any are found to exceed the limits set in Table 11-4 or Table 11-5, then these would be controlled accordingly. Alternative methods (i.e. a static drum roller instead of a vibratory roller) and/or vibration monitoring would be undertaken.

11.10.29 With suitable controls of impacts where vibration impacts are identified at sensitive receptors close to the construction works boundary, vibration effects are assessed as not significant. Control measures will be developed in the Outline Environmental Management Plan OEMP to be provided with the final Environmental Statement.

Operation Effects

11.10.30 Daytime and night-time traffic noise levels within the study area have been predicted and are assessed in terms of:

- Government Policy (for individual dwellings potentially exceeding the SOAEL); and
- Environmental Impact Assessment significance (for communities between the LOAEL and SOAEL).

11.10.31 Figures 11.2 and 11.3 show the long term noise level contours and the noise difference contours (i.e. the changes in noise) resulting from the operational scheme in 2038. Those specific receptors where a noise effect has been identified in the following assessment for the operation of the scheme in 2038 are highlighted on Figure 11.4. These are coloured according to the magnitude of impact scale shown in Table 11-7 and Table 11-8, as shown in the key to the figure. Appendices 11.5.2 to 11.5.4 provide tabulated noise levels results and indicate associated impacts.

11.10.32 The assessment results are described in the following sections and these are supported by the figures and tables described above. The effects are reported separately for each of the four scheme sections, west to east, as previously described under baseline conditions (Section 11.6), i.e.:

- Chainage: west of 0+000.000 - 4+000.000;
- Chainage: 4+000.000 – 7+500.000;
- Chainage: 7+500.000 – 11+000.000;
- Chainage: 11+000.000 – east of 14+000.000.

Chainage: west of 0+000.000 – 4+000.000:

11.10.33 On this section, the scheme alignment would be to the north of the existing A30 until it reaches the B3284 where it would rejoin the existing alignment. As shown in Figure 11.3 (noise change map), this would result in noise increases around the proposed new Chiverton Junction, affecting dwellings in this area (e.g. Silverdene) and those further to the northeast (e.g. Callestick Vean properties).

11.10.34 However, the reduced traffic on the existing A30 would result in noise reductions to the south of the scheme on this section (e.g. Roscarnick Farm and Fourburrow Farm, the latter is currently in a Noise Important Area). Although there would be no change in alignment around the existing Chiverton Junction, the low noise road surface would result in some noise reductions at Three Burrows. Again, these noise reductions are shown in Figure 11.3.

11.10.35 It should be noted that reductions due solely to the low noise road surface would occur in the absence of the scheme as it is assumed that the existing A30 would be resurfaced with low noise surface by 2038 in any case.

*Residential receptors: **direct** effects exceeding the SOAEL – individual dwellings*

11.10.36 The avoidance and mitigation measures integrated into the scheme would minimise the direct adverse effects on the majority of receptors. The mitigation incorporated for the assessment reported in this PEIR assumes measures where they are practicable and hence sustainable in terms of providing a clear noise benefit to affected communities.

11.10.37 There are no dwellings on this section of the scheme predicted to experience direct effects from increased noise levels higher than the relevant significant observed adverse levels (SOAEL as described in Table 11-1 and criteria defined in Table 11-6). This refers to a direct effect where there is at least a 1dB impact as a result of the scheme in the future year (2038), rather than effects from non-scheme roads.

11.10.38 The noise level information (Appendix 11.5.1) shows that 14 dwellings would already exceed the SOAEL in the absence of the scheme (as well as with the scheme), and some of these receptors are already in Noise Important Areas. For these dwellings there is negligible noise change, hence no direct adverse or beneficial effect.

11.10.39 As noted, there are locations where the noise levels would reduce as a result of the scheme (as shown in the noise difference contours – Figure 11.3). For one dwelling on this section of the scheme (Four Burrows Farm House within NIA 13097), noise levels would reduce such that the noise exposure would fall below the SOAEL with the scheme in operation. This large reduction (major beneficial impact) is assessed as a direct **significant beneficial** effect.

*Residential receptors: **indirect** effects exceeding the SOAEL – individual dwellings*

11.10.40 Twelve dwellings on this section of the scheme are predicted to be subject to indirect noise increases (minor impacts) resulting in noise levels higher than the relevant significant observed adverse levels. These are indirect **significant observed adverse** effects in terms of government noise policy. These would occur mainly around the Blackwater area, where there is at least a 1dB impact as

a result of traffic noise changes on non-scheme roads. These dwellings are included in the highlighted properties on the noise impact map (Figure 11.4).

11.10.41 There are locations where the noise levels would reduce as a result of the scheme. For nine dwellings, the reductions are large enough to be assessed as **significant beneficial** indirect effects although still remaining above the SOAEL, as highlighted in Figure 11.4.

*Residential receptors: **direct** effects between LOAEL and SOAEL – communities*

11.10.42 Figure 11.4 shows the long term 40dB night-time noise level contour from the operation of the scheme in 2038. The extent of the 40dB night-time noise level contour is larger than, the 50dB daytime contour. In general, below these levels, adverse effects are not expected (refer to LOAEL description in Table 11-1 and thresholds in Table 11-6).

11.10.43 Above 40dB during the night and 50dB during the day, the effect of noise is dependent on the baseline noise levels in that area in 2023 (Do-Minimum) and the change in noise level (magnitude of impact) brought about by the scheme by the future assessment year of 2038 (Do-Something). The noise impacts and effects predicted for the operation of the scheme are shown on Figure 11.4.

11.10.44 Northwest of the proposed new Chiverton Junction, dwellings closest to the scheme around chainage 1+600.000 would be subject to moderate adverse direct effects, these impacts are indicated on Figure 11.4. These effects are likely to be considered by the local community as an effect on the acoustic character of the area such that there is a perceived change in the quality of life. Considering the impact on the noise amenity outside the dwellings, the number of impacts and the grouping of impacts, and the current baseline noise levels, overall this is considered to be a likely **significant adverse** effect, in EIA terms. Given the noise contributions from multiple lanes of traffic that comprise the proposed grade separated junction, it is not considered practicable or sustainable to provide sufficient roadside screening alongside each lane of the junction to mitigate the impacts at this location.

11.10.45 Further from the scheme (approximately 250m), again on the northwest side of the proposed junction, there are other small groups of properties around chainages 1+500.000 and 2+000.000 that would be subject to moderate adverse direct effects. Just beyond chainage 2+000.000, approximately 400m northwest of the proposed junction a group of dwellings would be subject to minor adverse direct effects. Considering the impact on the noise amenity outside the dwellings, the number of dwellings impacted and the grouping of impacts, and the current baseline noise levels, this is considered to be a likely **significant adverse** effect on these communities. As noted above, it is not considered practicable to mitigate the noise impacts alongside the junction, especially at these large distances from the scheme.

11.10.46 Moving northeast to chainage 4+000.000, a dwelling (Callestick Bungalow) would be near to the scheme and subject to a noise increase just under 3dB. This single dwelling would be subject to a change less than the minor adverse effect threshold (hence not potentially significant), but it also does not represent a community of dwellings which is part of the criteria for a likely significant effect at noise exposures between LOAEL and SOAEL.

11.10.47 To the southeast of the scheme on this section, there are two individual dwellings near to the existing A30 that would be subject to large noise decreases of 5-10dB or more (i.e. Roscarnick Farm and Four Burrows Farm House). Four Burrows Farm House is within NIA 13097 and was also noted above as falling below the SOAEL as a result of the noise reduction. These noise reductions would be moderate or major beneficial impacts respectively. However, considering the small number of beneficial impacts at these individual properties, this is not assessed as a likely significant beneficial effect.

*Residential receptors: **indirect** effects between LOAEL and SOAEL – communities*

11.10.48 On this section of the scheme there are no dwellings identified as being subject to adverse or beneficial indirect noise effect, as a result of any change in road traffic noise associated with non-scheme roads.

*Non-residential sensitive receptors: **direct** effects*

11.10.49 Around chainage 0+700.000, near the proposed new Chiverton Junction, the Church of St Peter and Mithian Church Hall approximately 200m west of the scheme would be subject to small noise increases less than 3dB, and would not meet the criteria in Table 11-9 for a potential significant effect.

*Non-residential sensitive receptors: **indirect** effects*

11.10.50 The Trevarth Holiday Park approximately 300m west 0+400.000 would generally be subject to small increases in noise of less than 1dB. Chiverton Caravan and Touring Park immediately to the north of Trevarth Holiday Park, would be subject to increases of 3-5dB due to indirect noise impacts from the lane on its western boundary. However, as a proportion of the whole site, this represents a relatively small impacted area. For both sites, these caravans are not permanent residential properties, and hence non-residential receptors. This is not assessed as a significant effect in this area.

Noise Important Areas

11.10.51 Four Burrows Farm House is within NIA 13097. As noted above, a noise reduction of over 10dB is predicted at this location.

Chainage: 4+000.000 – 7+500.000:

11.10.52 At the western end of this assessment section around chainage 4+700.000, the scheme would include the Chybucca grade separated junction connecting the scheme to the existing A30 on the north side, and the B3284 to the south. The scheme would then continue on the south side of the existing A30 to the end of this section.

11.10.53 As shown in Figure 11.3 (noise change map), this would result in noise increases south of the scheme, and noise decreases north of the existing A30 around communities at Little Tresawen and Marazanvose. The noise reductions at Marazanvose would occur within NIA 3291.

*Residential receptors: **direct** effects exceeding the SOAEL – individual dwellings*

11.10.54 The avoidance and mitigation measures integrated into the scheme, including those described around the Marazanvose / NFH area (Table 11-10), would minimise the direct adverse effects on the majority of receptors. There are no dwellings on this section of the scheme predicted to experience direct effects from increased noise levels higher than the relevant significant observed adverse levels. This refers to a direct effect where there is at least a 1dB impact as a result of the scheme, rather than effects from non-scheme roads.

11.10.55 As noted, there are locations where the noise levels would reduce as a result of the scheme (as shown in the noise difference contours – Figure 11.3). In some cases (three dwellings, including NIA 3291 at Marazanvose), the reductions are large enough to be assessed as minor or moderate beneficial impacts, as highlighted in Figure 11.4 (**significant beneficial** effects). For one dwelling on this section of the scheme (Lower Tresawen), noise levels would reduce such that dwellings that were above the SOAEL would be below the SOAEL with the scheme in operation, i.e. major beneficial impact in this case (**significant beneficial** effect).

*Residential receptors: **indirect** effects exceeding the SOAEL – individual dwellings*

11.10.56 There are five dwellings on this section of the scheme predicted to be subject to indirect noise increases (minor impacts) resulting in noise levels higher than the relevant significant observed adverse levels. These impacts are predicted alongside the B3284, just east of the existing A30. These are indirect **significant observed adverse** effects where there is at least a 1dB impact as a result of traffic noise changes on non-scheme roads.

*Residential receptors: **direct** effects between LOAEL and SOAEL – communities*

11.10.57 There is one dwelling on this section of the scheme subject to an adverse direct effect (minor impact) between the LOAEL and SOAEL (Nanteague Farm). This location does not represent a community of dwellings, hence this is not assessed as a significant effect on this area.

*Residential receptors: **indirect** effects between LOAEL and SOAEL – communities*

11.10.58 On this section of the scheme there are six dwellings identified as being subject to adverse indirect noise effects (minor or moderate impacts), as a result of the increase in road traffic noise around Allet Common on the lane between the A30 (around chainage 6+000.000) and the B3284. Considering the degree of impact, the number of affected dwellings and the current baseline noise levels, this is considered to be an indirect likely **significant adverse** effect on the community in this area.

*Non-residential sensitive receptors: **direct** effects*

11.10.59 There are no non-residential noise sensitive receptors assessed as subject to adverse or beneficial direct effects on this section of the scheme. The mitigated noise level increases are predicted to be approximately 2dB at the area of the NFH wedding venue (and about 1dB at the NFH dwellings). This is a relatively small level of impact that would not meet the increase criterion for a potentially significant effect for a non-residential receptor (Table 11-9). The baseline noise

prediction indicates an existing ambient noise level of 48dB$L_{Aeq,day}$ outside (at ground floor height). The BS8223 guideline range for external amenity spaces is 50-55dB$L_{Aeq,T}$. The operational noise level with the scheme would remain at the lower end of this range assuming the predicted 2dB increase. Internal noise levels, assuming a partially open window (10-15dB attenuation) would meet the BS8233 guidance upper limit of 40dB$L_{Aeq,T}$ for a use as a ballroom/banqueting hall.

*Non-residential sensitive receptors: **indirect** effects*

11.10.60 On the B3284 around the Allet Common area, the Allet Methodist Church would be subject to noise increases less than 3dB and would not meet the criteria in Table 11-9 for a potential significant effect. Similarly, the Summer Valley Touring Park further south off the B3284 would not meet the criteria for a potential significant effect.

Noise Important Areas

11.10.61 Marazanvose Farm group of dwellings are located close to, or directly alongside the A30 (within NIA 3291). Noise reductions of between 3 to 5dB are predicted at this location.

Chainage: 7+500.000 – 11+000.000:

11.10.62 East of NFH, the scheme re-aligns with the existing A30 until chainage 8+500.000 where the scheme diverges to the southeast, further away from the community of Zelah. Further east, around chainage 10+000.000, the scheme diverges further southeast, up to approximately 200m from the existing A30.

11.10.63 As shown in Figure 11.3 (noise change map), this would result in noise increases southeast of the scheme, although there are generally fewer properties close to the A30 on this side of the highway. There would also be noise decreases north of the existing A30, for example at Henver Cottage within NIA 3292, and Tregorland and Zelah Hill Cottage within NIA 3293.

*Residential receptors: **direct** effects exceeding the SOAEL – individual dwellings*

11.10.64 The avoidance and mitigation measures integrated into the scheme would minimise the direct adverse effects on the majority of receptors. There are two dwellings on this section of the scheme predicted to experience direct **significant observed adverse** effects from increased noise levels higher than the relevant significant observed adverse effect level. This refers to a direct effect where there is at least a 1dB impact as a result of the scheme. These are Hill House around chainage 8+300.000, and Trevalso Cottage around chainage 9+600.000 (moderate and major impacts). The properties would be potentially eligible for noise insulation under the Noise Insulation Regulations (NIR) 1975 (as amended), which would avoid the significant observed adverse effects. However, there are differences in the method of assessment for HD 213/11 used in this assessment and NIR, and hence this will need to be confirmed within six months of the scheme opening to traffic via a dedicated NIR assessment (this is also discussed in Paragraph 11.8.6).

11.10.65 The noise level information (Appendix 11.5.1) shows that two dwellings would already exceed the SOAEL, in the absence of the scheme (as well as with the scheme). For these dwellings there is negligible noise change, hence no direct adverse or beneficial effect.

11.10.66 As noted, there are locations where the noise levels would reduce as a result of the scheme (as shown in the noise difference contours – Figure 11.3). In the case of Zelah Hill Cottage, the reductions are large enough to be assessed as a major beneficial impact (**significant beneficial** effect), as highlighted in Figure 11.4. For four dwellings on this section of the scheme, noise levels would reduce (major impact) such that dwellings that were above the SOAEL would be below the SOAEL with the scheme in operation, i.e. **significant beneficial** effects.

*Residential receptors: **indirect** effects exceeding the SOAEL – individual dwellings*

11.10.67 There are no dwellings on this section of the scheme predicted to be subject to indirect noise increases resulting in noise levels higher than the relevant significant observed adverse levels.

*Residential receptors: **direct** effects between LOAEL and SOAEL – communities*

11.10.68 There are two dwellings on this section of the scheme subject to adverse direct effects between the LOAEL and SOAEL, Trevalso Farm (+9.800.00) and Honeycombe Barn (+11.000.000). These noise increases would be just over 3dB and categorized as minor adverse impacts. Considering the impact on the noise amenity outside the dwellings, and these being individual dwellings affected, these are not assessed as likely significant adverse effects in these areas.

*Residential receptors: **indirect** effects between LOAEL and SOAEL – communities*

11.10.69 On this section of the scheme there are no dwellings identified as being subject to adverse or beneficial indirect noise effect, as a result of the increase in road traffic noise associated with non-scheme roads.

*Non-residential sensitive receptors: **direct** effects*

11.10.70 Around chainage 9+300.000, the Zelah Village Hall approximately 200m west of the scheme would be subject to small noise increases less than 3dB and would not meet the criteria in Table 11-9 for a potential significant effect.

*Non-residential sensitive receptors: **indirect** effects*

11.10.71 There are no non-residential noise sensitive receptors assessed as subject to adverse or beneficial direct effects on this section of the scheme.

Noise Important Areas

11.10.72 There would be noise decreases north of the existing A30, at Henver Cottage within NIA 3292, and Tregorland and Zelah Hill Cottage within NIA 3293. The latter NIA would be subject to major beneficial impacts.

<u>Chainage: 11+000.000 – east of 14+000.000</u>

11.10.73 On this easternmost section, the scheme is aligned just south of existing A30 until chainage 13+000.000 where the scheme crosses to the north of the existing A30 to form the proposed Carland Cross grade separated junction. The scheme re-aligns further east with the existing A30 at chainage 14+000.000.

11.10.74 As shown in Figure 11.3 (noise change map), this would result in noise increases south of the scheme, although there are generally fewer properties close to the A30 on this side of the highway. There would also be noise decreases north of

the existing A30, for example at Racland House and Four Winds (within NIA 3294) which are 30m from the road. On the south side of the proposed Carland Cross grade separated junction, the scheme would be further from the dwellings here than the existing A30, resulting in noise reductions around the area of the Carland Cross Cottages.

*Residential receptors: **direct** effects exceeding the SOAEL – individual dwellings*

11.10.75 The avoidance and mitigation measures integrated into the scheme would minimise the direct adverse effects on the majority of receptors. There are no dwellings on this section of the scheme predicted to experience direct effects from increased noise levels higher than the relevant significant observed adverse effect level. This refers to a direct effect where there is at least a 1dB impact as a result of the scheme.

11.10.76 There are locations where the noise levels would reduce as a result of the scheme (as shown in the noise difference contours – Figure 11.3). At Four Winds (within NIA 3294), the reductions would result in a minor impact (**significant beneficial**), as highlighted in Figure 11.4. For five dwellings on this section of the scheme, noise levels would reduce (minor impact) such that dwellings that were above the SOAEL would be below the SOAEL with the scheme in operation, i.e. **significant beneficial** effects.

*Residential receptors: **indirect** effects exceeding the SOAEL – individual dwellings*

11.10.77 There are no dwellings on this section of the scheme predicted to be subject to indirect noise increases resulting in noise levels higher than the relevant significant observed adverse effect level. This refers to indirect effects where there is at least a 1dB impact as a result of traffic noise changes on non-scheme roads.

11.10.78 In some areas, the noise levels would reduce as a result of traffic changes in non-scheme roads. In some cases, the reductions (minor impact) are large enough to be assessed as **significant beneficial** effects. In this case these reductions would occur around the north side of the village of Mitchell.

*Residential receptors: **direct** effects between LOAEL and SOAEL – communities*

11.10.79 There are two dwellings on this section of the scheme subject to adverse direct effects (minor impact) between the LOAEL and SOAEL. Considering the impact on the noise amenity outside the dwellings, and these being individual dwellings affected, this is not assessed as likely significant adverse effect on a community in this area.

*Residential receptors: **indirect** effects between LOAEL and SOAEL – communities*

11.10.80 On this section of the scheme there is one dwelling subject to an adverse indirect impact (minor) between the LOAEL and SOAEL which is Sunnyside, some 500m south of the scheme. This is not assessed as a likely significant adverse effect.

*Non-residential sensitive receptors: **direct** effects*

11.10.81 There are no non-residential noise sensitive receptors assessed as subject to adverse or beneficial direct effects on this section of the scheme.

*Non-residential sensitive receptors: **indirect** effects*

11.10.82 There are no non-residential noise sensitive receptors assessed as subject to adverse or beneficial indirect effects on this section of the scheme.

Noise Important Areas

11.10.83 There would be noise decreases north of the existing A30 at Racland House and Four Winds (within NIA 3294).

Operational ground-borne vibration assessment

11.10.84 No operational ground-borne vibration impacts are expected. This is because, in accordance with highway construction standards, the surface of the proposed pavement alterations would be smooth with no surface irregularities, which could generate significant levels of ground-borne vibration. It is a standard requirement under the specification for new highways that the new road surfaces would be free of significant discontinuities.

11.10.85 The size of irregularities necessary to cause perceptible ground-borne vibration is only expected in 'exceptional circumstances'. It is not considered that any such exceptional circumstances would arise during operation of the scheme. For more detail on operational ground-borne vibration assessment see Appendix 11.3.

11.11 Monitoring

11.11.1 The prediction and assessment methodologies set out in section 11.5 of this chapter would be used as necessary to support the verification of the effectiveness of mitigation measures. This would be carried out as part of Highways England's Post- Opening Project Evaluation (POPE) procedures, which ensure highway schemes are built in accordance with the accepted design.

11.11.2 Where access is required onto private land for monitoring purposes, prior consultation would be undertaken with the occupier and appropriate arrangements would be made to enable the monitoring to be undertaken.

11.11.3 Highways England has a duty under Regulation 6 of the NIR to assess noise levels following the opening of the scheme to traffic. The purpose of this is to establish the buildings which previously did not qualify for an original offer of carrying out or making a grant in respect of carrying out noise insulation work, but which would have become eligible by virtue of increased traffic flow. Assessments would be carried out in accordance with the obligations set out in the NIR.

11.12 Summary

11.12.1 Construction and operational traffic noise has been assessed in terms of Government Policy (for individual dwellings potentially exceeding the SOAEL), and Environmental Impact Assessment significance (between the LOAEL and SOAEL – communities). These different types of effect are explained in Table 11-1.

Construction

11.12.2 Construction noise and vibration has been assessed from the available construction information. The assessment assumes that the works would be undertaken following the principles, controls and processes set out in the Outline

Environmental Management Plan OEMP to be provided with the final Environmental Statement.

11.12.3 The principal activities with the potential to cause noise and vibration effects are: site clearance and site enabling works, earthworks, structures, drainage, and surfacing.

11.12.4 Temporary significant construction noise effects have been assessed at six residential locations which are shown in Figure 11.1. These are direct effects above the SOAEL threshold, as described in Government Policy (see Table 11-6). These residential locations are:

- Highfield (also representative of The Annex and Burrow Farm),
- Roscarnick Farm,
- Elmsleigh (also Barn Wyn, Treffry Cottage, 1 The Cottages, Ranger Barn),
- Henver Lane Cottage (also Henver Cottage),
- Pennycomequick; and
- Honeycombe Barn (also Honeycombe House and residential Caravan).

11.12.5 The results are shown in Table 11-11.

11.12.6 For direct effects between the LOAEL and SOAEL, likely noise effects are assessed as temporary significant for construction at five residential locations. The assessment locations given below which represent these areas, are shown in Figure 11.1. These residential locations are:

- The Stables and nearby residences,
- Callestick Vean Bungalow,
- NFH Villa,
- Zelah Lane Farm, Zelah Lane Farm Annexe, Trolgroggan Bungal, Chapel Cottage, The Nook Zelah Lane and The Chapel; and
- 2 Church Lane and nearby residences.

11.12.7 The results are shown in Table 11-11.

11.12.8 Likely noise impacts are also assessed as temporary significant effects at four non-residential receptors, these are direct effects:

- Mithian Church Hall,
- The Church of St Peter,
- NFH wedding venue; and
- Trevarth Holiday Park.

11.12.9 Construction vibration effects have been assessed as not significant, subject to suitable mitigation protocols to be defined in the OEMP.

11.12.10 This construction noise and vibration assessment will be further developed for the ES. This will include more detailed construction methodology information regarding processes and programme.

Operation

11.12.11 Incorporated mitigation is envisaged (see Table 11-11) to avoid significant observed adverse effects from the scheme, and to minimise, as far as practicable (and sustainable), other likely significant adverse effects from the scheme.

11.12.12 Operational noise effects, both direct and indirect, were identified for individual dwellings in the future assessment year (2038). The effects are associated with a noise change of 1dB or more where existing noise levels exceed the SOAEL, i.e. a significant effect in Government Policy terms (see Table 11-1). Specifically, there are:

- two dwellings assessed as subject to direct adverse effects above the SOAEL;
- 17 dwellings assessed as subject to indirect adverse effects above the SOAEL. Indirect effects are those resulting from traffic noise changes on non-scheme roads.

11.12.13 It should be noted that many of the residential locations in the study area would already exceed the SOAEL in the absence of the scheme, and some of these receptors are already in Noise Important Areas. Without the scheme, 71 residential properties are predicted to be exposed to high noise levels at or above the SOAEL in the Do Minimum baseline year (2023).

11.12.14 Reductions in noise would occur in the Do-Something scenario (with scheme 2038) for those residential locations that already exceed the SOAEL in the Do-Minimum scenario (without scheme 2023). These are predicted, as follows:

- 23 dwellings are assessed with beneficial effects (with scheme 2038), although still remaining above the SOAEL;
- 11 dwellings would reduce to a level below the SOAEL (with scheme 2038) with beneficial effects.

11.12.15 There are several communities assessed as being subject to direct, likely significant adverse effects in 2038 (i.e. community effects – between the LOAEL and SOAEL, see Table 11-1). These are all to the northwest of the scheme, as follows:

- dwellings nearest to the proposed new Chiverton Junction around chainage 1+700.000;
- small groups of dwellings further from the scheme (approximately 250m) between chainages 1+500.000 and 2+000.000; and dwellings just beyond chainage 2+000.000.

11.12.16 For indirect effects, there is one community assessed as being subject to a likely significant adverse effect (around Allet Common area on the lane between the A30 and the B3284).

11.12.17 These direct and indirect noise changes are reflected in the HD 213/11 noise impact tables shown in Appendix 11.5.2, and the associated noise nuisance tables in Appendix 11.5.3.

11.12.18 For non-residential sensitive receptors, there are no direct or indirect operational effects assessed as significant.

11.12.19 The assessment indicates noise decreases at dwellings in five noise important areas. These include:

- Four Burrows Farm House (NIA 13097),
- Marazanvose Farm group of dwellings (NIA 3291),
- Henver Cottage (NIA 3292),
- Tregorland and Zelah Hill Cottage (NIA 3293); and
- Racland House and Four Winds (within NIA 3294).

11.12.20 Operational vibration effects have been assessed as not significant.

Further work

11.12.21 It has been noted in Section 11.8 that certain information was not available for the PEIR, hence there is further work that will be carried out for inclusion in the ES. This will include the results of the baseline noise measurement survey which will provide supplementary information for the baseline assessment. Where necessary, assumptions have been made with the advice of the scheme design engineers regarding aspects of the construction process.

11.12.22 When scheme contractors have developed a full construction method statement and more detailed information on programme, the assessment of construction noise and vibration will be reviewed and updated.

11.12.23 DMRB HD 213/11 requires consideration of potential noise impacts on existing roads outside the study area, where these are affected by traffic flow changes above a specified threshold. This assessment will be carried as part of the ES but has not been included in this PEIR.

11.12.24 The NN NPS requires that the effects on ecological receptors are considered and this will be included across the Ecology and Noise & Vibration Chapters of the ES.

Table 11-12 Summary Impact Table

Description of potential impact	Incorporated design, mitigation and enhancement measures	Duration of impact	Significance of potential impact
Assessment of effects due to construction			
Noise impacts due to construction works at new junctions, online improvements and offline scheme sections. Stages of work will include: • site clearance and site enabling works; • earthworks; • structures; • drainage; and • surfacing.	Works would be undertaken according to Best Practicable Means as set out in the Outline Environmental Management Plan, OEMP to be provided with the final Environmental Statement. BPM measures to include: • selection of quiet and low vibration plant equipment, • consider quieter methods (including non-vibratory compaction, where required), • location of equipment on site, • control of working hours, • provision of acoustic enclosures and the use of less intrusive vehicle alarms, • screening.	Temporary – junctions works likely to affect nearby receptors for longer periods than mainline works.	• Temporary significant construction noise effects at six residential areas above SOAEL (see Table 11-1 for definition of SOAEL). • Temporary significant for construction at five residential areas between LOAEL and SOAEL. • Temporary significant effects at four non-residential receptors. • Construction vibration effects have been assessed as not significant, subject to suitable mitigation protocols to be defined in the OEMP.
Assessment of effects due to operation			
Noise impacts due to altered or new highways; potential noise decreases in locations where new alignment will be further from noise sensitive locations.	Screening is incorporated as part of the landscape and visual mitigation design; screening height has been increased in the Marazanvose / NFH area. A low noise surface would be also incorporated as part of the scheme.	Permanent	• Two dwellings assessed as subject to direct adverse effects above the SOAEL (see Table 11-1 for definition of SOAEL). • 17 dwellings assessed as subject to indirect adverse effects above the SOAEL. • 23 dwellings are assessed with beneficial effects, although still remaining above the SOAEL. • 11 dwellings would reduce to a level below the SOAEL with beneficial effects.

Description of potential impact	Incorporated design, mitigation and enhancement measures	Duration of impact	Significance of potential impact
			• Several small communities assessed as being subject to direct, likely significant adverse effects– between the LOAEL and SOAEL to the northwest of the scheme nearest to the proposed new Chiverton Junction. • One community assessed as being subject to an indirect, likely significant adverse effect (around Allet Common area on the lane between the A30 and the B3284). • Noise decreases at dwellings in five noise important areas.

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Preliminary Environmental Information Report

Chapter 12 People and Communities

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12. People and Communities

12.1 Introduction

12.1.1 This Chapter of the PEIR provides an assessment of the potential effects of the scheme on the following topics:

- **Effects on Vehicle Travellers**, including views from the road, driver stress, and effects on bus travellers;
- **Effects on Walkers, Cyclists and Horse-riders (WCHs)**, including community severance, relief from existing severance, amenity and journey length;
- **Effects on Land and Property**, including commercial properties, agricultural land and farm holdings, development land and community land;
- **Effects on tourism and recreation facilities**, and on users and operators of these facilities; and
- **Effects on People**, including effects on employment, housing, access to services, community safety, access to green space and physical activity, and neighbourhood amenity.

12.1.2 Existing conditions have been characterised to establish the baseline against which likely significant effects from both the construction and operational phases of the scheme have been assessed.

12.1.3 The assessment has been undertaken in line with following DMRB Volume 11, Section 3 guidance:

- Part 6, 'Land Use';
- Part 8 'Pedestrians, Equestrians, Cyclists and Community Effects'; and
- Part 9 'Vehicle Travellers'.

12.2 Legislative and Policy Framework

Legislation

National Parks and Access to Countryside Act 1949

12.2.1 The National Parks and Access to the Countryside Act 1949 is an Act of the Parliament of the United Kingdom which created the National Parks Commission which later became the Countryside Commission and then the Countryside Agency, which became Natural England when it merged with English Nature in 2006. The Act provided the framework for the creation of National Parks and Areas of Outstanding Natural Beauty in England and Wales, and also addressed public rights of way and access to open land. The Act aims:

- To make provision for National Parks and the establishment of a National Parks Commission;
- To confer on the Nature Conservancy and local authority's powers for the establishment and maintenance of nature reserves; and
- To make further provision for the recording, creation, maintenance and improvement of public paths and for securing access to open country.

Countryside and Rights of Way Act 2000

12.2.2 The Countryside and Rights of Way Act 2000 (CRoW Act 2000) applies to England and Wales only, received Royal Assent on 30 November 2000, with the provisions it contains being brought into force in incremental steps over subsequent years. The Act is compliant with the provisions of the European Convention on Human Rights, requiring consultation where the rights of the individual may be affected by these measures.

12.2.3 The Act provides a new right of public access on foot to areas of open land comprising mountain, moor, heath, down, and registered common land, and contains provisions for extending the right to coastal land. The Act also provides safeguards which take into account the needs of landowners and occupiers, and of other interests, including wildlife.

12.2.4 The Act improves the rights of way legislation by encouraging the creation of new routes and clarifying uncertainties about existing rights. Of particular relevance to nature conservation, the Act introduces powers enabling the diversion of rights of way to protect SSSIs.

National

National Road and Rail Networks: National Policy Statement (NN NPS) (December 2014)

12.2.5 The NPS for National Networks is the principal policy document against which the scheme will be assessed.

12.2.6 The Government's vision and strategic objectives for national networks set out in the NN NPS includes 'supporting a prosperous and competitive economy', and specifically: Networks with the capacity and connectivity to support national and local economic activity and facilitate growth and create jobs; and Networks which join up our communities and link effectively to each other. Paragraph 2.27 states that '*in some cases….it will not be sufficient to simply expand capacity on the existing network. In those circumstances new road alignments and corresponding links, including alignments which cross a river or estuary, may be needed to support increased capacity and connectivity*.'

12.2.7 Paragraph 3.3 requires that 'reasonable opportunities to deliver environmental and social benefits as part of schemes' should be considered and that environmental and social impacts should be mitigated in line with the principles set out in the National Planning Policy Framework (NPPF) and the Government's planning guidance.

12.2.8 The NN NPS contains the following statement in Section 2 setting out the Government's vision and strategic objectives for nationally significant networks: '*The Government will deliver national networks that meet the country's long-term needs; supporting a prosperous and competitive economy and improving overall quality of life, as part of a wider transport system. This means:*

- *Networks with the capacity and connectivity to support national and local economic activity and facilitate growth and create jobs;*
- *Networks which support and improve journey quality, reliability and safety;*

- *Networks which support the delivery of environmental goals and the move to a low carbon economy;*
- *Networks which join up our communities and link effectively to each other*'.

12.2.9 The assessment has considered existing and proposed land-uses and the presence of communities on either side of the A30. The assessment has considered changes to journey times and reliability, which would support economic growth. It is considered that the scheme complies with the requirements of the NN NPS by supporting economic development through improved access to jobs and services and improved journey time reliability. Mitigation for relevant environmental effects has been identified where necessary.

National Planning Policy Framework (NPPF) (Communities and Local Government 2012)

12.2.10 The Government published the NPPF in March 2012. The document streamlines national planning policy into a consolidated set of priorities, replacing most Planning Policy Statement and Planning Policy Guidance notes. The NPPF sets out 12 core planning principles that should underpin decision taking.

12.2.11 The scheme meets the applicable core principles and advice concerning development with the NPPF, for example by supporting economic development through improved access to jobs and services and improved journey time reliability.

National Planning Practice Guidance (PPG) (2014)

12.2.12 The Planning Practice Guidance provides practical guidance to support the NPPF. The Guidance states that existing open space should be taken into account when considering development proposals.

12.2.13 The assessment has considered existing open space as part of the assessment and found that the scheme would have no adverse impact upon existing provision.

Government White Paper: Healthy Lives, Healthy People (2010)

12.2.14 This white paper outlines the Government's commitment to:

- protecting the population from serious health threats;
- helping people live longer, healthier and more fulfilling lives;
- improving the health of the poorest, fastest.

12.2.15 The goal is a public health service that achieves excellent results, unleashing innovation and liberating professional leadership.

Highways England Cycling Strategy

12.2.16 Highways England's Cycling Strategy sets out how the planned roads improvements programme will provide integrated schemes which improve cycling facilities, contributing towards the development of an integrated, safe, comprehensive and high quality cycling network.

12.2.17 The vision for cycling builds upon the overall aim to deliver a high performing strategic road network and the best possible service to road users. Specifically, it

aims to *"contribute to a connected, comfortable, attractive and high quality cycling network, suitable and safe for use by people of all ages and abilities."*

Highways England Accessibility Strategy

12.2.18 Highways England's Accessibility Strategy explains how Highways England will deliver its ambition to enhance accessibility to and across the strategic road network for users and communities, as set out in the Highways England Delivery Plan.

12.2.19 The vision for accessibility focuses on supporting road users' journeys, including pedestrians, cyclists, equestrians, those with disabilities (such as users with mobility or sensory impairments) and other vulnerable users, while delivering longer-term benefits for communities and users alike. It aims to address the barriers that roads can sometimes create, help expand people's travel choices, enhance and improve network facilities, and make every day journeys as easy as possible.

Local

The Cornwall Local Plan Strategic Policies 2010-2030 (adopted 2016)

12.2.20 The Local Plan sets out the overarching planning policy framework for the whole of Cornwall for the period up to 2030.

12.2.21 Policy 25 Green Infrastructure of the Local Plan aims for development proposals should contribute to an enhanced, connected and functional network of habitat, open spaces and waterscapes by restoring or enhancing connectivity for nature and people through the site and linking to adjacent sites or green routes and helping to provide better links between urban and rural landscapes and coastal areas.

12.2.22 Policy 27 Transport and Accessibility of the Local Plan aims for major developments to ensure a resilient and reliable transport system for people, goods and services, development proposals should '*be designed to provide convenient accessible and appropriate cycle and pedestrian routes, public transport and road routes within immediate vicinity of the* development' and '*provide safe and suitable access to the site for all people and cause a significantly adverse impact on the local or strategic road network that cannot be managed or mitigated'*.

12.2.23 Policy 17 Health and Wellbeing of the Local Plan aims to improve the health and wellbeing of Cornwall's communities, residents, workers and visitors. Development should:

- Protect, and alleviate risk to, people and the environment from unsafe, unhealthy and polluted environments by avoiding or mitigating against harmful impacts and health risks such as air and noise pollution and water and land contamination and potential hazards afforded from future climate change impacts;
- Maximise the opportunity for physical activity through the use of open space, indoor and outdoor sports and leisure facilities and providing or enhancing active travel networks that support and encourage walking, riding and cycling; and

- Provide flexible community open spaces that can be adapted to the health needs of the community and encourage social interaction.

Cornwall Local Plan Strategic Policies 2010-2030: Community Network Areas Sections

12.2.24 The scheme is within both PP6 Truro and Roseland and PP7 St Agnes and Perranporth Community Network Areas. Specific objectives to be addressed in planning for the Truro and Roseland area include:

- Objective 3 Employment – provide a high quality, well paid employment in locations that reduce the need to travel;
- Objective 4 Sustainable Transport – enable the use of more sustainable transport modes and reduce congestion through the provision of additional transport infrastructure and ensuring sustainable transport is designed into new development;
- Objective 5 Shops and Services – support the retail function of Truro in relation to other main towns in Cornwall and within the South West. Protect shops and access to services and facilities in rural areas; and
- Objective 6 Community Facilities – ensure that facilities, including health, leisure, education and sports facilities, are provided to support new development and address existing deficiencies.

12.2.25 Specific objectives to be addressed in planning for the St Agnes and Perranporth Community Network area include:

- Objective 2 Tourism and Employment – Support the tourist industry and enable other employment opportunities;
- Objective 3 Rural Businesses – Protect and ensure the sustainability of rural shops and businesses;
- Objective 4 Services and Public Transport – Co-ordinate a strategic approach to provision of services and public transport to encourage self-containment and sustainable transport;
- Objective 6 Needs of the Elderly – provide for the needs of an elderly population.

The Truro and Kenwyn Neighbourhood Development Plan

12.2.26 Relevant to development management decisions in the Truro and Kenwyn Neighbourhood Plan Area, in which part of the scheme is based.

12.2.27 The Plan is keen to ensure that there is fair access to community centres, services and facilities across the whole of the Plan area.

12.2.28 Opportunities for new trails and improvements to existing crossings and routes for walking and cycling have been considered and identified in the Plan. Standards for new development have been set that include consideration of active travel, accessibility to public transport, mixed uses and access to recreation and other high volume uses.

12.2.29 The Plan also sets out standards for new employment development across the plan area, including accessibility and parking requirements.

Guidance

12.2.30 The People and Communities assessment is in accordance with the following guidance:

- Handbook for Cycle Friendly Design (Sustrans 2014);
- Design Manual for Road and Bridges (DMRB) Volume 11, Section 3, Part 9 Vehicle Travellers (Highways Agency, 1993);
- DMRB Volume 11, Section 3, Part 8 Pedestrians, Cyclists, Equestrians and Community Effects (Highways Agency, 1993);
- DMRB Volume 11, Section 3, Part 6 Land Use (Highways Agency, 2001); and
- HD42/17 Walking, Cycling and Horse-riding assessment and review (Highways England, 2017).

12.3 Study Area

12.3.1 For effects on vehicle travellers, walkers, cyclists and horse-riders, effects on land and property and effects on people, the scope of the study area for each assessment has been informed through consideration of the potential effect on all relevant receptors as a result of the scheme. The study area is therefore different in response to the topic under consideration and has its own tailored scope as shown in Table 12-1.

12.3.2 It should be noted that DMRB guidance does not specify a standard study area for the assessment of effects on all travellers. However, the guidance references the requirement to identify existing and proposed PRoW which may be affected by the scheme, particularly those associated with access to key community facilities. This has informed the approach to setting the study area.

12.3.3 Walking, cycling and equestrian routes within 5km of the scheme are shown in PEIR Figure 12.1, commercial properties are shown in Figure 12.2, agricultural land condition in Figure 12.3, Public Rights of Way directly affected by the scheme in Figure 12.4, and tourism and recreation facilities within the study area in Figure 12.5.

Table 12-1 Summary of Study Areas

Topic	Study Area
Vehicle travellers - Driver stress	The study area for driver stress is from the A30 between Chiverton and Carland Cross.
Vehicle travellers - Views from Road	The study area for views from road is from the A30 between Chiverton and Carland Cross.
Effects on WCHs – journey length	The study area for Walkers, Cyclists and Horse riders is 5km, based on the scope of the scheme and associated HD42 guidance. The study area extends along the A30 from the outskirts of Redruth to Summercourt, encompassing St Agnes, Shortlanesend, Zelah, Trispen and St Newlyn East. Main roads include the A390 and A39 as far as the outskirts of Truro. National Cycle Network (NCN) Route 32, the Cornish Way, is open and signed through the study area from Bodmin to Truro via Padstow and Newquay.
Effects on WCHs – amenity	The study area for Walkers, Cyclists and Horse riders is 5km, based on the scope of the scheme and associated HD42 guidance. The study area extends along the A30 from the outskirts of Redruth to Summercourt, encompassing St Agnes, Shortlanesend, Zelah, Trispen and St Newlyn East. Main roads include the A390 and A39

Topic	Study Area
	as far as the outskirts of Truro. National Cycle Network (NCN) Route 32, the Cornish Way, is open and signed through the study area from Bodmin to Truro via Padstow and Newquay.
Community severance	Community facilities have been considered within approximately 1km of the scheme in order to capture the likely effects of the scheme from severance to access.
Relief from existing severance	Relief from severance have been considered within 1km of the scheme.
Effects on land and property	Community land and private property have been considered within approximately 1km of the scheme. The agricultural land and farms assessment has considered the footprint of the scheme and adjacent land which may be severed. Development land is considered within 500m of the scheme, though major planning applications up to 1km from the scheme have been considered where potential impacts have been identified. For the purposes of this assessment, future changes in land use for which planning permission has been granted may also be relevant to the assessment of a scheme.
Tourism and recreation	The study area for the assessment of effects on tourism and recreation includes any facilities within the corridor of the preferred route, and facilities accessed from the A30 between Chiverton and Carland Cross. The assessment of amenity effects on specific facilities additionally takes into account the study areas used in the air quality, noise and vibration, and landscape and visual assessments. Tourism and recreation effects are also considered at a strategic level, covering the whole of Cornwall.
Effects on people	The local study area includes all residences and businesses along the existing A30 and the proposed route and also communities in the immediate surrounding area that contain facilities which are assumed to be used by local residents.

12.4 Potential Impacts

Effects on Vehicle Travellers

12.4.1 The assessment considers construction and operational effects on drivers' views from the road, driver stress and bus travellers.

12.4.2 Construction effects could include increased frustration due to traffic congestion from online working and drivers' views of the surrounding landscape could be affected by construction compounds.

12.4.3 Operation effects could include restricted, intermittent or open views for drivers across the landscape, and the scheme could improve the efficiency of the transport network along the A30.

Effects on Walkers, Cyclists and Horse-riders (WCHs)

12.4.4 This assessment considers construction and operational effects on relief from existing severance, on community severance and on pedestrians, cyclists and equestrians in terms of amenity and journey length.

12.4.5 Effects could include enhanced accessibility due to new overbridges and underbridges or reduced accessibility due to diversions and PRoWs being stopped up for pedestrians, cyclists and equestrians or effects on amenity of the PRoWs/non-PRoWs as a result of a combination of significant air quality, noise and/or visual effects.

Effects on Land and Property

12.4.6 The assessment considers construction/operational effects on commercial properties, agricultural land and farm holdings, on development land and community land.

12.4.7 Effects could include demolition of property and temporary and permanent land-take.

Effects on Tourism and Recreation

12.4.8 The assessment considers construction and operational effects on tourism and recreation facilities, and on users and operators of these facilities.

12.4.9 Three broad categories of effects have been considered: effects or perceived effects on the accessibility of Cornwall as a tourist destination; direct effects for local tourism and recreation facilities, including temporary or permanent loss of land or facilities and effects on access; and indirect effects on amenity for local tourism and recreation facilities, as a result of a combination of significant air quality, noise and/or visual effects.

12.4.10 The assessment of indirect amenity effects relies on information provided in the Air Quality, Noise and Vibration, and Landscape and Visual assessments provided within this PEIR. This means that the potential for in-combination effects on amenity for particular facilities can only be assessed where relevant information is available in these chapters. Where certain tourism facilities may have been scoped out of other environmental assessments, it has not been possible at this stage to assess the potential for amenity effects resulting from significant environmental effects.

12.4.11 Effects on PRoW are considered under the assessment of effects on walkers, cyclists and horse-riders, and so are not included in the tourism and recreation assessment.

Effects on People

12.4.12 The assessment considers the effects on local residents including vulnerable groups in terms of health and socio-economic effects.

12.4.13 Effects could include reduced or enhanced access to green spaces affecting resident's physical activity levels, effects on employment, effects on accessibility to services such as hospitals, schools and other community facilities and effects on neighbourhood amenity as a result of a combination of significant air quality, noise and/or visual effects.

12.5 Assessment Methodology

12.5.1 The assessment of People and Communities includes the assessment of the potential effects described in section 12.4 above.

Value of Receptor

12.5.2 The significance of an environmental effect is a function of the 'value' of the receptor and the 'magnitude' or 'scale' of the impact.

12.5.3 Volume 11, Section 2, Part 5 HA 205/08 'Assessment and Management of Environmental Effects' of the DMRB, provides advice on typical descriptors of environmental value, magnitude of change and significance of effects. The importance or sensitivity of each resource has been identified using DMRB and IEMA guidance criteria[1].

12.5.4 There is no specific guidance for the assessment of tourism and recreation effects. Therefore, the sensitivity of tourism and recreation resources has been identified using professional judgement and knowledge of the location, drawing on desk-based research. Information about tourism in Cornwall is provided in Section 12.6.

Effects on Vehicle Travellers and WCHs

12.5.5 The following broad receptor groups or categories have been considered and their sensitivity is outlined within Table 12-2:

- Transport users: pedestrians, cyclists, equestrians; public transport; vehicle travellers who are users/ operators travelling to/from home, work and nearby trip attractors;
- Sensitive receptors: such as schools, playgrounds, hospitals, tourist attractions, open spaces, recreational areas; and
- Transport infrastructure: road network, footpaths/Public Rights of Way (PRoW), cycle paths and bridleways.

Table 12-2 Receptor sensitivity for Vehicle Travellers

Sensitivity of resource or receptor	Typical descriptors
High importance (very limited potential for substitution)	Receptors of greatest sensitivity to traffic flow include schools, colleges, playgrounds, accident blackspots, retirement homes and urban/residential roads without footways that are used by pedestrians
High/medium importance (limited potential for substitution)	Traffic flow sensitive receptors include: congested junctions, doctors' surgeries, hospitals, shopping areas with roadside frontage, roads with narrow footways, unsegregated cycleways, community centres, parks and recreation facilities
Low/medium importance	Receptors with some sensitivity to traffic flow: places of worship, public open space, nature conservation areas, listed buildings, tourist attractions and residential areas with adequate footway provision
Low importance	Receptors with low sensitivity to traffic flows and those sufficiently distant from affected roads and junctions

[1] DMRB Volume 11, Section 3, Part 8 and Part 9

Table 12-3 WCH Receptor sensitivity

Receptor sensitivity	Description
Very high	Very high importance and rarity, international scale and very limited potential for substitution
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
Negligible	Very low importance and rarity, local scale

Effects on Land and Property

12.5.6 Unlike most other environmental topics, the sensitivity of socio-economic receptors is not determined by reference to designations or an objective standard. The importance or sensitivity of resources has been categorised based on the perceived type and value of the asset or facility affected by the scheme, using professional judgement and DMRB Volume 11 Section 3 Part 6. The criteria set out in Table 12-4 and Table 12-5 are used as a guide for assessment.

Table 12-4 Receptor sensitivity for Land and Property

Sensitivity of resource or receptor	Typical descriptors
High	• Residential properties; • Safeguarded wharves; • Specialised commercial uses (for example uses that are location dependent); • Buildings used by the community such as schools, community centres and places of worship); • Open space or recreational facilities that are of national significance (for example National Trails)
Medium	• Land associated with residential or commercial sites (for example gardens) • Community land, open space or recreational facilities of regional significance
Low	• Derelict or unoccupied buildings that are not the subject of a current planning permission; • Community land, open space or recreational facilities of local significance (for example pocket parks, playing fields)

Table 12-5 Receptor sensitivity for Agricultural Land and Farm Holdings

Sensitivity of resource	Typical descriptors
Very High	Grade 1 agricultural land, specialised horticultural, intensive agricultural units.
High	Grade 1 and 2 agricultural land, annual horticultural cropping
Medium	Grades 2 and 3a agricultural land, arable land and annual horticultural cropping and intensive grassland based enterprises
Low	Grades 3b and lower quality land, arable and grassland areas.

Negligible	Grade 4 or 5 agricultural land, grassland/ limited arable areas.

Effects on Tourism and Recreation

12.5.7 The sensitivity of tourism and recreation resources is determined by a combination of two factors: their economic importance to the local area and to the region, and their capacity to accommodate potential changes without incurring a material loss or gain. The definitions of sensitivity used in the assessment are provided in Table 12-6.

Table 12-6 Receptor sensitivity for Tourism and Recreation

Sensitivity of resource or receptor	Description
High	Tourism and recreation facilities, including relevant businesses, possessing regionally significant economic value, that are considered to have little capacity to accommodate potential changes without incurring a material loss or gain.
Medium	Tourism and recreation facilities, including relevant businesses, possessing locally significant economic value, that are considered to have some capacity to accommodate potential changes without incurring a material loss or gain.
Low	Tourism and recreation facilities, including relevant businesses, possessing some local economic value, that are considered to have capacity to accommodate potential changes without incurring a material loss or gain.

Effects on People

12.5.8 Receptor sensitivity reflects the economic, social or community value of the receptor, and the extent to which it is considered the receptor has the capacity to accommodate potential changes. The definitions of receptors sensitivity used in the assessment are provided in Table 12-7.

Table 12-7 Receptor sensitivity for Effects on People

Sensitivity or resource or receptor	Typical descriptors
High	Businesses, individuals, groups of individuals, or other receptors possessing very significant economic, social or community value, that are identified as having very low capacity to accommodate potential changes without incurring a material loss (or gain). Vulnerable groups such as elderly, socio-economically deprived and infirm.
Medium	Businesses, individuals, groups of individuals, or other receptors possessing locally significant economic, social or community value, that are identified as having some capacity to accommodate potential changes without incurring a material loss (or gain).
Low	Businesses, individuals, groups of individuals, or other receptors possessing some local economic, social or community value, that are identified as generally having capacity to accommodate potential changes without incurring a material loss (or gain).

Magnitude of Impacts

Effects on Vehicle Travellers – Views from the Road

12.5.9 View from the road is defined as the extent to which travellers, including drivers, are exposed to the different types of scenery through which a route passes. Views from the road are assessed according to travellers' ability to see the surrounding landscape on a four-point scale, as defined in the DMRB: no view,

restricted view, intermittent view and open view. The magnitude of impact on Views from the Road was assessed using the criteria in Table 12-8.

Table 12-8 Magnitude of impact - Views from the Road

Magnitude of Impact	Beneficial	Adverse
No Change	Views remain the same	
Minor	No view – restricted	Restricted – no view
	Restricted - Intermittent	Intermittent – Restricted
	Intermittent – Open	Open – Intermittent
Moderate	No View – Intermittent	Intermittent – No View
	Restricted - Open	Open - Restricted
Major	No View – Open	Open – No View

Effects on Vehicle Travellers – Driver Stress

12.5.10 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 (Minor);
- Moderate;
- High (Major).

Effects on Walkers, Cyclists and Horse-riders – Journey length

12.5.11 Severance is described as changes to a route that will hinder users or ultimately stop them using a (PRoW), principally by increasing journey lengths and times.

Table 12-9 Magnitude of impact – Journey Length

Magnitude of impact	Description
Minor	General current journey pattern is likely to be maintained, but there will probably be some hindrance to movement (e.g. journey will be increased by up to 250m);
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 (e.g. journey increased by 250 - 500m)
Major	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 existing journeys (e.g. an increase in length of journey more than 500m).

Effects on Walkers, Cyclists and Horse-riders – Amenity

12.5.12 Amenity is defined in DMRB Volume 11 Section 3 Part 8 as the relative pleasantness of a journey, and is concerned with changes in the degree and duration of people's exposure to traffic, and the impact of the road itself.

12.5.13 The definitions of magnitude of impact used in the assessment are summarised below in Table 12-10.

Table 12-10 Magnitude of impact - Amenity

Magnitude of impact	Description
Negligible	Very little appreciable change in the experience of the travellers in the area.
Minor	Minimal alteration in the experience of the travellers, such that there would be a measurable change but not considered to significantly affect the travelling experience.
Moderate	An alteration in the experience of the traveller in the area, but to a moderate degree such that the travelling experience would be changed.
Major	A major alteration in the experience of the traveller in the area, such that the travelling experience would be significantly affected.

Relief from existing severance

12.5.14 There is potential for a road scheme to have a beneficial impact by relieving existing severance. DMRB Volume 11 Section 3 Part 8 provides guidance on the relief of severance, resulting from a scheme, through the reduction of vehicle traffic. Table 12-11 categories relief from severance by reduction in existing traffic levels[2].

Table 12-11 Categorising the Level of Relief from Severance

	Minor	Moderate	Substantial
Built Up Area	30%	30-60%	+60%
Rural Area	60-75%[3]	75-90%[4]	90%[5]

Community severance

12.5.15 Community severance is concerned with the role of roads as a 'barrier' between different parts of a community, and the resulting distortion of journey patterns. DMRB defines community severance as 'the *separation of residents from facilities and services they use within their community caused by new or improved roads or by changes in traffic flows*'.

12.5.16 Using criteria in the DMRB, new community severance has been described using a three point scale as shown in Table 12-12.

[2] Relief of severance is not significant where traffic flows are already relatively low; the guidelines do not apply to roads with an existing Annual Average Daily Traffic (AADT) flow of fewer than 8,000 vehicles. However, where particularly vulnerable user groups are relieved from severance the description may need to be amended.
[3] Where the existing road is passing through a village or on the perimeter of built up area.
[4] Where the existing road substantially bisects a village or small town this figure may be halved.
[5] Where the existing road substantially bisects a village or small town this figure may be reduced to 60%.

Table 12-12 Magnitude of impact - community severance

Magnitude of impact	Description
Minor	• Pedestrian at-grade crossing (located at carriageway level) of a new road carrying below 8,000 vehicles per day (Average Annual Daily Traffic (AADT)); or • A new bridge will need to be climbed or a subway transverse; or • Pedestrian journeys increased by up to 250m.
Moderate	• Two or more of the hindrances set out under 'slight' applying to single trips; or • Pedestrian at-grade crossing of a new road carrying between 8,000-16,000 vehicles per day (AADT) in the opening year; or • Journeys will be increased by 250-500m.
Major	• Pedestrian at-grade crossing of a new road carrying 16,000 vehicles per day (AADT) in the opening year; or • An increase in length of journeys of over 500m; or • Three or more of the hindrances set out under 'slight' or two or more set out under moderate.

Effects on Land and Property

12.5.17 The magnitude of change on land and property resources or receptors has been described using the levels of impact set out in Table 12-13.

Table 12-13 Definitions of Impact Magnitude for Community and Private Assets

Magnitude of Impact	Typical Criteria Descriptors (excluding Agricultural and Farm Holdings and Land-take)	Typical Criteria Guidelines (Agricultural and Land Holdings)
Major	Demolition of buildings or significant loss of land (>50% of land) Complete severance of access Significant change to accessibility	Loss of more than 50 hectares (ha) of the best and most versatile land. Agricultural production affected at a regional level with full time farming enterprises rendered unworkable
Moderate	Moderate loss of land (between 15% to 50% of land) Major severance of access	Loss of more than 20 ha of best and most versatile land. Agricultural production affected at a local level. Full-time farming enterprise/s rendered unworkable
Minor	Minor loss of land (15% to 2% of land) Some partial or temporary severance of access	Loss of 5 – 20 ha best and most versatile land. Affects the workability of individual farming enterprises, but farming can continue as before.
Negligible	A very slight change (<2% of land)	Loss of less than 5 ha best and most versatile land. No adverse effects on farming enterprises or production
No change	No discernible change from the baseline conditions	No effects on agricultural land or soils.

Effects on Tourism and Recreation

12.5.18 The criteria used to determine magnitude of impact for tourism and recreation facilities are provided in Table 12-14.

Table 12-14 Definitions of Impact Magnitude for Tourism and Recreation

Magnitude of effects	Description
Negligible	A direct or indirect effect that would be likely to result in very minor or no changes to baseline conditions for tourism and recreation facilities and their users.
Minor	A direct or indirect effect that would be adverse or beneficial and would be likely to result in minor changes to baseline conditions for a small number of tourism and recreation facilities and their users.
Moderate	A direct or indirect effect that would be adverse or beneficial and would be likely to result in partial changes to baseline conditions for a moderate number of tourism and recreation facilities and their users.
Major	A direct or indirect effect that would be adverse or beneficial and would be very likely to result in total or permanent changes to baseline conditions for a large number of tourism and recreation facilities and their uses.

Effects on People

12.5.19 The magnitude of effect takes into account both the degree of the potential change to socio-economic conditions, including any health impacts arising from changes in exposure to noise and air quality effects, and the scale of the change in terms of receptors likely to be affected. Emerging industry guidance will be considered where relevant.

Table 12-15 Magnitude of impact – Effects on People

Magnitude of effects	Description
Negligible	A direct or indirect effect that would be likely to result in very minor or no changes to baseline conditions for businesses, individuals, groups of individuals, or other receptors.
Minor	A direct or indirect effect that would be adverse or beneficial, and would be likely to result in minor changes to baseline conditions for a small number of businesses, individuals, groups of individuals, or other receptors.
Moderate	A direct or indirect effect that would be adverse or beneficial, and would be likely to result in partial changes to baseline conditions for a moderate number of businesses, individuals, groups of individuals, or other receptors.
Major	A direct or indirect effect that would be adverse or beneficial, and would be very likely to result in total or permanent changes to baseline conditions for a large number of businesses, individuals, groups of individuals, or other receptors.

Assessment of Significance

12.5.20 The significance of effects is a function of the magnitude of the impact and the sensitivity of the receptor. Table 12-16 sets out how the significance of impacts have been determined. Where two possible scores exist, professional judgment has been used to determine the significance of the effect.

Table 12-16 Assessing significance of effect

Value / Sensitivity	Magnitude of Impact				
	No change	Negligible	Minor	Moderate	Major
Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight
Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or Moderate
Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or Large
High	Neutral	Slight	Slight or moderate	Moderate or Large	Large or Very Large

12.6 Baseline Conditions

12.6.1 This section provides a summary of baseline information collected for this assessment. A full, detailed baseline will be provided in the Environmental Statement.

Effects on Vehicle Travellers

Views from the Road

12.6.2 "View from the road" is defined in DMRB Volume 11 Section 3 Part 9 as the "extent to which travellers, including drivers, are exposed to different types of scenery through which a route passes".

12.6.3 The view from the road assessment criteria considers the attractiveness of the road setting from the viewpoint of drivers and passengers. Given the rural nature of the landscape along the length of the scheme, the new section is considered to be open and attractive. Topography throughout the survey area is undulating. The highest altitudes are at the northern and southern ends of the survey area, and the the lowest are at Trevalso, Nancarrow and Little Nanteague. Slopes are typically shallow to moderate, although exceptionally steep gradients are present to the north of Carland Cross.

Driver Stress

12.6.4 According to the DMRB guidance, driver stress has three main components: frustration, fear of potential accidents, and uncertainty.

12.6.5 The existing A30 provides the main road connection between Cornwall and the rest of the UK. It also provides a key connection between local villages and towns including Truro, the centre of civil administration in Cornwall.

12.6.6 The section between Chiverton and Carland Cross is single carriageway, with three at grade junctions with B roads, thirteen junctions with minor roads, and numerous connections from farm tracks, entrances to dwellings and businesses. Current congestion forms a bottleneck, preventing reliable east to west journeys, particularly during peak periods and the summer tourist season. The frequency of junctions and the variation in speed of vehicles entering the road could be perceived as a potential hazard, and there is limited space for overtaking and for vehicles turning right off the A30. The local road network is used as a rat-run by vehicles avoiding traffic on the A30.

12.6.7 These factors are likely to contribute to driver frustration and fear, particularly at peak times and during the tourist summer season. Although it is not possible to assess route uncertainty, the level of Driver Stress experienced is therefore considered to be high. **Error! Reference source not found.** No detailed modelling of the performance of the A30 has been undertaken at this stage of assessment for PEIR.

Collision Data

12.6.8 Accident data for the A30 corridor between Chiverton and Carland Cross was obtained from Cornwall Council for the period 2012-2016. Additional data was sourced from crashmap.co.uk, covering a 5km radius from the scheme. Overall, collision data does not indicate that pedestrians, cyclists or equestrians are unduly at risk on the corridor between Chiverton and Carland Cross. Incidents involving cyclists on the wider road network are of concern, although on the periphery of the study area.

Public Transport

12.6.9 There are no railway stations within the 5km study area of this section of the A30. Seven bus routes stop along the existing A30 between Chiverton and Carland Cross, all of which connect the north of the county to Truro. Bus stops are located on the A390 about 200m south of Chiverton Cross, at Marazanvose, in close proximity to the Marazan Farm Campsite and Marazanvose Farm, and at Zelah on the approach roads and immediately before the junction with the A30.

Effects on Walkers, Cyclists and Horse-riders

Amenity and Journey Length

12.6.10 A physical condition survey of the PRoWs within the footprint of the scheme was undertaken in July 2016. Access points and lengths of PRoWs that are adjacent to or intersect with sections of the existing A30 were surveyed in the context of surrounding communities and the local road network. A site visit was undertaken in September 2017 in the morning and early afternoon, which consisted of walking along all available pedestrian, cycling and equestrian routes in the local area and driving through areas of interest in the wider study area.

12.6.11 For most of the scheme length, the A30 carriageway has a grass verge without any footway provision. It is generally an intimidating environment for pedestrians due to the volume and speed of traffic. A 500m length of footway is available between Zelah and Mount Pleasant and pedestrian road crossings are provided at Chiverton Cross, Church Lane in Zelah, and Carland Cross. There are no dedicated facilities for cyclists along the A30 although the junctions at Chiverton Cross and Carland Cross provide some off-road links between arms. A number of road crossings are popular with cyclists.

12.6.12 Surveys were carried out over three days in August 2017 between 7am and 7pm to record walking, cycling and horse-riding movements during the peak holiday period[6]. The survey findings indicated that there is demand along the A30 corridor, particularly south of Marazanvose, that shows high numbers of both

[6] Surveys were carried out over the weekend before the August bank holiday. The data may therefore be less representative of typical weekday travel patterns, particularly at rush hour. However, given the seasonal characteristics of the study area, the peak month is considered more appropriate.

pedestrians and cyclists. This may be associated with the campsites, bus stops, or a combination of both.

12.6.13 Cornwall Council have designated their PRoW as Gold, Silver or Bronze, based on criteria including use, accessibility, connections to promoted national or regional trails, and links to settlements, visitor attractions and public transport. PRoW that are within close vicinity of the scheme are set out in Table 12-17, along with their designation and assumed level of use. A map of PRoW is provided in Figure 12.1.

Table 12-17 PRoW in close vicinity of the scheme

ProW	Description of location	Designation	Assumed level of use[7]
Bridleway 314/65/1	North from existing A30 on track leading to Creegmeor Farm	Silver	Low
Bridleway 309/3/1	South from the existing A30 to the B2384	Silver	Very low
Footpath 319/16/1	South west from the A30 at Marazanvose and east at NFH	Gold	Low
National Cycle Network - Route 32 (the Cornish Way)	Crosses the existing A30 at Chiverton Lodge. A spur travels along a short section of the A30 before following a road south. The scheme crosses a section north of Honeycombe Farm.	n/a	n/a
Footpath 319/1/2	Joins with the existing A30 and Bridleways 319/1/1 and 319/9/1 opposite Zelah Lane Farm	Gold	Low
Bridleway 319/1/1	East from Henver Lane at Zelah Lane Farm, to cross the existing A30 via an overbridge	Gold	Medium
Bridleway 319/9/1	Joins with Footpath 319/1/2 and Bridleway 319/1/1 south of the existing A30, south of Zelah at the overbridge	Gold	Low
Footpath 319/11/1	Crossed by the scheme south of the existing A30 at Penny-Come-Quick	Bronze	Very low
Footpath 319/12/1	East of the A30 adjacent to Trevalso Cottage	Bronze	Very low
Bridleway 314/64/1	North from the B2384 from Callestick Vean	Silver	Low

[7] Informed by July 2016 survey

ProW	Description of location	Designation	Assumed level of use7
Unnamed path (not designated on Definitive Map)	Crosses the existing A30 from the southern end of Church Lane in Zelah	n/a	n/a

12.6.14 Byways 321/14/2 (Gold Priority) and 314/1/1 (Bronze Priority) are located in close proximity to the roundabouts at either end of the scheme where it will join with the existing A30. Although not directly impacted by the scheme, these byways have been considered within this assessment. There are also pavements and roadside paths at both the Chiverton Cross and Carland Cross roundabouts which act as a safe means for WCHs to cross, particularly at Chiverton Cross where there is a desire line from residential properties to the east to the Chiverton Arms to the west of the existing A30.

Community Severance

12.6.15 The existing A30 is considered too busy to be safely crossed by WCHs. There are no dedicated pedestrian or roundabout crossings, and crossing points for both WCHs and motorised traffic are predominantly at the existing road crossings.

12.6.16 There are scattered residential dwellings located adjacent to this section of the A30, and villages including Blackwater, Zelah and Tresawen. There are no specific services provided at these villages that are capable of attracting a substantial volume of WCHs. It is considered that the rural nature of the area and the sparse location of communities do not generate substantial WCH flows along or across this section of the A30, and that these are not anticipated to increase significantly in future years.

Community Facilities

12.6.17 There are a number of community facilities located within the study area that can be accessed by the existing A30. Commercial properties are shown in Figure 12.2, and tourism and recreation facilities are shown in Figure 12.5. For further baseline information on community facilities and commercial properties, see Tourism and Recreation section below.

Effects on Land and Property

Community Land

12.6.18 There are no allotments, playgrounds, sports pitches, or formal open spaces located along the length of the scheme.

12.6.19 There is an area of land designated under the Countryside and Rights of Way Act (2000) as Open Access land, which comprises much of Newlyn Downs and is located 250m north west of Carland Cross junction. There is also a smaller section of Open Access land located around a disused quarry immediately adjacent and to the south of the A30 approximately 250m west of Carland Cross junction. Part of this southern area is within the land-take of the scheme.

Allocated Housing

12.6.20 In the Cornwall Local Plan, the Community Neighbourhood Area (CNA) of St Agnes and Perranporth, under which part of the scheme falls, aims to develop

1,100 dwellings before 2030, of which 490 had already been completed at the time of writing the Strategic Policies Document in 2014. The remaining section falls under the CNA of Truro and Roseland, which aims to develop 3,900 dwellings before 2030.

Development Land

12.6.21 There are no development allocations within the Cornwall Local Plan which would be directly affected by the scheme. There are no current planning applications within the footprint of the scheme.

Demolition of Private Property

12.6.22 The scheme may require the acquisition of private property north of B3284, at an approximate chainage of 5600m, which are known to be part of a shooting range. In addition, a house and outbuildings at Marazan Farm Campsite would be required to be demolished, as well as a barn in NFH. The barn has planning permission for conversion to a one-bedroom house. No other private property, other than agricultural land, is required for the scheme.

Agricultural Land

12.6.23 A detailed survey of soil and site characteristics was undertaken along the A30 between Chiverton and Carland Cross in June 2017. Within the study area is a mixture of large arable fields, and smaller fields in use as pasture. Agricultural land quality in the survey area is most affected by soil wetness and workability as influenced by the very wet climate.

12.6.24 The total areas of each ALC grade are given in Table 12-18 and are shown in Figure 12.3. This data updates the survey undertaken in June 2017, taking into account the current scheme design.

Table 12-18 Agricultural Land Classification (ALC)

Grade	Description	Area (ha)	% of agricultural land
1	Excellent quality	0.0	-
2	Very good quality	65.4	50.3
3a	Good quality	39.6	30.5
3b	Moderate quality	23.0	17.6
4	Poor quality	0.0	-
5	Very poor quality	2.1	1.6
Total ALC agricultural land		130	100
Other land (non-agricultural)		58.5	-
Data not available		32.1	-

12.6.25 The scheme passes through at least 80 fields, as shown on OS base mapping. At least 36 fields are bisected, potentially resulting in small parcels of land that cannot be accessed or utilised effectively. Agricultural land-take for the scheme is likely to be more than 20ha, and therefore it is likely that an Agricultural Impact Assessment will be required.

Tourism and Recreation

Cornwall

12.6.26 Visit Cornwall estimates that the visitor economy supports approximately 53,000 jobs in Cornwall. This represents close to a quarter of all employment in the county in 2016[8]. Cornwall receives approximately 15 million day visits and over 4 million domestic overnight stays each year, generating £2.6 billion of business turnover.[9] Approximately 10% of all economic output in the county is attributable to tourism expenditure, by some distance the highest in the UK[10].

12.6.27 Tourism is highly seasonal, with the total number of trips to Cornwall increasing from approximately 100,000 in January, to close to 800,000 in the August peak.[11] Throughout the year, the proportion of visitors that travel to Cornwall using their own car is around 80%. The Cornwall Visitor Survey found that, along with car parking, traffic was among the most frequently mentioned issues that visitors to Cornwall said that they disliked about their visit and felt could be improved[12].

Chiverton to Carland Cross

12.6.28 There are a number of tourist and recreational facilities located within the study area that are accessed from the existing A30 Chiverton to Carland Cross. These include camping and caravanning sites, accommodation providers, equestrian centres, recreational facilities, and public houses and restaurants. Tourism facilities within the study area are shown in Figure 12.5. These figures are in draft, and are being consulted upon with Cornwall Council. Feedback from Cornwall Council will be included in the Environmental Statement.

Effects on People

Local Economy – Deprivation

12.6.29 The Indices of Multiple Deprivation (IMD) use a combination of information to create an overall measure of deprivation. The IMD ranks all Lower Super Output Areas (LSOAs) in England, with the most deprived given a rank of 1. There are five LSOAs affected by the proposed scheme. The LSOA of Cornwall 032A, which includes the village of Zelah, is within the 30% most deprived in England. Deprivation is lower in the other LSOAs.

12.6.30 In 2015, Cornwall was ranked 95th out of 326 local authorities in England for average IMD score. This was an increase in ranking from 2010, when Cornwall

[8] According to the Business Register and Employment Survey (BRES), total employment in Cornwall in 2016 was 220,000.
[9] Visit Cornwall (2016), Cornwall Visitor Survey 2016: Quarterly Update Report Summer and Autumn Interviewing Periods 2016. The South West Research Company Ltd. Available online at: https://www.visitcornwall.com/sites/default/files/generic_files/Cornwall%20Visitor%20Survey%20-%20Quarterly%20report%20%28Aug%20%26%20Sept-Nov%20data%202016%29_1.pdf
[10] ONS (2016), The regional value of tourism in the UK: 2013. Available online at: https://www.ons.gov.uk/peoplepopulationandcommunity/leisureandtourism/articles/theregionalvalueoftourismintheuk/2013
[11] Visit Cornwall (2011), Value of Tourism 2011. The South West Research Company Ltd. Available online at: https://www.visitcornwall.com/sites/default/files/generic_files/Value%20of%20Tourism%20in%20Cornwall%202011%20by%20District.pdf
[12] Visit Cornwall (2016), Cornwall Visitor Survey 2016.

was ranked at 110, suggesting that the level of deprivation in Cornwall has increased during this period relative to other areas of England.

Local Economy – Employment

12.6.31 Employment statistics for Cornwall show that economic activity is slightly higher than the average for Great Britain, and unemployment is lower than the national average. The proportion of economically inactive residents is lower than the national average and in line with the average for the South West.

12.6.32 Key industries in terms of employment include wholesale and retail trade and repair of motor vehicles, human health and social work, accommodation and food services, education, and manufacturing[13].

12.6.33 The Cornwall Local Plan identifies employment land within Truro and St Agnes and Perranporth, but these locations are focussed towards the town centres and are not found on the A30 corridor.

Social Profile

12.6.34 At the 2011 Census, Cornwall had a population of 536,000. In line with national trends, Cornwall's population is getting older as average life expectancy continues to rise. Expansion in higher education and better employment prospects have, however, led to reductions of younger people leaving Cornwall[14].

12.6.35 Data from the 2011 Census shows that there is a lower proportion of both children and older people in Cornwall than seen regionally and nationally, indicating that the proportion of residents who are of working age is above average. The majority of residents (96%) are from White ethnic backgrounds and around 60% identify as Christians, in line with the regional and national average. The proportion of residents who experience a limiting long-term health problem or disability is higher than the regional and national average, at 21.4%.

Health Profile

12.6.36 The Public Health England Health Profile for Cornwall in 2017[15] concludes that the health profile of people in Cornwall is varied compared with the average for England. Deprivation is lower than average. However, about 19% (16,800) children live in poverty. Life expectancy is 6.6 years lower for men and 5.1 years lower for women in the most deprived areas of Cornwall than in the least deprived areas.

12.6.37 The rate of alcohol-related hospital stays, and the rate of alcohol-specific hospital stays among those under 18, is worse than the average for England. The rate of smoking related deaths better average, but there is a higher level of smoking in pregnant women at the time of delivery. Estimated levels of adult excess weight are worse than average, however the proportion of children classified as obese (18%) is lower than average. The rate of self-harm hospital stays is worse than the average for England.

[13] https://www.nomisweb.co.uk/reports/lmp/la/1946157349/report.aspx#tabempunemp
[14] https://www.cornwall.gov.uk/council-and-democracy/data-and-research/data-by-topic/population/
[15] http://fingertipsreports.phe.org.uk/health-profiles/2017/e06000052.pdf

12.6.38 There is an Air Quality Management Area within Truro, known as the Truro AQMA. Noise, air quality and neighbourhood amenity are key environmental determinants of health, with poor air quality linked to incidence of chronic lung disease, heart conditions and asthma among children, and noise pollution linked to sleep disturbance, cardiovascular and psycho-physiological effects[16]. Further matters specifically associated with air quality assessment are considered in this PEIR.

12.7 Consultation

12.7.1 Highways England organised and facilitated three workshops to gather the views and insights of walking, cycling and horse-riding stakeholders about the project and its impact, and to identify potential opportunities to improve facilities. Workshops were held between November 2015 and November 2016,

12.7.2 The following opportunities were identified:

- The provision of road crossing facilities on the new A30, including crossing facilities for equestrians.
- The down-graded A30 provides opportunity for a linear cycle route adjacent to the A30.
- The stopped-up A30 north-east of the Carland Cross roundabout provides an opportunity for an off-road link to connect with Mitchell. (Post-meeting advice from the design team is that earthworks from the mainline tie-in may adversely affect this opportunity.)
- The provision of a new PRoW link between the existing A30 to the site of special scientific interest (SSSI) area at Newlyn Downs.
- An example of the cycling infrastructure on the A9 at Pitlochry where the new cycling route is linked to the old route was provided, as it is a similar situation and could be applied to this section of the A30.

12.7.3 Some attendees recommended that new junctions be designed to be safer and more attractive to cyclists. It was agreed that this is likely to require a separate cycle only route across Chiverton Cross roundabout in an underpass or on a bridge, with appropriately shallow gradients.

12.7.4 Stakeholder engagement is ongoing, with the aim to involve those user groups identified since the workshops and any who were unable to attend previous events. The scheme design is ongoing and it is appropriate that the stakeholders be given an opportunity to comment on the emerging proposals. Statutory consultation, programmed for 29 January to 11 March 2018 will allow for formal submission of comments.

12.8 Assessment Assumptions and Limitations

12.8.1 Any economic effects experienced by the loss of private property are addressed within the economic appraisal for the project.

12.8.2 The assessment of the WCH route amenity relies on qualitative descriptions by the assessor which is subjective. There is also a degree of subjectivity in the assessment of views. Where subjective assessments are presented below, attempts to reconcile against evidence have been made throughout.

[16] NHS London Healthy Urban Development Unit (2017), Rapid Health Impact Assessment Tool

12.8.3 The DMRB Volume 11, Section 3, Part 8 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 set out 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 WCHs for recreation or to access important facilities within their community, have not altered.

12.8.4 The assessment relies, in part, on data provided by third parties (e.g. local authorities) which are the most up to date, available at the time of the assessment. No significant changes or limitations in these datasets have been identified that would affect the robustness of the assessment for EIA purposes.

12.8.5 The proposed Chiverton and Carland Cross junctions have been designed in accordance with Highways England's and the Department for Transport's (DfT) standards for road signing and it is therefore unlikely that route uncertainty would be a contributing factor to Driver Stress once the Main or Alternative schemes are operational. This assessment therefore focusses on potential changes to driver frustration and fear of potential accidents caused by changes to traffic flows and vehicle speeds, and route uncertainty has not been considered further within this assessment.

12.8.6 In order to avoid double counting of effects, the assessment of views from the road effects identifies and assesses only temporary adverse effects which arise as a result of activities and elements that are unique to the construction phase. For example, the permanent removal of built form or vegetation is assessed as part of the operational phase, but the works, such as disruption caused by construction plant used during demolition and site clearance are assessed as part of the construction phase.

12.9 Design, Mitigation and Enhancement Measures

Construction Mitigation

Vehicle Travellers - Views from the Road

12.9.1 There is no mitigation proposed in relation to drivers' views from the road during the construction phase, however where overriding landscape or design constraints do not restrict this, the View from the Road should not be further obstructed by new structure(s), and open views of the surrounding countryside should be retained.

Vehicle Travellers – Driver Stress

12.9.2 When work is required online, a series of traffic management measures will be implemented including:

- Single way working of traffic in each direction maintained at all times;
- Safety measures to reduce fear of accidents;
- Clear signage and layout especially at diversion routes; and
- Speed restriction in work areas for the safety of road users and the construction workforce. These restrictions will only be introduced when the works commence and will remain until a specific section was complete;

12.9.3 A mandatory 40mph speed limit would be imposed where construction occurs in the vicinity of the existing A30. There is likely to be some increase in congestion and queue lengths when construction works take place directly on the existing A30.

12.9.4 Any 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, thereby mitigating impacts associated with driver uncertainty.

Vehicle Travellers - Bus services

12.9.5 To mitigate the impact on bus services, early consultation with bus operators, provision of advance travel information for passengers and effective traffic management would be required.

12.9.6 Any temporary bus stops to be provided should be clearly signposted for the general public.

Walkers, Cyclists and Horse-riders

12.9.7 Traffic Management Measures will be planned and approved and will include provision of both pedestrians and cyclists to travel safely through the construction works.

12.9.8 Nuisance due to noise, dust and visual impacts due to movement of construction vehicles will be mitigated through considerate construction management including the use of screening (temporary or permanent), which will be outlined in further detail in an Outline EMP to be submitted as part of the ES with the DCO application.

Community Severance

12.9.9 The mitigation measures for public rights of way, cycle routes and bridleways during the construction phase are set out above.

Land and Property

12.9.10 Where access is affected to private properties and businesses, temporary alternative access would be provided.

12.9.11 Wherever possible, land required in addition for construction, for site compounds, would be returned to agricultural use. Crop loss can be reduced by giving advanced warning to enable farmers to plan ahead and consideration of field drainage impacts during the design phase. Severance during construction will be minimised through careful siting of construction compounds and lay down areas and careful planning of construction activities through consultation with the landowners, and mitigated in places by new temporary and permanent accesses.

12.9.12 In areas of land which would be temporarily acquired, soils would be managed in accordance with DEFRA (2009) ‘Construction Code of Practice for the Sustainable Use of Soils on Construction Sites’ whilst a Soils Management Plan would be followed which will include details of how agricultural land will be restored at the end of construction. Nuisance from noise, dust and visual impacts due to movement of construction vehicles will be mitigated through considerate construction management including the use of screening (temporary or permanent) which will be outlined in further detail in an Outline EMP to be

submitted as part of the ES with the DCO application.Ongoing consultation to take into account the individual needs of landowners and inform mitigation design if agreed. Appropriate financial compensation would be explored for landowners where temporary land acquisition is required, through the Compulsory Purchase Acquisition mechanism.

Tourism and Recreation

12.9.13 Use of best practice construction methods during construction will reduce disruption to users of facilities within the facility of the scheme. Where access is affected to businesses, temporary alternative access would be provided.

12.9.14 Nuisance due to noise, dust and visual impacts due to movement of construction vehicles will be mitigated through considerate construction management including the use of screening (temporary or permanent), which will be outlined in further detail in an outline EMP to be submitted in support of the ES with the DCO application.

Effects on People

12.9.15 Nuisance from noise, dust and visual impacts due to movement of construction vehicles will be mitigated through considerate construction management including the use of screening (temporary or permanent), which will be outlined in further detail in an outline EMP to be submitted as part of the ES with the DCO application.

12.9.16 PRoWs should remain open where possible and diverted if necessary, instead of closures, to allow active travel and recreational use by residents.Require the Early Contractor Involvement (ECI) contractor to advertise locally for sub-contractors and suppliers. Liaise with local colleges and job centres to explore training and employment opportunities through the construction process, including apprenticeships.

12.9.17 When work is required online a series of traffic management measures will be implemented including:

- Single way working of traffic in each direction maintained at all times; and
- Speed restriction in work areas for the safety of road users and the construction workforce. These restrictions will only be introduced when the works commence and will remain until a specific section was complete.

Operation Mitigation

Vehicle Travellers - Views from the Road

12.9.18 Landscape mitigation measures as outlined in Chapter 7 would consist of the landscape planting and principally designed with the intention of mitigating negative effects and benefiting nature conservation and biodiversity, landscape integration and visual amenity.

Vehicle Travellers – Driver Stress

12.9.19 Measures such as road layout, signage and junction arrangements have been designed to minimise driver stress. The majority of the scheme would have a national speed limit of 70mph.

Walkers, Cyclists and Horse-riders

12.9.20 Use of best practice design with regards to the safety of WCHs, including lighting, will improve the amenity of users of the footpaths in the surrounding areas. Additionally, landscaping that can provide screening of the road where possible and reduce noise level for the wider network of PRoW will also improve amenity for users.

12.9.21 Existing types of access to PRoW should be retained, for example, by not introducing new barriers such as stiles, which may restrict certain users.

12.9.22 The scheme would provide the following new WCH routes:

- Chiverton Junction underbridge;
- Chybucca Junction overbridge;
- Tressawen Road underbridge;
- Green bridge;
- Tolgroggan overbridge;
- Trevalso Lane underbridge;
- Penny-Come-Quick underbridge;
- Barrows Junction underbridge; and
- Newlyn Downs Walking, Cycling and Horse-riding Wildlife Crossing.

Community Severance

12.9.23 The mitigation measures for public rights of way, cycle routes and bridleways during the operation phase are set out above.

Land and Property

12.9.24 Severance during operation can be mitigated in places by the provision of permanent accesses.

12.9.25 Appropriate financial compensation would be explored for landowners where permanent land acquisition is required, through the Compulsory Purchase Acquisition mechanism.

Land used by Community

12.9.26 There would be no direct effects on community facilities as a result of land-take, construction works or the operation of the scheme and therefore no mitigation measures are required.

Tourism and Recreation

12.9.27 Severance during operation can be mitigated in places by the provision of permanent accesses.

12.9.28 Appropriate financial compensation would be explored for landowners of affected tourism and recreation facilities where permanent land acquisition is required, through the Compulsory Purchase Acquisition mechanism.

Effects on People

12.9.29 Nuisance due to noise, dust and visual impacts due to movement of construction vehicles will be mitigated through considerate construction management including the use of screening (temporary or permanent), which will be outlined

in further detail in an Outline EMP to be submitted as part of the ES with the DCO application.

12.9.30 Appropriate financial compensation would be explored for landowners where permanent land acquisition is required, through the Compulsory Purchase Acquisition mechanism.

12.9.31 Ongoing consultation to take into account the individual needs of landowners and inform mitigation design if agreed, such as the location of replacement access points.

12.10 Assessment of Effects

Construction Effects

Effects on Vehicle Travellers

Views from the road

12.10.1 The majority of the construction of the scheme would take place offline, which would minimise impacts on road users of the existing A30. The works at Chybucca and Tolgroggan would take place online.

12.10.2 Sources of construction effects on views from the road include:

- Temporary construction compounds;
- Stockpiling and storage of materials;
- Excavation and handling of materials;
- On and off-site construction traffic; and
- On-site plant.

12.10.3 In addition to the construction of new stretches of dual carriageway, there would be 8 construction compounds between Chiverton and Carland Cross at the following locations:

- Western compound at the existing Chiverton Cross Junction;
- Chiverton junction compounds at the new Chiverton grade-separated junction;
- Chybucca junction compound at the new Chybucca grade-separated junction;
- Tressawen Road Underbridge compound for bridge construction;
- Tolgroggan Over Bridge compound for bridge construction;
- Penny-Come-Quick Underbridge compound for bridge construction;
- Barrows Junction Underbridge compound; and
- Eastern compound at the new Carland Cross grade-separated junction.

12.10.4 It is not considered that the open views from the road along the Blackwater Bypass would be affected by the construction of the scheme. On the approach to Chiverton Cross Junction however vegetation clearance would likely be required which would open up the views at this location and would enhance visibility of the Western compound at Chiverton Cross Junction on a short-term basis.

12.10.5 The Chiverton Junction compounds at the new grade-separated junction and the construction of the new section of the A30 would be situated to the north of the existing A30 which, at this location, currently experiences closed views from the road due to relatively high hedgerows between the parallel sections of the A30 and A3075 until just after the two roads diverge. It is anticipated that any vegetation removal at this location would be minor and would not impact on views from the road. The high hedgerows would block the construction of the new junction from view.

12.10.6 Where the A30 and A3075 diverge, views from the A30 to the north and south are currently open, with higher elevation to the north and lower elevation to the south. During construction views to the north would be slightly disturbed by the construction works associated with the new stretch of road. It is considered that the existing long-distance views to the south would however counter-balance this impact.

12.10.7 From Chiverton to Chybucca, restricted views currently persist and, as the construction works would be carried out offline to the south of the existing A30, it is not considered that these views will be affected until the approach to Chybucca where the works will be carried out online as the existing and new road merge.

12.10.8 The views from the existing road approaching Chybucca are currently hindered by hedgerows and vegetation, which is reduced slightly where the existing A30 widens into two lanes. Construction of the new stretch of A30 and grade-separated junction would occur online and would likely result in some vegetation loss, which would have the benefit of opening up the views from the road to the surrounding countryside.

12.10.9 Where the existing A30 is proposed to be retained following Chybucca, views to the north are intermittent whilst views to the south are limited by the slightly higher elevation. Tressawen Road Underbridge compound and areas required for stone and soil stockpiles would be situated on the south of the existing A30 during construction. As the views are currently limited, this would likely have a temporary impact resulting in a closed view to the south but retaining the intermittent / open view to the north.

12.10.10 The approach to Marazanvose is unlikely to be impacted by the scheme as the views from the road are currently intermittent. At Marazanvose there is likely to be vegetation clearance as the works are carried out online which it is anticipated may result in an opening of views from the road to the surrounding landscape.

12.10.11 Along the Zelah bypass, views from the road are currently restricted, and the proposed construction of a new dual carriageway to the south would unlikely be visible except for a number of points along the road. This includes at the point where the two unnamed watercourses cross underneath the bypass. It is considered that the views from the road would not be significantly impacted in this section, and will remain as a restricted view.

12.10.12 Views from the existing road following Zelah Hill are currently intermittent and the construction of the new dual carriageway to the south would not impact upon these views. The views at Penny-come-quick open up and it is anticipated that the proposed dual carriageway would be visible in the long distance open views.

12.10.13 The view from the intersection of the B3285 and A30 looking northeast has been assessed in PEIR Chapter 7 Landscape and Visual as having a low susceptibility to change by the scheme. It is considered that this will remain restricted, with the hedgerows and long distance views of the road providing a funnelling effect along the road.

12.10.14 On the approach to Carland Cross, views are currently open with occasional interruption by hedgerows and dwellings. The construction of the new road and Carland Cross junction would likely dominate long distance views. This would be an adverse impact on views from the road by restricting visibility of the landscape.

12.10.15 Table 12-19 provides a breakdown of the magnitude of impact associated with the construction of the scheme.

Table 12-19 Magnitude of impact of scheme

Road section	Existing view	View during construction	Magnitude of impact
South of Chiverton Cross / Chiverton approach	Open / Restricted	Open / Open	Moderate beneficial
Chiverton to Chybucca	Restricted	Restricted	No change
Approach to Chybucca	Restricted	Open	Moderate beneficial
Chybucca to Marazanvose	Intermittent	Intermittent / open	Slight beneficial
Zelah	Restricted	Restricted	No change
Penny-come-quick	Open	Open	No change
B3285 and A30	Restricted	Restricted	No change
Approach to Carland Cross	Open	Open	No change

12.10.16 For the purposes of the assessment it has been assumed that vegetation clearance will only be required along the existing A30 where junctions would connect with the new A30 and where construction compound areas would be required. Where the existing A30 would be retained, it is assumed that vegetation clearance would not be required.

Driver Stress

12.10.17 The level of Driver Stress experienced on the existing A30 is considered to be high. Whilst a performance assessment of the existing A30 has not yet been undertaken, it is considered that the new scheme may result in an increase in the factors associated with Driver Stress during construction.

12.10.18 The majority of the construction works would take place offline, however at Chybucca and Tolgroggan the works would take place online. At these locations, the presence of construction personnel and machinery on the side of the road within close proximity of operational lanes would likely result in an increase in driver fear associated with the fear of potential accidents. Congestion is also anticipated at these locations, with speed restrictions and traffic management measures in place which may encourage slower moving traffic and thus driver frustration.

12.10.19 During construction, the presence of construction plant, temporary diversions and road works around the existing junctions at Chiverton and Carland Cross would likely lead to an increase in congestion which is likely to result in an increase in journey times. This would be temporary during construction however

it is likely that congestion and associated driver frustration would be particularly affected during peak hours, and during the tourist season.

12.10.20 There is potential for an increase in vehicle travellers to divert from the existing A30 and use the wider local road network rather than pass through the road works. This may also impact upon driver frustration, particularly for local travellers.

12.10.21 During construction, it is likely there would be an increase in vehicles on the road associated with the transportation of materials and other vehicles travelling to and from site. It is considered that this is likely to be less than 200 vehicles per day, but at peak times may result in an increase in driver fear due to the large vehicles necessary. It is assumed that construction vehicles will exit and enter the existing A30 through side roads and use side road networks where viable, which should help to mitigate impacts on the existing road.

12.10.22 Assuming no mitigation, the construction works would cause moderate disruption to vehicle travellers. The construction impacts on driver stress would be **temporary, short-term and moderate adverse**. However, traffic management measures would be implemented during the construction phase and any diversion routes would be clearly marked and signed during this period would reduce the construction impacts on driver stress to **short-term slight adverse**.

Bus Travellers

12.10.23 During the construction phase, the scheme would affect bus travellers access to two bus stops at Marazanvose (one in each direction) adjacent to the A30 and in close proximity to the Marazan Farm Campsite and Marazanvose Farm will be temporarily affected by construction works. The impact on bus travellers would be **short-term moderate adverse** if bus travellers are unable to get to important destinations on time, for example hospital appointments, school, college or work.

12.10.24 To mitigate the impact on bus services, early consultation with bus operators, provision of advance travel information for passengers and effective traffic management would be required. Furthermore, any temporary bus stops to be provided should be clearly signposted for the general public. With mitigation in place, the impact on bus travellers during the construction phase would reduce the effect to **short-term slight adverse**.

Relief from Existing Severance

12.10.25 Changes in new severance has been assessed for the A30 using the criteria outlined in Section 12.5 in terms of changes to pedestrian, cyclist and equestrian severance.

12.10.26 It has been identified that there would be no roads on the construction route that would have a decrease in traffic flow of 30% or more. It is therefore considered that construction traffic would have a **negligible** effect on the relief from existing severance and would not be significant.

Community Severance

12.10.27 During construction, the majority of WCH routes will be maintained. However, there would be temporary closures on Public Rights of Ways, cycleways and bridleways that would hinder WCH journeys and potentially increase journey lengths for pedestrians, cyclists and equestrians and potentially vulnerable users

such as school children and the elderly as set out in Table 12-20. Taking these factors into account, the predicted environmental construction effects on community severance are assessed as **slight - moderate adverse**.

12.10.28 The implementation of mitigation measures including diversions, the enforcement of a EMP and appropriate signage for pedestrians, cyclists and equestrians during construction where appropriate would ensure that overall effects on community severance are reduced and the effect is considered to be **slight adverse** and not significant.

Effects on Walkers, Cyclists and Horse-riders (WCHs)

12.10.29 During the construction phase, the following WCH routes listed in Table 12-20 would be affected prior to mitigation. Refer to Figure 12.4 for locations of WCH receptors.

Table 12-20 Construction impacts on WCHs prior to mitigation

Receptor	Description of impact	Sensitivity	Magnitude	Significance	Comments
Pavements/roadside paths at existing Chiverton Cross roundabout	Direct impact on pavements and roadside paths	Low	Minor	Slight adverse	Although not designated as PRoWs, there are pavements and roadside paths at the existing Chiverton Cross roundabout. These act as a safe means for WCHs to cross particularly as there is a desire line from residential properties to the east of Chiverton Arms to the west of the existing A30. Possible diversions in place during construction stage, this would have a slight adverse impact on pedestrians travelling between east of Chiverton Arms to the west of the existing A30.
Byway 314/1/1 (PRoW)	Indirect impact on amenity of PRoW users	Medium	Minor	Slight adverse	The bypass is accessed via the B3277 from the Chiverton Cross Roundabout where the bypass will join the existing A30. The level of use is low, unlikely to be used for utility journeys and to be part of a long distance path or national route. Construction activity may generate noise, dust and visual impacts from moving construction vehicles which could impact on the amenity of PRoW users.
Bridleway 314/64/1 (PRoW)	Indirect impact on amenity of equestrians using bridleway from construction activity	Medium	Minor	Slight adverse	The bridleway is north of the junction with B3284 at Callestick Vean, it is considered that the level of use of this bridleway is low, it is not part of a long distance path or national route. The proposed A30 will be directly adjacent to the bridleway. Construction activity may generate noise, dust and visual impacts from moving construction vehicles which could impact on the amenity of equestrians/horses.
Bridleway 314/65/1 (PRoW)	Indirect impact on amenity of equestrians using bridleway from construction activity	Medium	Minor	Slight adverse	The bridleway goes north from the existing A30 on the track leading to Creegmeor Farm. There is no visible signage, on the northern edge of the A30 at this point. In theory, it would be possible to cross from the entrance to the bridleway to the entrance of the B3284, south of the A30. However, due to the speed of the traffic on this section of road, it is considered that this is provides an unsuitable location for equestrian users to cross the road.

Receptor	Description of impact	Sensitivity	Magnitude	Significance	Comments
					Construction activity may generate noise, dust and visual impacts from moving construction vehicles which could impact on the amenity of equestrians/horses.
Bridleway 309/3/1 (PRoW)	Direct impact on severance of bridleway for equestrian users	Medium	Moderate	Moderate adverse	Bridleway 309/3/1 goes south from the existing A30 to the B2384. There are no visible crossing points, signage, or gaps in the hedge on the southern edge of the A30 at this point. Due to the speed of the traffic on this section of road, it is considered that this provides an unsuitable location for equestrian users to cross the road. In addition, there are no significant settlements that the bridleway connects. The level of use, as informed by the PRoW Condition Assessment, is assumed to be very low. However, during construction bridleway 309/3/1 will be severed during construction. Therefore, equestrians will not be able to use the bridleway and this would have a moderate adverse effect on equestrian users and community severance.
Footpath 314/67/1 (PRoW)	Indirect impact on amenity of PRoW users	Medium	Minor	Slight adverse	Footpath 314/67/1 connects the minor road at Lower Ventongimps to the existing A30. Construction activity may generate noise, dust and visual impacts from moving construction vehicles which could impact on the amenity of PRoW users.
National Cycle Network Route 32	Direct impact on WCH route	Medium	Minor	Slight adverse	It then goes north and crosses the existing A30 at Chiverton Lodge to then follow Henver Lane, and the B3285, where it joins with an unnamed section of the National Cycle Network. This spur from Route 32 travels along a short section of the A30 (approximate chainage 10600m to 11000m), before following the road south past Honeycombe Farm. The scheme crosses the unnamed section north of Honeycombe Farm. Construction activity may generate noise, dust and visual impacts from moving construction vehicles which could impact on the amenity of cyclists. PRoW will be maintained throughout construction, subject to review by contractors.

Receptor	Description of impact	Sensitivity	Magnitude	Significance	Comments
Quiet lane locally used by cyclists by NFH	Direct effect on WCH severance	Low	Minor	Slight adverse	Quiet lane locally used by cyclists by NFH to be stopped-up, this would have long term slight adverse effect on cyclists and pedestrians.
Footpath 319/16/1 (PRoW)	Direct impact on footpath severance for PRoW users	Medium	Moderate	Moderate adverse	Footpath 319/16/1 goes south west from the A30 at Marazanvose and east at NFH. Footpath traverses over agricultural field, likely to be used primarily for recreational purposes. During construction, footpath 319/16/1 will be severed. This would have a moderate adverse impact on community severance for pedestrians and cyclists.
Bridleway 319/9/1 (PRoW)	Direct impact on severance of bridleway for equestrian users	Medium	Moderate	Moderate adverse	Bridleway 319/9/1 joins with Footpath 319/1/2 and Bridleway 319/1/1 south of the existing A30, south of Zelah at the overbridge. 319/9/1 joins at its southern end to an unclassified road with national speed limit. Although not pedestrianised, is possible that users may use this section of road to link to Footpath 319/16/1. However, during construction bridleway 319/9/1 will be severed. This would have a moderate adverse impact on community severance for equestrians.
Footpath 319/1/2 (PRoW)	Indirect impact on amenity of PRoW user from construction activity	Medium	Minor	Slight adverse	Footpath 319/1/2 joins with the existing A30 and Bridleways 319/1/1 and 319/9/1 opposite Zelah Lane Farm. The PRoW is likely to be used for recreational purposes. Construction activity may generate noise, dust and visual impacts from moving construction vehicles which could impact on the amenity of PRoW users.
Bridleway 319/1/1 (PRoW)	Indirect impact on amenity of equestrians using bridleway from construction activity	Medium	Minor	Slight adverse	Bridleway 319/1/1 goes east from Henver Lane at Zelah Lane Farm goes over the existing A30. Construction activity may generate noise, dust and visual impacts from moving construction vehicles which could impact on the amenity of equestrians/horses.

Receptor	Description of impact	Sensitivity	Magnitude	Significance	Comments
Footpath 319/12/1 (PRoW)	Direct impact on severance of footpath	Medium	Moderate	Moderate adverse	PRoW 319/12/1 lies east of the A30 adjacent to Trevalso Cottage. This is shown as a small length of footpath on the definitive map which should in theory link to the A30 but in reality, does not actually appear to provide any through access, or link to any other PRoWs. The level of use, as informed by the PRoW Condition Assessment, is assumed to be very low. However, during construction footpath 319/12/1 will be severed. This would have a moderate adverse impact on community severance for pedestrians and cyclists.
Footpath 319/11/1 (PRoW)	Direct impact on severance of footpath	Medium	Moderate	Moderate adverse	Footpath 319/11/1 lies south of the A30 at Penny-Come-Quick and it is primarily used for access to residential properties, level of use is very low. However, during construction footpath 319/11/1 will be severed. This would have a moderate adverse impact on community severance for pedestrians and cyclists.
Quiet lane to be stopped up at Penny-come-Quick	Direct impact on WCHs	Low	Moderate	Slight adverse	Part of the quiet lane located south of the scheme at Penny-come-Quick will be severed during construction stage. This would have a moderate adverse effect on WCHs and community severance.
Bridleway 321/14/2 (PRoW)	Indirect impact on amenity of equestrians using bridleway from construction activity	Medium	Minor	Slight adverse	Bridleway 321/14/2 is located in close proximity to Carland Cross Roundabout and is adjacent to the A39. Construction activity may generate noise, dust and visual impacts from moving construction vehicles which could impact on the amenity of equestrians/horses.
Pavements/roadside paths at existing Carland Cross roundabout	Direct impact on pavements and roadside paths	Low	Minor	Slight adverse	Although not designated as PRoWs, there are pavements and roadside paths at the existing Carland Cross roundabout. These act as a safe means for WCHs to cross. Possible diversions in place during construction stage, this would have a slight adverse impact on pedestrians accessing the Carland Cross Bed and Breakfast and the Shell Garage.

12.10.30 It is assumed that all footpaths, cycle routes and bridleways proposed to be retained in the permanent operational scheme will be maintained during construction with local temporary diversions as required. It may be possible that temporary closures will be required but these will be for short periods and will be agreed with the Local Authority PRoW Officer and the relevant user groups. Nuisance due to noise, dust and visual impacts due to movement of construction vehicles will be mitigated through considerate construction management including the use of screening (temporary or permanent), which will be outlined in further detail in an Outline EMP to be submitted in support of the ES with the DCO application.

12.10.31 With mitigation in place, the effects on pedestrians, cyclists and equestrians would reduce from short term **slight-moderate adverse** to **slight adverse**.

Effects on Land and Property

Commercial properties

12.10.32 The impacts on commercial properties prior to mitigation during the construction phase are shown in Table 12-21. All commercial receptors are shown on Figure 12.2. The majority of commercial properties affected by the scheme are relatively specialised in terms of their operations (for example locational requirements).

12.10.33 It is assumed that during the construction phase, all access to commercial properties will remain open.

Table 12-21 Construction impacts on commercial properties prior to mitigation

Receptor	Description of impact	Sensitivity	Magnitude	Significance
Commercial properties				
Chiverton Caravan and Touring Park Ref 16 on Figure 12.2	Possible impacts on access to Chiverton Caravan and Touring Park from temporary traffic management via the Chiverton Cross roundabout. Possible temporary noise and dust impacts during construction activities.	High	Minor	Slight adverse
Trevarth Holiday Park Ref 17 on Figure 12.2	Possible impacts on access to Trevarth Holiday Park from temporary traffic management via the Chiverton Cross roundabout. Possible temporary noise and dust impacts during construction activities.	High	Minor	Slight adverse
Esso and Total Garages at Chiverton Cross Roundabout Ref 1 and 2 on Figure 12.2	Possible impacts on access to Esso and Total garages from temporary traffic management for vehicle travellers accessing Esso and Total garages via Chiverton Cross roundabout. Possible temporary impacts from noise and dust during construction activities.	High	Minor	Slight adverse
Starbucks at Chiverton Cross Roundabout Ref 3 on Figure 12.2	Possible impacts on access to Starbucks from temporary traffic management via Chiverton Cross roundabout. Possible temporary impacts from noise and dust during construction activities.	High	Minor	Slight adverse
Chiverton Arms Ref 4 on Figure 12.2	Possible impacts on access to Chiverton Arms from temporary traffic management via Chiverton Cross roundabout.	High	Minor	Slight adverse
Chiverton Equestrian Centre Ref 15 on Figure 12.2	Possible impacts on access to Chiverton Equestrian Centre from temporary traffic management via B3277 and A3075	High	Minor	Slight adverse
Trevissome Park Offices along A30 Ref 5 on Figure 12.2	Possible impacts on access to Trevissome Park from temporary traffic management via the A3075 and the A30. Possible temporary noise and dust impacts during construction activities.	High	Minor	Slight adverse
Allstore, Pendown Ref 6 on Figure 12.2	Possible impacts on access to Allstore from temporary traffic management particularly as HGVs accessing the site generally use the Chiverton Roundabout and come back along the A3075	High	Minor	Slight adverse

Receptor	Description of impact	Sensitivity	Magnitude	Significance
Truro Sawmills, Penhallow Ref 7 on Figure 12.2	Possible impacts on access to Truro Sawmills from temporary traffic management particularly as HGVs accessing the site generally use the Chiverton Roundabout and come back along the A3075 or along the B3284 off the A30.	High	Minor	Slight adverse
Town and Country Motors, Marazanvose Ref 8 on Figure 12.2	Possible impacts on access to Town and Country Motors from temporary traffic management via A30. Possible temporary noise and dust impacts during construction activities.	High	Minor	Slight adverse
Marazan Farm Campsite Ref 9 on Figure 12.2	Marazan Farm Campsite would be demolished by the scheme and would cease to operate.	High	Major	Large adverse
NFH Ref 10 on Figure 12.2	Demolition of a barn with planning permission for conversion to a one-bedroom house. Possible impacts on access to NFH from temporary traffic management via A30. Possible temporary noise and dust impacts during construction activities.	High	Moderate	Moderate adverse
Hawkins Arms, Zelah Ref 11 on Figure 12.2	Possible impacts on access to Hawkins Arms from temporary traffic management via A30	High	Minor	Slight adverse
Parklands Toyota at Carland Cross roundabout Ref 13 on Figure 12.2	Possible impacts on access to Parklands Toyata from temporary traffic management via A30. Possible temporary noise and dust impacts during construction activities.	High	Minor	Slight adverse
Shell Garage at Carland Cross roundabout Ref 12 on Figure 12.2	Possible impacts on access to Shell Garage from temporary traffic management via A30. Possible temporary noise and dust impacts during construction activities.	High	Minor	Slight adverse
Carland Cross Windfarm (ScottishPower Renewables) Ref 14 on Figure 12.2	Possible impacts on access to Carland Cross windfarm due to temporary traffic management via A30 as access to the windfarm would be severed.	High	Minor	Slight adverse

12.10.34 Besides the demolition of Marazan Farm campsite and effects at NFH, the overall impact on commercial properties during construction is short-term slight adverse. With mitigation in place, these impacts would remain as **short-term slight adverse**. Mitigation in the form of appropriate financial compensation for landowners where permanent land acquisition is required and new accesses provided would also reduce the significance of impacts at NFH to **slight adverse.**

Agricultural Land

12.10.35 The impacts on agricultural land prior to mitigation arising from the construction of the scheme are shown in Table 12-22. The ALC of this land is also illustrated in PEIR Figure 12.3. The data shows that 18.4 hectares of agricultural land will be required temporarily, and 109.9 hectares will be required permanently. Of this, BMV land comprises 100.0% of the land required temporarily and 78.3% of land required permanently. BMV land is in grades 2 and 3a, with no land required in grade 1, therefore the construction of the scheme would result in a **moderate adverse** impact on agricultural land within the study area.

Table 12-22: Impacts on agricultural land

	Temporary	Permanent
Total land	23.6 ha	185.2 ha
Total ALC agricultural land required	18.4 ha	109.9 ha
Total BMV agricultural land required	18.4 ha	86.0 ha
% of land required that is BMV land	100.0%	78.3%

12.10.36 Consultation with landowners would be ongoing to account for individual needs and inform mitigation. Mitigation measures would be put in place, including careful planning of construction activities and siting of construction compounds, advance warning to enable farmers to plan ahead, and temporary alternative accesses where access to land is affected.

12.10.37 Where land is acquired temporarily, soils would be managed in accordance with DEFRA (2009) ‘Construction Code of Practice for the Sustainable Use of Soils on Construction Sites’, and a Soils Management Plan would be followed. Wherever possible, land required temporarily would be returned to agricultural use. Appropriate financial compensation would be explored for landowners where land acquisition is required, through the Compulsory Purchase Acquisition mechanism.

12.10.38 Mitigation would reduce the impact of temporary land requirements to **short-term slight adverse.** Given the amount of BMV land that would be required permanently, however, the overall long-term impact remains **moderate adverse.**

12.10.39 A more detailed assessment of impacts on agricultural land will be provided in the Environmental Statement. This will include an assessment of the impact on each farm or land holding, including the total area of land to be acquired on each plot, and the proportion of BMV land.

Community Land

12.10.40 There is no Common Land which will be impacted by the scheme. Although a smaller section of open access land located around a disused quarry

immediately adjacent and to the south of the A30 approximately 250m west of Carland Cross junction would be affected by the construction stage of the scheme. The quarry is currently inaccessible by the general public due to undergrowth and the quarry is not used for recreational purposes, therefore during the construction stage the scheme would have a **negligible** effect on community land.

Development Land

12.10.41 Although it is anticipated that a further 610 dwellings are to be built in the Community Network Area of St Agnes and Perranporth before 2030, the scheme traverses through rural land which has not been designated for development and therefore it is considered there would be no impacts on development land during construction.

Tourism and Recreation

Strategic access

12.10.42 It is assumed that, during the construction phase, all access to commercial properties will remain open. There may, however, be some congestion and delays where the scheme would tie in with the existing A30, resulting in increased journey times. This may cause a temporary reduction in the accessibility or perceived accessibility of Cornwall as a tourism destination, particularly during the summer peak.

12.10.43 As established above, approximately 80% of the 20 million staying and day visitors who travel to Cornwall each year arrive by private car, with smaller proportions travelling by bus, coach and by hire car. Given the importance of the A30 as a key route for visitors travelling to Cornwall by road, any impact on the accessibility or perceived accessibility of the county due to congestion and delays arising from the construction of the scheme could result in **short-term moderate adverse** effects on tourism across Cornwall.

12.10.44 Traffic management measures would be implemented during the construction phase, with any diversion routes clearly marked and signed. This would reduce the significance of effects on strategic access to **short-term slight adverse.**

Direct effects on local tourism and recreation facilities

12.10.45 As well as affecting strategic access, congestion, delays and increased journey times during construction could also cause a temporary reduction in access to tourism and recreation facilities within the study area, or a perception of reduced access. This could result in **short-term slight adverse** effects on tourism receptors within the study area, including those accessed from the A30.

12.10.46 The assessment of effects on land and property has identified possible effects as a result of temporary traffic management during construction for the following tourism and recreation facilities:

- Chiverton Caravan and Touring Park;
- Trevarth Holiday Park;
- Chiverton Arms;
- Chiverton Equestrian Centre;
- Marazan Farm Campsite;

- NFH; and
- Hawkins Arms, Zelah.

12.10.47 Mitigation measures would be in place including traffic management. However, the effect on these facilities would remain **short-term slight adverse.**

12.10.48 Construction of the scheme would require the demolition of a barn at NFH, which has planning permission for conversion to a one-bedroom house. The assessment of effects on land and property identifies this as a **moderate adverse** effect, which would reduce to **slight adverse** following the provision of mitigation in the form of a new access route and financial compensation for the affected landowners.

12.10.49 The construction of the scheme would also require the demolition of a house and outbuildings at Marazan Farm Campsite. It is understood that Marazan Farm Campsite would cease to operate, resulting in a **long-term large adverse effect.** Mitigation would be in place in the form of appropriate financial compensation for the affected landowners.

In-combination effects on amenity for local tourism and recreation facilities

12.10.50 Certain tourism receptors – including accommodation, food and drink providers, and some tourist attractions – can be more sensitive to changes in their operating environment. Indirect amenity effects can arise as a result of a combination of two or more significant environmental effects such as noise, air quality, and visual effects arising during the construction of the scheme. As discussed in section 12.4 above, the potential for indirect amenity effects for specific receptors can only be assessed where relevant information is provided in the Air Quality, Noise and Vibration, and Landscape and Visual assessments.

12.10.51 During construction, the noise assessment identifies temporary significant effects at NFH, and at Trevarth Holiday Park. The landscape and visual assessment identifies a slight adverse effect for users of holiday accommodation at NFH that is not considered significant. It does not identify visual effects for users of Trevarth Holiday Park. The air quality assessment identifies no significant impacts at any sensitive receptor location along the A30. Therefore no in-combination effects on amenity have been identified for tourism receptors as a result of the construction of the scheme, and the effect is considered **neutral.**

Effects on People

Employment

12.10.52 The scheme would result in the demolition of Marazan Farm campsite. Disturbance to people's living and social environment and routine may precipitate stress and health deterioration in relocated individuals[17]. Employment and income are among the most significant determinants of long-term health, influencing a range of factors including the quality of housing, education, diet,

[17] Heller, T., 1982, The Effects of Involuntary Residential Relocation: A Review, American Journal of Community Psychology, 10 (4): 471- 492, cited in BAA, 2008, The G2 Project: A Health Impact Assessment, Annex A. HIA Gateway, West Midlands Public Health Observatory

lifestyle, coping skills, access to services and social networks[18]. The loss of business would cause a **moderate-large adverse effect** on the business owner. However appropriate financial compensation would be explored for landowners where permanent land acquisition is required, through the Compulsory Purchase Acquisition mechanism.

12.10.53 During construction, the scheme would provide employment for construction workers. The site workforce could be approximately 50-100 staff at any one time and would consist of management and administration staff, civil and structural engineers/surveyors, machine drivers, ground workers, steel fixers and electricians. This could benefit some local people, although it was identified in the baseline that unemployment in Cornwall is below average. Skilled workers would be required for many of the roles available but there would also be opportunities for lower skilled workers and potentially for training and apprenticeships. This could help to retain people within the 16-29 age range, who are under-represented within the study area.

12.10.54 The construction of the scheme could support the local economy through the increased use of services by construction workers and through the supply chain, depending on the demand for locally sourced materials and services. There is also a potential for increased congestion caused by construction traffic to temporarily impact on local businesses by disrupting access for workers, customers and suppliers.

12.10.55 Overall, there is potential for probable **short-term moderate beneficial** health and well-being effects associated with employment and economic activity during the construction phase.

Access to services

12.10.56 During construction, there may be some congestion and delays where the scheme would tie in with the existing A30. This may cause increased journey times and a reduction in the reliability of bus services. Temporary impacts on public and cycle routes are also anticipated such as short lengths of diversions. This may cause a temporary reduction in the accessibility of services within Blackwater, Zelah and Truro. This could result in **short-term slight adverse** effects on bus users, particularly the elderly, and private car users but also cyclists and pedestrians who rely on the PRoWs to access these services.

12.10.57 Traffic Management Measures will be planned and approved and will include provision of both pedestrians and cyclists to travel safely through the construction works. To mitigate the impact on bus services, early consultation with bus operators, provision of advance travel information for passengers and effective traffic management would be required. With mitigation measures in place, the effect on access to services during the construction stage is considered to be not significant.

Neighbourhood Quality

12.10.58 During construction, the character of the small settlements along the A30 such as Zelah, Blackwater and Tresawen would be affected by the visual appearance

[18] Beland, F., Birch, S. and Stoddart, G. (2002), Unemployment and health: contextual level influences on the production of health in populations. Social Science and Medicine, Volume 55, pp. 2033-2052; Stafford, M., Marjkainen, P., Lahelma, E., and Marmot, M. (2005)

of construction activities including the presence of compounds, earthworks and machinery. Noise from construction works would be **temporarily significant** at the following residential locations, the assessment locations given below which represent these areas are shown on Figure 11.1 within Chapter 11 Noise and Vibration of the ES:

- Highfield (also representative of The Annex and Burrow Farm),
- Roscarnick Farm,
- Elmsleigh (also Barn Wyn, Treffry Cottage, 1 The Cottages, Ranger Barn),
- Henver Lane Cottage (also Henver Cottage),
- Pennycomequick; and
- Honeycombe Barn (also Honeycombe House and residential Caravan).
- The Stables and nearby residences,
- Callestick Vean Bungalow,
- Nancarrow Villa,
- Zelah Lane Farm, Zelah Lane Farm Annexe, Trolgroggan Bungal, Chapel Cottage, The Nook Zelah Lane and The Chapel; and
- 2 Church Lane and nearby residences.

12.10.59 The temporary construction works could affect the residents' neighbourhood amenity, which could have the potential to introduce disturbance or affect health without appropriate mitigation.

12.10.60 Air emissions from construction vehicles and machinery would not lead to any direct health effects. The dwellings nearest to the scheme would be at risk of dust impacts from earthworks, but with mitigation in place, dust emissions will be minimised. However, any occurrence of dust deposition would add the perception of overall impact on local amenity during construction. Impacts from construction emissions or construction dust will be managed through the implementation of mitigation measures to be detailed in the scheme CoCP.

12.10.61 The combination of construction impacts may lead to a reduction in local residents' satisfaction with their living environment, and potential changes in behaviours such as use of footpaths and outdoor spaces. This impact would cause a **short term moderate adverse** effect to neighbourhood quality and overall wellbeing for local residents.

12.10.62 Nuisance due to noise, dust and visual impacts due to movement of construction vehicles will be mitigated through considerate construction management including the use of screening (temporary or permanent), which will be outlined in further detail in an Outline EMP to be submitted as part of the ES with the DCO application. With mitigation in place, the effect on neighbourhood amenity during the construction stage is considered to be not significant.

Access to green space and physical activity

12.10.63 The footpaths, bridleways and cycle networks in the vicinity of the scheme as outlined in Figure 12.1 and 12.4 are largely used for recreational purposes, rather than for commuting purposes. During construction, some routes may experience disruption as outlined in Table 12-20. Routes may need to be diverted, potentially increasing travel time and causing further disruption. Construction noise and dust and the visual impact from construction equipment may impact the amenity of the route for pedestrians and cyclists. This may deter

people from using the area for physical activity, reducing their access to the health benefits of exercise.

12.10.64 The presence of construction sites near the local road network has the potential to discourage residents to access nearby green space due to reduced amenity and safety concerns. This has the potential to temporarily reduce levels of active travel and its associated health benefits, this impact would be **temporary slight adverse.**

12.10.65 Traffic Management Measures will be planned and approved and will include provision of both pedestrians and cyclists to travel safely through the construction works. Nuisance due to noise, dust and visual impacts due to movement of construction vehicles will be mitigated through considerate construction management including the use of screening (temporary or permanent), which will be outlined in further detail in an Outline EMP to be submitted in support of the ES with the DCO application. With mitigation in place, the effect on access to green space and physical activity during the construction stage is considered to be not significant.

Housing

12.10.66 The construction of the scheme would result in the demolition of one residential property at Marazan Farm. This would result in a **large adverse** effect for residents of this property. Appropriate financial compensation would be explored for landowners where permanent land acquisition is required, through the Compulsory Purchase Acquisition mechanism.

12.10.67 The site workforce could be approximately 50-100 staff at any one time and would consist of management and administration staff, civil and structural engineers/surveyors, machine drivers, ground workers, steel fixers and electricians. There would be positive effects from the construction workforce on local rental market assuming that most would seek temporary accommodation in Truro as it is the closest town.

12.10.68 For those residents of properties in close proximity to the construction site, there is potential for construction activity, e.g. construction noise and traffic, to affect the residential amenity of these properties, this is considered to be a **temporary slight adverse effect**.

12.10.69 Nuisance due to noise, dust and visual impacts due to movement of construction vehicles will be mitigated through considerate construction management including the use of screening (temporary or permanent), which will be outlined in further detail in an Outline EMP to be submitted in support of the ES with the DCO application. With mitigation in place, the effect on housing from noise, dust and visual impacts during the construction stage is not considered to be significant.

Community Safety

12.10.70 During the construction phase, there would be temporary increased Heavy Goods Vehicle (HGVs) movements and change in road layout. Construction traffic for any delivery of new materials to site will primarily use the existing A30 but will access the construction site and compounds off the associated side roads, including the A390, B3284, A39, Allet Road, Shortlanesend Road and Penny-Come-Quick Road. A haul road will be established by the contractor

through the site, and it is assumed that site-won material will be moved within the site using the haul road rather than the existing A30, with plant crossings required on some of the side roads. Full details will be confirmed in the Buildability Report, which will be prepared for the ES. The temporary increased HGV movements and change in road layout could increase risk of accidents. This would cause **temporary slight adverse** effect to local residents in Blackwater, Zelah and Tresawen.

12.10.71 When work is required online, a series of traffic management measures will be implemented including single way working of traffic in each direction maintained at all times. A mandatory 40mph speed limit would be imposed where construction occurs in the vicinity of the existing A30. With mitigation in place, the effect on community safety during the construction stage is considered to be not significant.

Operation Effects

Effects on Vehicle Travellers

Views from the road

12.10.72 Operational effects have been considered with respect to views from the existing A30 road. The existing A30 provides a positive experience with occasional long distance views over the surrounding agricultural landscape.

12.10.73 The views from the existing A30 of the new grade separated junction at Chiverton and the stretch of dual carriageway following would be limited by vegetation and hedgerows. Upon approach to Chybucca, the existing A30 would merge with the new A30 and the Chybucca grade separated overbridge would be visible in the foreground for a short distance, maintaining a restricted view.

12.10.74 The views from Chybucca to Marazanvose would remain intermittent, with the new road entering sight occasionally through the gaps in the vegetation. The merging of the two roads at Marazanvose has the potential to open up the views from the elevated road, providing the driver with views over longer distances.

12.10.75 At Zelah, the close alignment of the existing A30 with the new road may result in the loss of some vegetation which may open up the views of the landscape. The existing road is at a higher elevation than the new road at this location and thus the new road may restrict these views.

12.10.76 On the approach to Carland Cross, long distance views from the existing A30 would be limited by the grade separated overbridge.

12.10.77 Mammal crossings and junction features would serve to provide additional visual interest for vehicle travellers along the route of the existing A30.

12.10.78 For the purposes of this assessment it has been assumed that the removal of any vegetation during construction would be replanted. It is assessed that on balanced the scheme would have a **moderate adverse** impact on views from the road. Landscape mitigation measures as outlined in Chapter 7 would consist of the landscape planting and principally designed with the intention of mitigating negative effects and benefiting nature conservation and biodiversity, landscape integration and visual amenity. With mitigation in place, the impact of the scheme on views from the road would reduce the impact to **slight adverse**.

Driver Stress

12.10.79 The operation of the scheme may result in initial driver uncertainty resulting from unfamiliarity of the new road layout, however it is assumed that this will be designed out with the dual carriageway standards of road signing that would be incorporated into the scheme.

12.10.80 The scheme is anticipated to reduce driver frustration as a result of reduced congestion on the A30 with fewer delays and a more reliable route, resulting in ease of traffic flow.

12.10.81 The scheme is also anticipated to reduce driver fear as a result of the additional dual carriageway standards, increased width which complies to modern carriageway standards with additional lay-bys and the reduction in frequency of hidden junctions. Reduced frustration is also likely to be an output of the improved road surfacing which would reduce spray and noise generation.

12.10.82 It is assessed that on balance the scheme would provide a **long-term, moderate beneficial effect** on drivers' stress levels.

Bus Travellers

12.10.83 The scheme is anticipated to increase the reliability of bus services as a result of reduced congestion on the A30 with fewer delays and a more reliable route, resulting in ease of traffic flow. It is assessed that on balance the scheme would provide a **long-term, moderate beneficial effect** on bus travellers.

Relief from existing severance

12.10.84 Table 12-11 within Section 12.5 indicates that the scheme would not have more than a 30% reduction in traffic flow. Therefore, the impact of relief from existing severance on pedestrians, cyclists and equestrians would have a **negligible** effect.

Community Severance

12.10.85 As part of the scheme, the following WCH routes would be stopped up as further outlined in Table 12-20. This would have a **moderate adverse** effect community severance as pedestrians, cyclists and equestrians are no longer to use these routes to access nearby community facilities:

- bridleway 309/3/1;
- footpath 319/11/1; and
- footpath 319/12/1.

12.10.86 Mitigation opportunities have been identified for the pedestrians, cyclists and equestrians and are further reinforced as mitigation for community severance. They include the following:

- Chiverton Junction underbridge;
- Chybucca Junction overbridge;
- Tressawen Road underbridge;
- Green bridge;

- Tolgroggan overbridge;
- Trevalso Lane underbridge;
- Penny-Come-Quick underbridge; and
- Barrows Junction underbridge.

The proposed mitigation would improve WCH access throughout the operation of the scheme and offer an enhanced access to nearby community facilities along the A30 particularly at Tolgroggan overbridge and Trevalso Lane allowing cyclists and pedestrians to access community facilities at Zelah. The scheme would have a **slight beneficial** impact on community severance and is therefore not considered to be significant.

Walkers, Cyclists and Horse-riders (WCHs)

12.10.87 During the operational phase, the following WCH routes listed in Table 12-23 would be affected prior to mitigation. Figure 12.4 shows the location of WCH receptors.

Table 12-23 Operational impacts on WCHs prior to mitigation

Receptor	Description of impact	Sensitivity	Magnitude	Significance	Comments
Non-PRoW route at existing Chiverton Cross roundabout	Complete closure of pavements/roadside paths on existing Chiverton Cross roundabout. New 2.5m shared foot/cycleway on external edge of circulatory carriageway at Chiverton Cross junction. 2.5m shared footway/cycleway off carriageway on existing A30 northern verge	Low	Moderate	Slight beneficial	Complete closure of the pavements/roadside paths on existing Chiverton Cross roundabout. New 2.5m shared foot/cycleway on external edge of circulatory carriageway at Chiverton Cross junction. A 2.5m shared footway / cycleway off carriageway on existing A30 northern verge would be provided Cyclists travelling west could join the slip road carriageway at the crossing and travel to slip road. An underbridge would be provided at Chiverton Cross; this would provide pedestrians and cyclists a new access route and keep connectivity between north and south of the A30. This would have a slight beneficial effect for pedestrians and cyclists by reducing severance caused by road traffic between residual areas and community facilities. This reduction in severance may encourage increased travel by active modes.
Byway 314/1/1	Direct effect on amenity of PRoW user	Medium	Minor	Slight beneficial	The bypass is accessed via the B3277 from the Chiverton Cross Roundabout where the bypass will join the existing A30. The level of use is low, unlikely to be used for utility journeys and to be part of a long distance path or national route. WCH connectivity is retained, linking byway 314/1/1 to the A30
Bridleway 314/64/1	Direct effect on amenity of equestrians using bridleway from construction activity	Medium	Minor	Slight beneficial	The bridleway is north of the junction with B3284 at Callestick Vean, it is considered that the level of use of this bridleway is low, it is not part of a long distance path or national route. The proposed A30 will be directly adjacent to the bridleway. WCHs would use the new realigned carriageway linking Bridleway 314/64/1 to the A30
Bridleway 314/65/1	No indirect/direct effect on this WCH route	Medium	No change	Neutral	This WCH route will be maintained throughout the operation stage. There will be no change to the amenity or length of the WCH route.
Chybucca junction	Direct effect on WCHs - a new junction at Chybucca would provide a 3.0m	Low	Minor	Slight beneficial	A new junction at Chybucca would provide a 3.0m shared foot/cycleway on both sides of the carriageway. A

Receptor	Description of impact	Sensitivity	Magnitude	Significance	Comments
	shared foot/cycleway on both sides of the carriageway. A new underbridge would also be provided.				new underbridge would be provided at Chybucca junction. This would have a slight beneficial effect for pedestrians and cyclists by reducing severance caused by road traffic between residual areas and community facilities. This reduction in severance may encourage increased travel by active modes. The new underbridge would enhance connectivity for cyclists travelling along the B3284.
Bridleway 309/3/1	Direct effect on severance of bridleway for equestrian users	Medium	Moderate	Moderate adverse	Bridleway 309/3/1 goes south from the existing A30 to the B2384. There are no visible crossing points, signage, or gaps in the hedge on the southern edge of the A30 at this point. Due to the speed of the traffic on this section of road, it is considered that this provides an unsuitable location for equestrian users to cross the road. In addition, there are no significant settlements that the bridleway connects. The level of use, as informed by surveys of the PRoWs within the footprint of the scheme undertaken in July 2016), is assumed to be very low. However, during operation stage Bridleway 309/3/1 will be stopped up therefore equestrians will no longer be able to use this as a bridleway. This would have a moderate adverse effect on equestrians and community severance.
Tresawen Road underbridge	Direct effect on WCHs	Low	Moderate	Slight beneficial	This would have a slight beneficial effect for pedestrians and cyclists by reducing severance caused by road traffic between Tresawen and businesses south of the existing A30. This reduction in severance may encourage increased travel by active modes.
Quiet lane locally used by cyclists by NFH	Direct effect on WCH severance	Low	Minor	Slight adverse	Quiet lane locally used by cyclists by NFH to be stopped-up, this would have long term slight adverse effect on cyclists and pedestrians. However, a new 3m wide footpath to be provided between the quiet lane and proposed green bridge over the scheme.
New footpath and green bridge	Direct effect on WCHs - New 3m wide footpath to be provided between the	Low	Minor	Slight beneficial	A new 3m wide footpath to be provided between the quiet lane locally used by cyclists and the proposed

Receptor	Description of impact	Sensitivity	Magnitude	Significance	Comments
	quiet lane and proposed green bridge over the scheme				green bridge over the scheme. This would have a slight beneficial effect for pedestrians and cyclists by increasing connectivity.
National Cycle Network Route 32	No indirect/direct effect on this WCH route	Medium	No change	Neutral	It then goes north and crosses the existing A30 at Chiverton Lodge to then follow Henver Lane, and the B3285, where it joins with an unnamed section of the National Cycle Network. This spur from Route 32 travels along a short section of the A30 (approximate chainage 10600m to 11000m), before following the road south past Honeycombe Farm. The scheme crosses the unnamed section north of Honeycombe Farm. This WCH route will be maintained throughout the operation stage. There will be no change to the amenity or length of the WCH route.
Footpath 314/67/1	No indirect/direct effect on this WCH route	Medium	No change	Neutral	Footpath 314/67/1 connects the minor road at Lower Ventongimps to the existing A30. This WCH route will be maintained throughout the operation stage. There will be no change to the amenity or length of the WCH route.
Footpath 319/16/1	Direct impact on footpath severance for PRoW users	Medium	Minor	Slight beneficial	Footpath 319/16/1 goes south west from the A30 at Marazanvose and east at NFH. Footpath traverses over agricultural field, likely to be used primarily for recreational purposes. During operation, a new green bridge to cross the new dual carriageway. This would have a slight beneficial effect on WCHs increasing connectivity and providing aesthetic surroundings.
New footpath	Direct impact on WCHs	Low	Minor	Slight beneficial	A new 3m footpath to link between existing crossing steps through new footpath culvert and back to Church Lane. This new footpath would have a slight beneficial effect to for pedestrians and cyclists by reducing severance caused by road traffic between Church Lane and south of the proposed A30. This reduction in severance may encourage increased travel by active modes.
Bridleway 319/9/1	Direct impact on equestrian users	Medium	No change	Neutral	Bridleway 319/9/1 joins with Footpath 319/1/2 and Bridleway 319/1/1 south of the existing A30, south of

Receptor	Description of impact	Sensitivity	Magnitude	Significance	Comments
					Zelah at the overbridge. 319/9/1 joins at its southern end to an unclassified road with national speed limit. Although not pedestrianised, is possible that users may use this section of road to link to Footpath 319/16/1. However, this bridleway will be severed during operation by the scheme and will be replaced by a new bridleway adjacent to match existing bridleway 319/9/1 therefore there would be a neutral effect on equestrians using the new bridleway.
Tolgroggan Overbridge	Direct impact on WCHs	Low	Medium	Slight beneficial	This would have a slight beneficial effect for pedestrians and cyclists by reducing severance caused by road traffic caused by the A30. This reduction in severance may encourage increased travel by active modes.
Trevalso Lane underbridge	Direct impact on WCHs	Low	Medium	Slight beneficial	This would have a slight beneficial effect for pedestrians and cyclists by reducing severance caused by road traffic along the A30. This reduction in severance may encourage increased travel by active modes.
Footpath 319/1/2	No indirect/direct effect on this WCH route	Medium	No change	Neutral	Footpath 319/1/2 joins with the existing A30 and Bridleways 319/1/1 and 319/9/1 opposite Zelah Lane Farm. The PRoW is likely to be used for recreational purposes. This WCH route will be maintained throughout the operation stage. There will be no change to the amenity or length of the WCH route.
Bridleway 319/1/1	No indirect/direct effect on this WCH route	Medium	No change	Neutral	Bridleway 319/1/1 goes east from Henver Lane at Zelah Lane Farm goes over the existing A30. This WCH route will be maintained throughout the operation stage. There will be no change to the amenity or length of the WCH route.
Footpath 319/12/1	Direct impact on severance of footpath	Medium	Moderate	Moderate adverse	Footpath 319/12/1 lies east of the A30 adjacent to Trevalso Cottage. This is shown as a small length of footpath on the definitive map which should in theory link to the A30 but in reality does not actually appear to provide any through access, or link to any other PRoWs. The level of use, as informed by the PRoW Condition Assessment, is assumed to be very low.

Receptor	Description of impact	Sensitivity	Magnitude	Significance	Comments
					During operation, footpath 319/12/1 will be stopped up therefore WCHs will no longer be able to use this PRoW, this would have a moderate adverse effect on WCHs connectivity to nearby facilities.
Footpath 319/11/1	Direct impact on severance of footpath Indirect impact on amenity of PRoW user from construction activity	Medium	Moderate	Moderate adverse	Footpath 319/11/1 lies south of the A30 at Penny-Come-Quick and it is primarily used for access to residential properties, level of use is very low. During operation, footpath 319/11/1 will be stopped up therefore WCHs will no longer be able to use this as a footpath. This would have a moderate adverse effect on WCHs and community severance.
Quiet lane to be stopped up at Penny-come-Quick	Direct impact on WCHs	Low	Moderate	Slight adverse	Part of the quiet lane located south of the scheme at Penny-come-Quick will be stopped-up during operation stage. This would have a moderate adverse effect on WCHs and community severance.
Penny-come-Quick underbridge	Direct impact on WCHs	Low	Moderate	Slight beneficial	This would have a slight beneficial effect for pedestrians and cyclists by reducing severance caused by road traffic along A30. This reduction in severance may encourage increased travel by active modes.
Bridleway 321/14/2	No indirect/direct effect on this WCH route	Medium	No change	Neutral	Bridleway 321/14/2 is located in close proximity to Carland Cross Roundabout and is adjacent to the A39. This WCH route will be maintained throughout the operation stage. There will be no change to the amenity or length of the WCH route.
Barrows Junction Underbridge	Direct impact on WCHs	Low	Medium	Slight beneficial	This would have a slight beneficial effect for pedestrians and cyclists by reducing severance caused by road traffic at Carland Cross junction. This reduction in severance may encourage increased travel by active modes.
Non-PRoW route at existing Carland Cross roundabout	New 2.5m shared foot/cycleway on external edge of circulatory carriageway at Chiverton Cross junction.	Low	Moderate	Slight beneficial	New 2.5m shared foot/cycleway on external edge of circulatory carriageway at Carland Cross junction. A 2.5m shared footway/cycleway off carriageway on existing A30 northern verge would be provided. Cyclists

Receptor	Description of impact	Sensitivity	Magnitude	Significance	Comments
	2.5m shared footway/cycleway off carriageway on existing A30 northern verge				travelling west could join the slip road carriageway at the crossing and travel to slip road.
Newlyn Downs Walking, Cycling and Horse-riding Wildlife Crossing	A 4m width underpass providing new shared foot/cycleway facilities for WCHs west of the new Carland Cross junction. The path will provide an alternative route to the Carland Cross junction.	Low	Moderate	Slight beneficial	A new 4m shared foot/cycleway will provide a safe crossing point (in underpass) for WCHs through the new Carland Cross junction. The underpass will link the existing A30, which will be de-trunked, and the A39 from Truro.

12.10.88 Overall the scheme would have a **slight beneficial effect** for pedestrians and cyclists by reducing severance caused by road traffic between communities and businesses along the A30. This reduction in severance may encourage increased travel by active modes. However, footpaths 319/11/1, 319/12/1 and bridleway 309/3/1 will be stopped up therefore WCHs will no longer be able to use this PRoW, this would have a **moderate adverse effect** on WCHs connectivity to nearby facilities. The new underbridges and overbridges would improve WCH access throughout the operation of the scheme and offer an enhanced access to nearby community facilities along the A30 particularly at Tolgroggan overbridge and Trevalso Lane allowing cyclists and pedestrians to access community facilities at Zelah. Overall the scheme is anticipated to have a **slight beneficial effect** on pedestrians, cyclists and equestrians.

Effects on Land and Property

Commercial properties

12.10.89 The impacts on commercial properties prior to mitigation, during the operation phase are shown in Table 12-24. All commercial receptors are shown on Figure 12.2. The majority of commercial properties affected by the scheme are relatively specialised in terms of their operations (for example locational requirements).

Table 12-24 Operational impacts on commercial properties prior to mitigation

Receptor	Description of impact	Sensitivity	Magnitude	Significance
Commercial properties				
Chiverton Caravan and Touring Park Ref 16 on Figure 12.2	No direct/indirect impacts	High	No change	Neutral
Trevarth Holiday Park Ref 17 on Figure 12.2	No direct/indirect impacts	High	No change	Neutral
Esso and Total Garages at Chiverton Cross Roundabout Ref 1 and 2 on Figure 12.2	The scheme would affect accessibility to Esso and Total garages as vehicle travellers would have to pass the garage, exit the A30 at the new junction and then go back on themselves. The scheme would add an additional 1km for vehicle travellers compared to the current situation of 200m away from the roundabout. This could have a knock-on financial effect on the business.	High	Moderate	Moderate adverse
Starbucks at Chiverton Cross Roundabout Ref 3 on Figure 12.2	The scheme would affect accessibility to Starbucks as vehicle travellers would have to pass the garage, exit the A30 at the new junction and then go back on themselves. The scheme would add an additional 1km for vehicle travellers compared to the current situation of 200m away from the roundabout. This could have a knock-on financial effect on the business.	High	Moderate	Moderate adverse
Chiverton Arms Ref 4 on Figure 12.2	No direct/indirect impacts	High	No change	Neutral
Chiverton Equestrian Centre Ref 15 on Figure 12.2	No direct/indirect impacts	High	No change	Neutral
Trevissome Park Offices along A30 Ref 5 on Figure 12.2	No direct/indirect impacts	High	No change	Neutral
Allstore, Pendown Ref 6 on Figure 12.2	No direct/indirect impacts	High	No change	Neutral

Receptor	Description of impact	Sensitivity	Magnitude	Significance
Truro Sawmills, Penhallow Ref 7 on Figure 12.2	No direct/indirect impacts	High	No change	Neutral
Town and Country Motors, Marazanvose Ref 8 on Figure 12.2	Access to Town and Country Motors would be via the new Chybucca Junction via the new A30	High	Moderate	Moderate adverse
Marazan Farm Campsite Ref 9 on Figure 12.2	Marazan Farm Campsite would be demolished by the construction of the scheme and therefore would no longer be in operation.	n/a	n/a	n/a
NFH Ref 10 on Figure 12.2	New access route provided to NFH due to existing access road severed by scheme. The Noise and Vibration assessment (Chapter 11 of the ES) indicates that there is no increase in noise levels to affect the NFH business.	High	Moderate	Moderate adverse
Hawkins Arms, Zelah Ref 11 on Figure 12.2	No direct/indirect impact	High	No change	Neutral
Parklands Toyota at Carland Cross roundabout Ref 13 on Figure 12.2	The scheme reduces the visibility of the business for passing trade. Access to remain the same	High	Minor	Slight adverse
Shell Garage at Carland Cross roundabout Ref 12 on Figure 12.2	The scheme reduces the visibility of the business for passing trade. Access to remain the same	High	Minor	Slight adverse
Carland Cross Windfarm (ScottishPower Renewables) Ref 14 on Figure 12.2	Access would be severed by the scheme. New access would be provided via Carland Cross junction to the windfarm site.	High	Moderate	Moderate adverse

12.10.90 Effects resulting from the demolition of Marazan Farm Campsite are considered under Construction.

12.10.91 The overall effect on commercial properties during the operation stage is **slight – moderate adverse**. However, with appropriate mitigation in place the overall effect on commercial properties would reduce to **slight adverse**. It should be noted that the Hawkins Arms in Zelah relies on the brown signs on the A30 to generate passing trade. The signing strategy should include "brown" signs at Chybucca for eastbound traffic and Carland Cross for westbound traffic.

Agricultural Land

12.10.92 Impacts on agricultural land arising from land that will be required permanently for the construction and operation of the scheme are included under Construction. A more detailed assessment of impacts on agricultural land will be provided in the ES. This assessment will identify any impacts arising from the operation of the scheme, including for each farm or land holding affected.

Community Land

12.10.93 There is no Common Land which will be impacted by the scheme. Although a smaller section of open access land located around a disused quarry immediately adjacent and to the south of the A30 approximately 250m west of Carland Cross junction affected during the operational stage of the scheme however the quarry is currently inaccessible due to undergrowth and is not used by the public for any recreational purposes. Therefore, the scheme would have a **negligible** impact on Community land.

Development Land

12.10.94 Although a further 610 dwellings are to be built in the Community Network Area (CAN) of St Agnes and Perranporth before 2030, the scheme traverses through rural land which has not been designated for development and therefore it is considered there would be no impacts on development land during construction.

Tourism and Recreation

Strategic access

12.10.95 The new structure has been designed to reduce delays, which will improve the resilience of the local and trunk road highway networks. The scheme would therefore enhance accessibility and journey time reliability for visitors travelling to Cornwall, improving perceptions of Cornwall as a tourism location and potentially supporting tourism in the county, particularly during the summer peak.

12.10.96 As established above, approximately 80% of the 20 million staying and day visitors who travel to Cornwall each year arrive by private car, with smaller proportions travelling by bus, coach and by hire car. Given the importance of the A30 as a key route for visitors travelling to Cornwall by road, any improvement or perceived improvement in the strategic accessibility of the county could result in a **long-term moderate beneficial** effect for the tourism sector in Cornwall.

Direct effects on local tourism and recreation facilities

12.10.97 Direct effects as a result of demolitions at Marazan Farm Campsite and NFH are considered under Construction.

12.10.98 An existing access road to the NFH would be severed by the scheme. The assessment of effects on land and property identifies this as a **moderate adverse** effect, which would reduce to **slight adverse** following the provision of mitigation in the form of a new access route.

In-combination effects on amenity for local tourism and recreation facilities

12.10.99 Certain tourism receptors – including accommodation, food and drink providers, and some tourist attractions – can be more sensitive to changes in their operating environment. Indirect effects on amenity for tourism receptors can arise as a result of a combination of two or more significant environmental effects such as noise, air quality, and visual effects arising from the operation of the scheme. As discussed in Section 12.4, the potential for indirect amenity effects can only be assessed where relevant information is provided in the Air Quality, Noise and Vibration, and Landscape and Visual assessments.

12.10.100 The noise, air quality and landscape and visual assessments have not identified any significant effects for tourism and recreational facilities as a result of the operation of the scheme. Therefore no in-combination effects on amenity have been identified for individual tourism receptors as a result of the construction of the scheme, and the effect is considered **neutral.**

Effects on People

Employment

12.10.101 The scheme has been designed to reduce delays which will improve resilience of the local and trunk road highway networks and improve the reliability of bus services. The scheme would therefore support local businesses and employment through enhanced accessibility and improved journey time reliability. This would improve perceptions of Cornwall as a business location and could enhance economic outcomes which contribute to health and well-being. This would have a long term **slight beneficial** effect on reliable access for local businesses.

Access to services

12.10.102 During operation, the scheme has been designed to reduce delays which would improve resilience of the A30 and would benefit surrounding communities by improving access to services in Zelah, Blackwater and Truro. This would have a long term **slight beneficial** effect on access for local communities.

12.10.103 The following underbridges and overbridges would be provided for the scheme:

- Chiverton Junction underbridge;
- Chybucca Junction overbridge;
- Tressawen Road underbridge;
- Green bridge;
- Tolgroggan overbridge;
- Trevalso Lane underbridge;
- Penny-Come-Quick underbridge;
- Barrows Junction underbridge; and

- Newlyn Downs Walking, Cycling and Horse-riding Wildlife Crossing.

12.10.104 The new underbridges and overbridges would improve WCH access throughout the operation of the scheme and offer an enhanced access to nearby community facilities along the A30 particularly at Tolgroggan overbridge and Trevalso Lane allowing cyclists and pedestrians to access community facilities at Zelah.

Neighbourhood Quality

12.10.105 During operation, there are several communities assessed as being subject to a likely **significant adverse** effect. These are all to the northwest of the scheme and are due to direct effects form road traffic:

- dwellings nearest to the proposed new Chiverton Junction around chainage 1+700.000,
- small groups of dwellings further from the scheme (approximately 250m) between chainages 1+500.000 and 2+000.000; and
- dwellings just beyond chainage 2+000.000.

12.10.106 The scheme could affect the residents' neighbourhood amenity, which could have the potential to introduce disturbance or affect health without appropriate mitigation.

12.10.107 However, during operation the Noise and Vibration assessment (Chapter 11 of the ES) indicates noise decreases at the following residential properties, this would have a **moderate beneficial** effect on the residents at the following properties:

- Four Burrows Farm House;
- Marazanvose Farm group of dwellings;
- Henver Cottage;
- Tregorland and Zelah Hill Cottage; and
- Racland House and Four Winds.

12.10.108 Nuisance due to noise, dust and visual impacts due to movement of construction vehicles will be mitigated through considerate construction management including the use of screening (temporary or permanent), which will be outlined in further detail in an Outline EMP to be submitted in support of the ES with the DCO application. With mitigation in place, the effect on neighbourhood amenity during the construction stage is considered to be not significant.

Access to green space and physical activity

12.10.109 During the operation, the majority of footpaths, bridleways and cycle routes would not be affected by noise. New footpaths, underbridge and overbridges would have a **slight beneficial** effect for pedestrians and cyclists by reducing severance caused by road traffic between residential areas and community facilities. This reduction in severance may encourage increased travel by active modes within the area of the A30.

Housing

12.10.110 No housing impacts are predicted during the operational phase. Therefore, the impact of the scheme on housing within the local area is deemed as **negligible**.

Community safety

12.10.111 There were 112 collisions recorded in the study area, of which one is a fatality, 17 are serious and 94 minor collisions between 2012-2016. Two incidents involve pedestrians and two involve cyclists but none involve horse-riders, and none of the casualties are children or elderly people. During operation, the scheme would improve the safety, operation and efficiency of the transport network along the A30, therefore the scheme would have a **slight beneficial** effect on the safety of vehicle travellers, cyclists, pedestrians and equestrians.

12.11 Monitoring

12.11.1 The scheme would cause Marazan Farm campsite to be demolished. The demolition of the Marazan Farm campsite would cause a significant effect to the business owners however appropriate financial compensation would be explored for the landowners where permanent land acquisition is required through the Compulsory Purchase Acquisition mechanism.

12.11.2 There are no other significant adverse effects on People and Communities during both construction and operational stages of the scheme therefore monitoring is not required.

12.12 Summary

12.12.1 Table 12-25 highlights the overall summary of significance of effect for the topics during construction and operation of the scheme assessed within the People and Communities chapter.

Table 12-25 Summary of significance of effect during construction and operation

Topic	Receptor	Significance of effect during construction	Significance of effect during operation
Vehicle Travellers	Views from road	Moderate beneficial	Slight adverse
	Driver stress	Slight adverse	Moderate beneficial
	Bus travellers	Slight adverse	Moderate beneficial
Walkers, Cyclists and Horse-riders	Relief from existing severance	Negligible	Negligible
	Community severance	Slight adverse	Moderate beneficial
	Amenity and journey length	Slight adverse	Slight beneficial
Land and Property	Commercial properties	Slight adverse	Slight adverse
	Agricultural land and farm holdings	Moderate adverse	Neutral
	Community land	Negligible	Negligible
	Development land	Negligible	Negligible
Tourism and Recreation	Strategic access	Slight adverse	Moderate beneficial

Topic	Receptor	Significance of effect during construction	Significance of effect during operation
	Direct effects on tourism and recreation facilities	Slight adverse Large adverse (Marazan Farm Campsite)	Slight adverse (NFH)
	Amenity effects	Neutral	Neutral
People	Employment	Moderate beneficial Moderate adverse (Marazan Farm Campsite)	Slight beneficial
	Access to services	Slight adverse	Slight beneficial
	Neighbourhood Quality	Moderate adverse	Moderate adverse
	Access to green space and physical activity	Slight adverse	Slight beneficial
	Housing	Slight adverse Large adverse (Marazan Farm)	Negligible
	Community safety	Slight adverse	Slight beneficial

Further work

12.12.2 It should be noted that at this stage the information provided in this chapter is preliminary, and is based mostly on the 2017 scheme design, as described in Chapter 2. Further work is currently being undertaken to confirm the scale and significance of predicted impacts on people and communities arising from the scheme design. The final EIA work will be reported within the ES, which will accompany the DCO application to be made in Summer 2018.

12.12.3 As part of the EIA, new WebTAG guidance on Social Impact Appraisal (TAG Unit A4.1), published in December 2017, will be reviewed and any implications for the assessment methodology will be considered.

12.12.4 The ES will provide a full baseline, and a more detailed assessment of impacts on agricultural land. This will include an assessment of the impact on each farm or land holding, including the total area of land to be acquired on each plot, and the proportion of BMV land. Cornwall Council are being consulted on the tourism and recreational facilities included in the tourism assessment, and feedback will be included in the ES.

12.12.5 Potential cumulative effects will be investigated further as part of the EIA, and recommendations to improve environmental outcomes will be provided where appropriate.

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Preliminary Environmental Information Report

Chapter 13 Road Drainage and the Water Environment

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13 Road Drainage and Water Environment

13.1 Introduction

13.1.1 This chapter of the PEIR provides an assessment of effects on the water environment that may arise from the scheme. For the purposes of this chapter, the water environment is considered to comprise surface watercourses within the study area, groundwater contained within aquifer units that underlie the study area, other waterbodies or water dependent features that may potentially be affected and the potable water supply network.

13.1.2 The chapter describes the baseline conditions of the existing water environment in the study area and the methodology used to assess potential impacts during the construction and operational phases of the scheme, before presenting the results of these assessments and any further mitigations or monitoring deemed necessary.

13.1.3 The assessment considers the potential effects on the quality and quantity of surface and ground waters, geomorphology and flood risk as a result of construction activities, the operational road drainage and accidental spillages. These assessments have been carried out in accordance with (paragraphs 5.92 to 5.97) and water quality and resources (paragraphs 5.221 to 5.223).

13.1.4 The Water Framework Directive (WFD) compliance assessment and flood risk assessment (FRA) will be reported within the ES which will accompany the DCO application to be made in Summer 2018.

13.1.5 Any associated effects on ecology are considered in Chapter 8 Nature Conservation. Effects on ground conditions and water quality arising from existing land contamination are considered in the Chapter 9 Geology & Soils.

13.2 Legislative and Policy Framework

European Legislation

13.2.1 **Water Framework Directive (WFD) 2000/60/EC**: The WFD provides a framework for the protection of inland surface waters (rivers and lakes), transitional waters (estuaries), coastal waters and groundwater. The Directive requires Member States to establish river basin districts and for each of these a river basin management plan (RBMP), which are prepared, implemented and reviewed every six years. The current period from 2015-21 is Cycle 2 of these RBMPs.

13.2.2 **Groundwater Daughter Directive 2006/118/EC**: A Daughter Directive of the WFD, the Groundwater Directive establishes a regime which sets groundwater quality standards and introduces measures to prevent or limit inputs of pollutants into groundwater. Amended by Directive 2014/80/EU to clarify groundwater information to be provided to the European Commission. Member States must provide information on groundwater bodies classified as being at risk and threshold values for the respective pollutants and indicators established.

13.2.3 **Floods Directive 2007/60/EC**: The Floods Directive requires Member States to assess if all water courses and coast lines are at risk from flooding, to map the flood extent and assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk. The Directive requires that

flood risk management plans be prepared, implemented and reviewed every six years for each river basin district, in coordination with RBMPs prepared under the WFD.

13.2.4 **Habitats Directive 92/43/EEC & Birds Directive 2009/147/EC**: The Habitats Directive and Birds Directive ensure the conservation of a range of rare or threatened species. They establish the EU wide Natura 2000 ecological network of protected areas to safeguard against potentially damaging developments.

13.2.5 **Priority Substances Directive 2013/39/EU**: The Priority Substances Directive amends WFD 2000/60/EC and the Directive on Environmental Quality Standards (Directive 2008/105/EC) by updating the list of priority substances that would apply to WFD assessment.

13.2.6 **Urban Wastewater Treatment Directive 91/271/EEC (as amended) (UWWT Directive (consolidated)):** This Directive concerns the collection, treatment and discharge of urban waste water and the treatment and discharge of waste water from certain industrial sectors. The objective of the Directive is to protect the environment from the adverse effects of the above mentioned waste water discharges.

National Legislation

13.2.7 **Environmental Protection Act 1990**: The Act makes provision to control pollution arising from industrial and other processes for waste management.

13.2.8 **Water Industry Act 1991**: The Water Industry Act relates to water supply and the provision of wastewater services in England and Wales.

13.2.9 **Land Drainage Act 1991 (as amended**): The Land Drainage Act 1991 requires that a watercourse be maintained by its owner. The Act provides functions to internal drainage boards and local authorities to manage watercourses and provide consenting powers for proposed works to watercourses associated with development.

13.2.10 **Water Resources Act (England and Wales) 1991 (Amended 2009):** The Water Resources Act 1991 (WRA) (as amended) sets out the responsibilities of the Environment Agency (EA) in relation to water pollution, resource management, flood defence, fisheries, and navigation.

13.2.11 **Environment Act 1995**: The Environment Act sets new standards for environmental management, such as requiring national strategies for air quality and waste. It also deals with the establishment of the EA.

13.2.12 **Water Act 2003:** The Water Act 2003 amends the Water Resources Act 1991 and the Water Industry Act 1991 to make provision with respect to compensation under Section 61 of the Water Resources Act 1991.

13.2.13 **Water Resources (Abstraction and Impounding) Regulations SI 2006/641**: These Regulations contain provisions relating to the licensing of abstraction and impounding of water in England and Wales in the light of amendments made by the Water Act 2003 to the Water Resources Act 1991.

13.2.14 **Flood Risk Regulations 2009:** The Flood Risk Regulations 2009 transposes the EC Floods Directive (Directive 2008/60/EC) on the assessment and management of flood risk into domestic law in England and Wales and implements its provisions. The regulations designate a Local Lead Flood Authority (LLFA) and

imposes duties on the EA and Lead Local Flood Authorities to prepare a number of documents including:

- Preliminary Flood Risk Assessments;
- Flood hazard and flood risk maps; and
- Flood Risk Management Plans.

13.2.15 **The Groundwater (England and Wales) Regulations 2009:** These Regulations implement parts of the WFD that apply to groundwater (such as the Groundwater Directive). They supplement the Environmental Permitting Regulations 2010 and existing water pollution legislation.

13.2.16 **The Water Supply (Water Quality) Regulations 2010**: These Regulations provide the framework for drinking water quality in England in respect of public supplies provided by water companies and licensed water suppliers. The Drinking Water Inspectorate, acting on behalf of the Secretary of State, enforces the legislation.

13.2.17 **Flood and Water Management Act 2010:** The Act makes provision for water, including provision about the management of risks in connection with flooding and coastal erosion.

13.2.18 **Environmental Damage (Prevention and Remediation) (England) Regulations 2015:** These Regulations are based on the 'polluter pays principle and impose obligations on operators of economic activities requiring them to prevent, limit or remediate environmental damage. They apply to damage to protected species, natural habitats, sites of special scientific interest (SSSIs), water and land and implement Directive 2004/35/EC, on environmental liability.

13.2.19 **The Water Framework Directive (Standards and Classification) Directions England and Wales 2015**: The Water Framework Directive (WFD) Directions presents the updated environmental standards to be used in the second cycle of the Water Framework Directive (2000/60/EC) river basin management planning process in England and Wales. Environmental standards help assess risks to ecological quality of the water environment.

13.2.20 **The Groundwater (Water Framework Directive) (England) Direction 2016:** This sets out instructions to the EA on obligations to protect groundwater, including requirements to monitor and set thresholds for pollutants, add new pollutants to the monitoring list and change the information reported to the European Commission.

13.2.21 **The Environmental Permitting Regulations 2016**: The Environmental Permitting (England and Wales) (Amendment) (No. 2) Regulations SI 2016/475 came into force on 6 April. They amend the Environmental Permitting (England and Wales) Regulations SI 2010/675 in order to extend the requirement for an environmental permit to flood risk activities in addition to polluting activities included under the previous regulations. The new permitting requirements for flood risk activities replaces the current "flood defence consent scheme", allowing the EA (as regulator for England) to concentrate on higher risk activities.

13.2.22 **Water Environment (Water Framework Directive) (England and Wales) Regulations 2017**: The WFD has been transposed into the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. WFD is

delivered in England and Wales through a framework of River Basin Management Plans (RBMPs). England and Wales are divided into 11 River Basin Districts (RBDs), each comprising smaller management units known as water bodies, including all river, lake, groundwater, coastal, and transitional waters located within that RBD.

National Policy

13.2.23 **National Networks National Policy Statement (NN NPS)**

13.2.24 This sets out the need and governmental policies for nationally significant rail and road projects for England. Section 5.90 to 5.115 sets out how flood risk impacts should be considered, whilst sections 5.219 to 5.231 covers the assessment of impacts to water quality and resources.

13.2.25 **The National Planning Policy Framework 2012**: This provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans. Planning Policy Statement 10 “Meeting the challenge of climate change, flooding and coastal change” relates to flooding. The document aims to direct development away from areas of the highest risk of flooding but where necessary, development must be safe without increasing flood risk elsewhere.

Regional Policy

13.2.26 **South West River Basin Management Plan (RBMP) 2015:** This provides a framework for protecting and enhancing the benefits provided by the water environment. It also informs decisions on land use planning. Contains four sets of information which are important for the management of land and water; baseline classification of water bodies, statutory objectives for protected areas, statutory objectives for water bodies, summary programme of measures to achieve statutory objectives.

13.2.27 **West Cornwall Catchment Flood Management Plan (CFMP) 2012:** The CFMP for Cornwall is made up of one relatively large catchment – the River Fal and many other smaller catchments. The Fal Estuary is the major estuary in the West Cornwall catchment with smaller estuaries at Hal and Helford. This scheme is within the Upper Fal and Carnon sub area which uses the preferred approach of Policy 6, defined by the EA as, “areas of low to moderate flood risk where we will take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits”.

Local Policy

13.2.28 **The Cornwall Local Flood Risk Management Strategy: Part 1 – Strategic Vision (2014 - 2020).** Sets out how Cornwall Council and its partner authorities intend to work together to manage flood risk from all sources. This document comprises three parts: Strategic Vision, Local Flood Risk Management Profiles and Local Flood Risk Management Action Plans. This Local Flood Risk Management Strategy has been adopted to guide the development of policy and programmes across Cornwall Council’s operations and in its work with other organisations, communities and stakeholders.

13.2.29 **Cornwall Local Plan Strategic Policies 2010 – 2030.** Cornwall Local Flood Risk Management Strategy – sets out how council and partner organisations such as

EA and South West Water intend to work together to manage flood risk. Policy 26 addresses flood risk management and is intended to complement national policy and guidance on avoiding and minimising flood risks.

13.2.30 **Strategic Flood Risk Assessment (SFRA) for the Cornwall Local Plan 2009.** A tool for planning authorities to identify and evaluate flood risk in their area with the aim of directing development to the areas of lowest risk of flooding valid until 2026.

13.2.31 **Strategic Flood Risk Assessment (SFRA) for the Minerals Safeguarding Development Plan Document (DPD) 2016.** Updates of the 2009 SFRA take into account changes in national policy and guidance, particularly changes made by the introduction of the National Planning Policy Framework (NPPF), changes to EA data and new flood risk strategies published by Cornwall Council.

13.2.32 **Cornwall Sustainable Drainage Policy 2016.** Sets out Cornwall's LLFA's approach to sustainable drainage and aims to clarify what is appropriate in Cornwall. Cornwall council takes a proactive approach to encourage the use of SuDS for the management of surface water.

Guidance

13.2.33 Due reference has been made to GOV.UK guidance for preventing pollution[1], working on or near water[2] and for managing water on land[3].

13.2.34 CIRIA guidance used for the assessment includes:

- Control of Water Pollution from Construction Sites – Guide to Good Practice (SP156)
- Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors (C532)
- Control of Water Pollution from Linear Construction Projects – Technical Guidance (C648)
- Control of Water Pollution from Linear Construction Projects – Site guide (C649)
- Environmental good practice on site (C692)
- Groundwater control: design and practice (second edition) (C750)

13.3 Study Area

13.3.1 The study area has been selected based on a source – pathway – receptor approach.

13.3.2 For direct effects on surface waters, the study area includes the geographical extent of the full scope of the works and all surface water features within 500m of

[1] The Environment Agency, "Pollution prevention for businesses," 12 07 2016. [Online]. Available: https://www.gov.uk/guidance/pollution-prevention-for-businesses. [Accessed 10 2017].
[2] The Environment Agency, "Check if you need permission to do work on a river, flood defence or sea defence," 2017. [Online]. Available: https://www.gov.uk/permission-work-on-river-flood-sea-defence. [Accessed 2017].
[3] The Environment Agency, "Manage water on land: guidance for land managers," 19 02 2015. [Online]. Available: https://www.gov.uk/guidance/manage-water-on-land-guidance-for-land-managers. [Accessed 10 2017].

the scheme. Indirect effects on surface waters have been considered up to 1km away where features have hydrological connectivity to the scheme.

13.3.3 For groundwater, the study area includes the geographical extent of the full scope of the works and all groundwater features within 1km of the scheme.

13.3.4 The size of the study area has been selected based on professional judgement and is proportionate with the potential impacts posed by the scheme.

13.4 Potential Impacts

13.4.1 The scheme has the potential to impact the water environment during construction and operation.

13.4.2 During construction, the most significant effects to surface water features and groundwater features could arise from:

- Increased pollution risks from mobilised suspended solids, spillage of fuels or other harmful substances that may migrate to surface water and groundwater receptors.
- Impacts to the hydromorphological and ecological quality of watercourses associated with works within or in close proximity to watercourses, including physical change to the watercourses and longer term changes associated with sediment deposition.

13.4.3 During operation, the most significant effects to surface water features, groundwater features and flood risk could arise from:

- Polluted surface water runoff containing silts and hydrocarbons that may migrate or be discharged to surface water features or groundwater resources via the proposed highway drainage system.
- Permanent impact to the hydromorphological and ecological quality of water features associated with works within or in close proximity to water features.
- Permanent impacts to catchment hydrology caused by the introduction of a barrier to natural overland flow and changes to natural catchment dynamics associated with the proposed highway drainage system.
- Permanent impacts to catchment hydrology caused by impact to natural groundwater springs or groundwater flow associated with proposed road cuttings that could affect baseflow to watercourses.
- Increased rates and volumes of surface water runoff from an increase in impermeable area or changes to the existing drainage regime leading to a potential increase in flood risk.
- Increased flood risk to the scheme and to people and property elsewhere caused by crossing of watercourses thus affecting flood flow conveyance.

13.4.4 Little is known regarding existing drainage arrangements and water treatment provision. The scheme may provide an opportunity to provide betterment.

13.5 Assessment Methodology

13.5.1 The assessment methodology follows the guidance set out in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 10: HD 45/09 Road Drainage and the Water Environment (November 2009), subsequently referred to as HD 45/09. It is noted that this guidance is being updated and where available, the assessment methodology has been aligned with any emerging guidance.

13.5.2 HD 45/09 provides a methodology and criteria for assessing the impact of a proposed road scheme on the water environment. This standard methodology is made up of the four steps described below:

- Identification of potential water receptors within the study area (Table 13-1) and an assessment of the importance, value and sensitivity of each of these receptors (HD 45/09, Annex 4, Table A4.3).
- Identification of potential impacts to the water features during construction or operation (HD 45/09, Annex 4, Table 4.1).
- Assessment of the potential magnitude of the effect of any construction or operation impacts on the receptor (HD 45/09, Annex 4, Table A4.4).
- Assessment of the overall significance of any effects to receptors due to impacts (HD 45/09, Annex 4, Table A4.6). The significance of effect is determined by comparison of the identified importance/sensitivity of the receptors with the estimated magnitude of the effect (HD 45/09, Annex 1, Table A4.5). For the purpose of this assessment, significance values of moderate adverse and above have been defined as significant potential effects, and mitigation measures are necessary.

13.5.3 Specific methods required by HD 45/09, which only have relevance to particular construction or operation impacts, are detailed in the following sections.

Construction Impacts

13.5.4 HD 45/09 recommends that construction impacts are considered using the source – pathway – receptor approach and defers specific guidance of highway construction impacts to CIRIA 648 Control of Water Pollution from Linear Construction Projects.

13.5.5 The potential impacts of construction on surface water or sediment runoff, water quality, flood risk and groundwater quality or levels has been assessed based on the planned construction methods and sequencing. Where construction methods are not available, standard construction practices are assumed. Cumulative impacts as a result of construction phasing are also assessed.

13.5.6 Where measures to reduce construction impacts are considered standard practice they will be included in an Outline EMP which will be reported within the ES that will accompany the DCO application to be made in Summer 2018. It has been assumed that they will be carried out in respect of the impact assessment. Measures beyond standard practice are typically considered to be mitigation, and have been identified as such in the chapter.

Operational Impacts

13.5.7 The assessment of the potential impacts during operation has covered five key aspects of the water environment; surface water quality & quantity, flood risk, geomorphology, groundwater quality & quantity and accidental spillage. The proposed assessment approach for each aspect is detailed in the following sections. All assessments follow a source – pathway – receptor approach.

<u>Surface Water</u>

13.5.8 An assessment of the potential impacts of routine runoff on surface waters has been undertaken to determine the significance of the risk and if pollution

mitigation measures are needed. The assessment has used the Method A from the HD 45/09 guidance, in particular the Highways Agency Water Risk Assessment Tool (HAWRAT) which has been developed specifically for the purpose of supporting water quality assessments.

13.5.9 The proposed alignment of the scheme results in discharges to relatively minor watercourses, all of which have a catchment area of less than 1 km^2 at drainage outfall locations. An estimate of the Q95 flow at a subset of these watercourses was undertaken using the method described in the Institute of Hydrology Report No. 108. This indicated that a Q95 of 0.001 m^3/s is appropriate for the assessments of receiving waters at all proposed outfalls.

13.5.10 The low Q95 flow of all watercourses that would receive discharge from the proposed drainage systems increases the risk of this discharge infiltrating to groundwater. To ensure that all risks to water quality were captured in the assessment, the potential effect of the drainage system discharges were considered for both surface and ground waters.

13.5.11 A qualitative assessment of possible impacts on the hydromorphology of watercourses has been undertaken based on a geomorphologist's understanding of the potential for impacts to the flow dynamics and sediment transport processes and the subsequent effects that this might have on the ecological potential of the water feature.

13.5.12 The assessment has been made using professional judgement and experience and is focussed on locations where the proposed route physically interacts with watercourses (for example proposed culverts or realignments) or where sediment loading from the proposed drainage system may occur.

Groundwater

13.5.13 Annex I of HD 45/09 provides a methodology (Method C) to assess the potential impact on the quality of groundwater resources from routine runoff discharges to the ground.

13.5.14 For there to be a risk of impact to groundwater, a source, pathway and receptor all have to be present to create a pollutant linkage. In the context of the chapter, sources comprise the drainage water that would be discharged at the outfalls of the proposed drainage system, and the receptors are defined as controlled water bodies, including the groundwater that underlies the scheme area.

Accidental Spillage

13.5.15 The operational pollution effects from accidental spillage have been calculated using Method D from the HD 45/09 guidance. In line with HD 45/09 guidance for assessment of the risk posed by accidental spillage, if the annual probability that a spillage would cause a serious pollution incident to a water body is less than 1%, or 0.5% where spillage could affect protected areas for conservation, then the risk posed is considered acceptable and no further assessment has been carried out. The risk is assessed initially without any mitigation measures. If mitigation measures are needed to reduce the probability, a reduction factor is applied, depending on the type of mitigation used.

WFD Compliance

13.5.16 A standalone WFD compliance assessment for the scheme will be included within the ES which will accompany the DCO application to be made in Summer 2018 and the assessment methodology will be described there.

Flood Risk

13.5.17 A standalone FRA for the scheme will be included within the ES which will accompany the DCO application to be made in Summer 2018. It will include details of the methodology used to assess the risk of flooding as a result of the scheme. The approach will be agreed with Highways England (as the Highway Authority), Cornwall Council (as the Lead Local Flood Authority) and, the Environment Agency (as Lead Authority for main rivers).

13.6 Baseline Conditions

Baseline Methodology

13.6.1 The baseline describes the existing condition of surface waters, groundwater and flood risk within the study area. The value of each water feature identified has been determined based on the attributes and indicators of quality listed in HD45/09, Annex 4, Table A4.1.

13.6.2 The following data sources were used to compile the baseline conditions in the subsequent sections:

- Observations from a site walkover on 16th November 2017;
- EA Catchment Data Explorer[4];
- EA What's in your backyard (WIYBY)[5];
- South West River Basin Management Plan (2015);
- West Cornwall Catchment Flood Management Plan (2012);
- Existing highway drainage plans;
- National River Flow Archive[6];
- Natural England, MAGIC[7];
- Ordnance Survey (OS) mapping (including topography);
- British Geological Survey (BGS) mapping[8];
- Groundsure report;
- Information from historic and recent ground investigations;
- A30 River Habitat Appraisal[9];
- A30 Fish Population Surveys report[10];
- A30 Aquatic Ecology Surveys[11];
- EA flood risk mapping[12];

[4] The Environment Agency, "Catchment Data Explorer," Environment Agency, 01 11 2017. [Online]. Available: http://environment.data.gov.uk/catchment-planning/. [Accessed 10 2017].
[5] The Environment Agency, "What's In Your Backyard?," The Environment Agency, 18 09 2017. [Online]. Available: http://apps.environment-agency.gov.uk/wiyby/default.aspx. [Accessed 10 2017].
[6] Centre for Ecology and Hydrology, "National River Flow Archive," 10 2017. [Online]. Available: http://nrfa.ceh.ac.uk/data/station/meanflow/64001. [Accessed 10 2017].http://nrfa.ceh.ac.uk/data/station/meanflow/64001
[7] MAGIC, "Interactive mapping at your fingertips," 10 2017. [Online]. Available: http://www.magic.gov.uk/. [Accessed 10 2017].
[8] British Geological Survey, "Geology of Britain viewer," 2017. [Online]. Available: http://mapapps.bgs.ac.uk/geologyofbritain/home.html . [Accessed 10 2017].
[9] APEM, A30 River Habitat Appraisal, December 2016.
[10] APEM, A30 Fish Population Surveys, September 2017.
[11] APEM, A30 Aquatic Surveys, November 2017
[12] gov.uk, "Flood map for planning," 2017. [Online]. Available: https://flood-map-for-planning.service.gov.uk/. [Accessed 10 2017].

- Drinking Water Inspectorate (DWI) Map showing the rate of hardness in mg/l as Calcium Carbonate in England and Wales[13]; and
- The Coal Authority interactive map viewer[14].

13.6.3 The geomorphology baseline conditions were identified during a site walkover and using information contained in the River Habitat Appraisal report[9]. Channel dimensions, slope and roughness, as required by the Method A assessments (HAWRAT, Step 2, Tier 2) were confirmed from these sources. A visual inspection during a site visit is an appropriate method for undertaking a geomorphology survey to inform this level of assessment.

13.6.4 To establish a baseline condition, fisheries and invertebrate surveys[10,11] have been conducted for watercourses that would potentially be modified by the scheme.

13.6.5 Current and future potential traffic and accident data was obtained from predicted 2038 AADT flows to account for future growth.

13.6.6 Existing ground conditions and the potential for opening up pollution pathways from existing contaminated land have been considered in Chapter 9 Geology & Soils.

Surface Water

13.6.7 A review of OS mapping indicates that there are approximately 26 watercourses and surface water features within the 500m study area, see Table 13-1.

13.6.8 All watercourses identified the study area are classified as ordinary watercourses and come under the jurisdiction of Cornwall Council as Lead Local Flood Authority (LLFA). Downstream extents (typically in excess of 1km from the scheme alignment) are classified as main rivers and therefore under the jurisdiction of the EA.

13.6.9 The alignment of the existing A30 broadly follows a ridgeline and, as such, surface water runoff generally falls to the north and south of the A30 and all existing and proposed crossings are close to the head of any watercourses.

13.6.10 Within the study area, watercourses to the north of the scheme alignment include Perranporth Stream, Bolingey Stream, Holywell Stream and Benny Stream, whilst to the south of the scheme alignment watercourses are part of the River Kenwyn and River Allen catchments. These watercourses are all relatively short and steep and discharge along the north or south coast of Cornwall.

[13] Defra, “Map showing the rate of hardness in mg/l as Calcium Carbonate in England and Wales,” 2009. [Online]. Available: http://www.dwi.gov.uk/consumers/advice-leaflets/hardness_map.pdf . [Accessed 10 2017].
[14] The Coal Authority, “Coal Mining Reporting Area,” 2017. [Online]. Available: http://mapapps2.bgs.ac.uk/coalauthority/home.html. [Accessed 10 2017].

Table 13-1 Summary of notable water features within proximity of scheme alignment

Approx. chainage	Location relative to scheme	Description	Scheme elements	Value	Value Rationale
200m	Crossed by scheme within existing road alignment	Ordinary watercourse known as Calenick Stream. Flows south through the Carrick Heaths SSSI c. 700m downstream. Water quality monitored against WFD and current ecological quality is moderate. In NVZ (ID ET5). Not included in fish survey.	Existing culvert, new drainage outfall.	Medium	Has some amenity value.
1300m	220m north of scheme alignment	Ordinary watercourse known as Perranporth Stream. Flows northwards. Not included in fish survey.	New drainage outfall.	Medium	Has some amenity value (footpath / bridge).
1700m	240m south of scheme alignment	Ordinary watercourse. Flows east to confluence with River Kenwyn c. 2.3km downstream. Unsuitable for fish as ephemeral.	New drainage outfall.	Medium	Has some amenity value.
2200m	400m south of scheme alignment	Ordinary watercourse. Flows south to confluence with River Kenwyn c. 2km downstream. Suitable habitat but no fish present in survey.	New drainage outfall	High	Has some amenity value. Potential for fish.
2200m	500m south of scheme alignment	Pond assumed to be in hydraulic connectivity to ordinary watercourse also at chainage 2000m.	N/a	Medium	Has some amenity value.
3400m	270m north of scheme alignment	Ordinary watercourse known as Bolingey Stream. Flows north through the Callestick Vean CWS c. 750m downstream. No fish present during survey.	N/a	High	Quality of watercourse supports habitats and species in CWS
3800m	260m south of scheme alignment	Ordinary watercourse known as River Kenwyn. Flows south. Bullhead and brown trout fry found during survey.	N/a	High	Species protected under UK legislation.
4500m	100m north of scheme alignment	Ordinary watercourse. Flows north through the Callestick Vean CWS c. 300m downstream. Confluences with Bolingey Stream c. 550m downstream. No fish present during survey.	New drainage outfall	High	Quality of watercourse supports habitats and species in CWS
4400m	200m north of scheme alignment	Pond assumed to be in hydraulic connectivity to ordinary watercourse north of chainage 4100m.	New drainage outfall	High	Connected to high value watercourse.

Approx. chainage	Location relative to scheme	Description	Scheme elements	Value	Value Rationale
5000m	500m south of scheme alignment	Ordinary watercourse. Flows south to confluence with River Kenwyn c. 2km downstream. Scoped out of fish survey,	N/a	Medium	Has some amenity value.
6000m	200m south of scheme alignment	Pond assumed to be in hydraulic connectivity to ordinary watercourse south of chainage 6000m.	New drainage outfall	High	Connected to high value watercourse.
6050m	80m south east of scheme alignment	Ordinary watercourse. Flows south-east through the Carrick Heaths SSSI c. 680m downstream. Confluences with Zelah Brook c. 2km downstream. Surface water flow path upstream of the watercourse will be culverted. Brown trout present and suitable salmonid habitat.	Culvert, New drainage outfall	High	Species protected under UK legislation.
7200m	140m south of scheme alignment	Pond and ordinary watercourse. Flows east to confluence with Zelah Brook c. 1.4km downstream.	New drainage outfall	Medium	Has some amenity value.
7700m	490m north of scheme alignment	Ordinary watercourse. Flows north to confluence with Bolingey Stream c. 2.4km downstream.	N/a	Medium	Has some amenity value.
8900m	Crossed by scheme within existing road alignment	Ordinary watercourse known as Zelah Brook. Flows south to confluence with the River Allen c. 4.7km downstream. Water quality monitored against WFD and current ecological quality is good. Bullhead, lamprey and brown trout present in watercourse.	New drainage outfall	High	Species protected under UK legislation.
9250m	Crossed by scheme within existing road alignment	Ordinary watercourse. Flows south- east to confluence with Zelah Brook c. 340m downstream. Fish survey showed no presence but connected to nearby watercourses with protected species.	Culvert	High	Species protected under UK legislation in watercourse <100m downstream.
10000m	470m north-west of scheme alignment	Ordinary watercourse. Flows west to confluence with Bolingey Steam c. 3.3km downstream.	N/a	Medium	Has some amenity value.

Approx. chainage	Location relative to scheme	Description	Scheme elements	Value	Value Rationale
10500m	25m and 100m north of scheme alignment	Small ponds located north of scheme alignment. No known hydraulic connectivity with watercourses.	N/a	Low	No known hydrologic connectivity or ecological / amenity value.
10900m	460m north of scheme alignment	Ordinary watercourse known as Holywell Stream. Flows north. Water quality monitored against WFD and current ecological quality is moderate. Suitable conditions for fish but none present.	New drainage outfall	Medium	Has some amenity value and potential for fish.
11100m	Crossed by scheme by new road alignment	Ordinary watercourse known as River Allen. Flows south through the Trenerry Woods CWS c. 750m downstream. Water quality monitored against WFD and current ecological quality is good.	N/a	High	Quality of watercourse supports habitats and species in CWS
11900m	150m south of scheme alignment	Ordinary watercourse. Flows south through the Trenerry Woods CWS c. 300m downstream. Confluences with River Allen c. 900m downstream.	New drainage outfall	High	Quality of watercourse supports habitats and species in CWS
12300m	470m south of scheme alignment	Ordinary watercourse. Flows south-west through the Trenerry Woods CWS c. 920m downstream. Confluences with River Allen c. 1.1km downstream.	N/a	High	Quality of watercourse supports habitats and species in CWS
12700m	Crossed by scheme by new road alignment	Disused quarry that has since filled with water.	N/a	Low	No known hydrologic connectivity or ecological / amenity value.
12900m	220m north of scheme alignment	Ordinary watercourse located within the Newlyn Downs SSSI and SAC c.110m north of scheme options. Tributary of Benny Stream. Flows north through the SSSI and SAC. Water quality monitored against WFD and current ecological quality is moderate.	N/a	Very High	Within SSSI.
13400m	300m south of scheme	Ordinary watercourse known as Kestle Stream. Flows south through the Carrick Heaths SSSI c. 290m downstream. Water quality monitored against WFD and current ecological quality is good.	New drainage outfall	High	<500m upstream of SSSI.

Approx. chainage	Location relative to scheme	Description	Scheme elements	Value	Value Rationale
13800m	80m north of scheme alignment	Ordinary watercourse. Flows north through Goonwinnow CWS c.500m downstream. Confluences with tributary of Benny Stream 2.5km downstream.	N/a	High	Quality of watercourse supports habitats and species in CWS.

13.6.11 Watercourses within the study area include ordinary watercourses with no known designations, recreational value or value to the economy, which are considered to be of Low value. However, a number of the watercourses, which flow through designated sites of national and county-wide importance, are monitored against the objectives of the WFD and form part of wider catchments assessed to have good and moderate ecological and chemical quality. One of the watercourses is also known to support a surface water abstraction. The values of these resources are considered to be Medium to High. The watercourses at ch. 12900 is within a SSSI and SAC that is designated due to water features (Newlyn Downs) and is such considered to have a value of Very High.

13.6.12 Other surface water features within study area include a number of ponds which were identified within close proximity, located between approximately 20m to 35m, to the proposed scheme. A number of ponds were also identified between 190m and 360m from the proposed scheme. They have no known designations, and the use, quality and ecological value of these features is currently unclear. The ponds are located within predominantly rural areas and have no known significant recreational value or value to the economy. The value of these resources is currently considered to be the same as any connected watercourse or otherwise low.

13.6.13 Many of the watercourses flow through designated sites which are reliant on the water environment associated with the watercourse. All of these sites are considered as important features in the assessment, including Newlyn Downs SAC/SSSI, Carrick Heaths SSSI (comprised of several components located across the length of the scheme), Trenerry Wood CWS, Callestick Vean CWS and Goonwinnow CWS. All designated sites are discussed in more detail in Chapter 8 Nature Conservation, whilst those classed as WFD protected areas (SAC's) will also be discussed in the WFD compliance assessment provided in Summer 2018.

13.6.14 The existing A30 is primarily drained using traditional kerb and gully systems on embankments, and combined filter drains in cuttings. In some older sections, the carriageway appears to be drained by over the edge drainage into adjacent field ditches. Many of the minor existing side roads appear to have no defined drainage networks and rely on over the edge drainage into field ditches or runoff into adjacent land. Due to the age of some sections, it is deemed unlikely that attenuation is present and no evidence of attenuation was found during the site walkover. As a result, the existing highway runoff is likely to discharge uncontrolled into field ditches and adjacent watercourses. The exception to this is at Chiverton Junction, where there is an attenuation pond located to the west of the existing junction.

13.6.15 Review of the EA's Water Abstraction Licences map, on WIYBY[15] indicates that there are no surface water abstractions within the study area. The nearest surface water abstraction is located approximately 1km to the south of the existing A30, at chainage 8500m (approximate) and is believed to be for non-potable use.

13.6.16 Fish population surveys were conducted by APEM Ltd. in 2017 on watercourses surrounding the A30 corridor between Chiverton Cross and Carland Cross to understand the baseline aquatic conditions associated with the proposed works on the A30. Four sites were thought to be 'directly impacted' and 14 potentially 'indirectly impacted'.

13.6.17 Electrofishing surveys were carried out on 12 sites across potentially impacted watercourses. No fish were present at 7 of the 12 sites. At sites where fish were present they are in very low numbers with the exceptions of Site 12.1 where bullhead were present in high numbers of 28 specimens and Site 12.3 and Site 16.2 where brown trout were also present in relatively good numbers.

13.6.18 The aquatic physico-chemical conditions at each of the fish survey sites was generally good with moderate to high dissolved oxygen concentrations, neutral pH and low conductivity. The lack of fish in 7 of the sites is attributed to the ephemeral nature of these watercourses.

Groundwater

13.6.19 The proposed scheme alignment is underlain by Porthtowan Formation and Grampound Formation bedrock geology, comprising mudstone, sandstone and siltstone[8].

13.6.20 Review of the EA's Groundwater map, on WIYBY[16], the bedrock geology is classified as a Secondary A Aquifer, described as "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. Superficial deposits within this area are limited, with a scattering of clay, silt, sand and gravel overlying the bedrock geology in places"[17].

13.6.21 The majority of the area which encompasses the scheme alignment is not located within a designated groundwater Source Protection Zone (SPZ). However, land immediately to north of Carland Cross, along the alignment of the existing A30, is located within SPZ Zone 2, and approximately 230m from SPZ Zone 1.

13.6.22 Two licenced groundwater abstractions are known to be present within the study area. The first is approximately 440m north of the existing A30 at Carland Cross and is recorded for use for domestic and agricultural purposes. The second abstraction is located approximately 450m south of the A30 at approximate chainage 2000m and is recorded as agricultural use only.

13.6.23 As shown in Table 13-2, the scheme alignment is underlain by Secondary A Aquifer with a WFD classification of good. The majority of the extent of the scheme alignment is not located within a SPZ and the value of this resource is

[15] Environment Agency, "Water Abstraction licences," 2017. [Online]. Available: http://apps.environment-agency.gov.uk/wiyby/151261.aspx. [Accessed 2017].
[16] Environment Agency, "Groundwater," 2017. [Online]. Available: http://apps.environment-agency.gov.uk/wiyby/151261.aspx. [Accessed 2017].
[17] The Environment Agency, "What are the aquifer designations?," 18 09 2017. [Online]. Available: http://apps.environment-agency.gov.uk/wiyby/117020.aspx. [Accessed 2017].

considered to be Medium. The scheme alignment to north-west of Carland Cross Junction is located in Zone 2 of a SPZ and approximately 230m from Zone 1. It is not known whether the abstraction at this location is for potable use and therefore the value of this resource is considered to be Very High at this stage of the assessment.

Table 13-2 Underlying aquifer value

Name	Value rationale	Value assigned
Underlying Secondary A Aquifer	Aquifer providing water for agricultural or industrial use with limited connection to surface water	Medium
Area within SPZ 2	Groundwater abstraction – potentially for potable use.	Very High

Accidental Spillage

13.6.24 Accidents occurring on roads can cause fuel spills and other spills of potentially polluting substances. These spills can enter into the road drainage system, and consequently enter surface water bodies that receive highway drainage. There is also a risk of spills entering groundwater from natural infiltration. Information relating to pollution incidents within the study area, and traffic collisions have been obtained from the following source:

- Traffmap Accident Analysis System – Accident data provided between 01/01/2012 and 31/12/2016.

WFD Compliance

13.6.25 A detailed baseline of the existing status and objectives of WFD quality elements within the study area will be included in the WFD Compliance Assessment. Figure 13-**4** and Figure 13-**5** show the WFD surface water bodies and WFD ground water bodies respectively.

Flood Risk

13.6.26 The scheme alignment is located entirely in the low risk Flood Zone 1[12], which is defined as having a risk of flooding from fluvial and tidal sources of less than 1 in 1000 (0.1%) in any year.

13.6.27 Sections of the scheme alignment are indicated on the EA mapping (see Figure 13-3) to be at risk of flooding from surface water sources[12]. This mapping does not distinguish between areas at risk of flooding purely from surface water runoff (specifically during heavy rainfall events) and areas at risk from small watercourses that are too small to be included on fluvial flood risk mapping. Following a review of these locations, the main areas of surface water flood risk along the proposed scheme alignment are coincident with small watercourses crossed by the existing A30, indicating flooding from fluvial sources, rather than areas where the road drainage network is overwhelmed during rainfall events.

13.6.28 Potential flood risk receptors include the proposed highway, residential properties and agricultural land. The proposed highway is considered to have Very High importance as an essential infrastructure route. Residential receptors are

considered to have High value and agricultural land is considered to have Low value, see Table 13-3.

Table 13-3 Flood risk

Name	Value justification	Value assigned
Proposed highway	Regionally important infrastructure asset	Very High
Residential properties	Floodplain protecting between 1 and 100 residential properties	High
Agricultural land	Limited constraints and low probability of flooding residential and industrial properties	Low

13.7 Consultation

13.7.1 A number of stakeholders have been consulted to both gather baseline data and inform the assessment. Each of these and the reasons for consultation with them (specific to this chapter) are described below.

13.7.2 Cornwall Council has been consulted to obtain baseline data including local and unlicensed abstractions and in their capacity as LLFA with regards to the assessment of flood risk and crossing of ordinary watercourses.

13.7.3 Consultation is currently in progress with the Environment Agency.

13.7.4 The Planning Inspectorate were consulted during the scoping stage and provided an opinion along with collated responses from South West Water and Public Health England. These responses have been considered and included, where appropriate, in this chapter.

13.7.5 South West Water and Landowners are to be consulted upon development of the Environmental Statement.

13.8 Assessment Assumptions and Limitations

13.8.1 For the assessment of construction impacts, where construction methods are not available, standard construction practices are assumed where construction methods and sequencing information is not available.

13.8.2 Assessment of the drainage and the water environment aspects of the scheme have been carried out in accordance with HD 45/09, and supplementary methods as explained in the above sections for potential impacts not covered by this guidance.

13.8.3 Limitations and assumptions associated with the recommended methods are discussed below.

Surface Water

13.8.4 The baseline condition described in the assessment was obtained from the EA's 'Catchment Data Explorer'[4] website, along with the River Habitat Appraisal report[9].

13.8.5 For the HAWRAT model flow data is required. Due to the small size of the surface watercourses in the study area there is no available flow data available. The Q95

flow for each watercourse was therefore estimated using LowFlows software based on a manually delineated catchment area.

13.8.6 For surface watercourses with a Q95 estimated as being 0.001 m^3/s a Q95 of 0.001 m^3/s was used, in accordance with HD 45/09 guidance.

13.8.7 The water hardness parameter for HAWRAT were obtained from the Drinking Water Inspectorate (DWI) map which shows the rate of water hardness. This data is considered to be appropriate to use in the absence of chemical data for each watercourse. It is assumed that local potable water would have a similar hardness characteristic as the local surface water and the three water hardness levels used by the HAWRAT model are based on broad ranges.

Groundwater

13.8.8 The Method C assessment results in a significance of effect that is relevant to the specific locale of the point of discharge, which is not relevant to the wider groundwater body due to dilution effects. Supplementary risk assessment is proposed to assess this situation if it arises.

Gaps and Uncertainties

13.8.9 Geophysical investigations are currently ongoing to determine whether abandoned mine workings are, or have the potential to be, connected to the proposed road drainage network or to be disturbed by the scheme (during construction or operation). If these investigations indicate connectivity, then treatment of contaminated mine water may be required.

13.8.10 The FRA will be finalised once consultation and agreement with Cornwall Council and the EA has been reached. This will be reported within the ES which will accompany the DCO application to be made in Summer 2018.

13.8.11 The WFD compliance assessment will be finalised once consultation and agreement with the EA has been reached. This will be reported within the ES which will accompany the DCO application to be made in Summer 2018.

13.8.12 The drainage design is currently at an outline stage and will be finalised later in the design process.

13.8.13 Consultation in currently in progress with EA and is yet to be undertaken with South West Water.

13.9 Design, Mitigation and Enhancement Measures

Construction Mitigation

13.9.1 The Outline EMP, to be provided as part of the ES, will include measures that are considered as standard good practice that would be implemented by the construction contractor to reduce the likelihood of effects or their magnitude if they were to occur. The Outline EMP will also describe the procedures to be followed after an accidental spillage or other release of pollutants.

13.9.2 Works would also be carried out in accordance with any additional permitting requirements, for example Ordinary Watercourse Consent. Measures that are non-standard or site specific are described below and these should be incorporated into the contractor's construction method statement.

13.9.3 The standard measures included in the Outline EMP are based on the Environment Agency's Pollution Prevention Guidelines (PPGs).

13.9.4 Examples of the standard practice mitigations included in the Outline EMP include the provision of spill kits, restricting site traffic to dedicated haul roads and ensuring hard-standing areas are regularly swept and maintained.

13.9.5 Effective delivery of the measures set out here and in the Outline EMP would be monitored during the construction phase by the Environmental Clerk of Works.

13.9.6 Additional site specific measures would include**:**

- A surface water management system using measures such as temporary silt fencing, cut off ditches, settlement ponds and bunds set up early in the construction period to capture all runoff and prevent ingress of sediments and contaminants into existing drainage ditches where necessary.
- Water with a higher risk of contamination which requires discharge, including groundwater pumped out of pilings during concrete pouring, would be contained and treated using appropriate measures such as coagulation of sediments, dewatering and pH neutralisation prior to discharge. There are various proprietary package treatment plants available that can provide these measures.
- Contaminated water that cannot be treated on site would, if necessary, be pumped to a suitably licenced tanker before being exported off site for treatment at an appropriately permitted facility.
- Areas of exposed sediment deemed at risk of erosion during heavy rainfall or flood inundation should be protected using either temporary measures (e.g. sheeting) or semi-permanent measures (for example coir matting) until vegetation is able to establish on these surfaces.
- Works would be suspended during out-of-bank river flows or during intense rainstorms.
- A water quality monitoring programme prior to and during construction works would be agreed with EA.

Operational Mitigation

13.9.7 The following flow volume and quality control measures are incorporated into the scheme design to provide a sustainable urban drainage system (SUDS) and are not considered to comprise additional mitigation.

13.9.8 The carriageway drainage would consist of a three stage treatment train of grassed swales (dry), catch-pits and detention basins to remove and retain soluble and suspended pollutants to ensure discharges to groundwater or local watercourses are at acceptable levels.

13.9.9 Attenuation/infiltration basins would be designed to ensure that groundwater levels would not impede their performance. In addition, where embankments are to be constructed above key groundwater/surface water interactions (springs), culverts or drainage blankets will be incorporated into the design to maintain the existing flow regime and to ensure the sub-surface flows do not compromise the integrity of the earthworks.

13.9.10 These mitigations will be updated as the drainage design and assessment of effects are finalised.

13.10 Assessment of Effects

Construction Effects

Surface Water

13.10.1 Following the implementation of measures required by the Outline EMP, the magnitude of any pollution incident or temporary physical modification is likely to be negligible. Therefore, the significance of effect would be **neutral**.

Groundwater

13.10.2 Following the implementation of measures required by the Outline EMP, the magnitude of any pollution incident or temporary change in groundwater levels is likely to be negligible. Therefore, the significance of effect would be **neutral**.

Accidental Spillage

13.10.3 Following the implementation of measures required by the Outline EMP, the magnitude of any accidental spillage is likely to be negligible. Therefore, the significance of effect would be **neutral**.

WFD Compliance

13.10.4 Any potential effects on WFD quality elements or objective as a result of the scheme will be described in the ES upon completion of the WFD compliance assessment.

Flood Risk

13.10.5 Any potential effects of construction of the scheme upon flood risk will be described in the ES upon completion of the flood risk assessment.

Operational Effects

Surface Water

Surface Water Quantity

13.10.6 The proposed scheme alignment generally traverses a boundary between two watersheds. Several springs emerge along the flanks of this watershed boundary, flowing to the north and south and as such there are interactions with earthworks associated with the scheme. The locations of embankments that would be constructed over springs and headwater streams are summarised within Table 13-4 and a description provided of the potential impact.

Table 13-4 Summary of springs and headwater streams affected by embankments construction

Embankment	Chainage (m)	Hydrological/ hydrogeological feature	Potential effect	Mitigation/ design aspect	Residual effect
Tresawsen Embankment	5+900 to 6+200	Surface water flow path – collects 80m south-east, downstream of the culvert, as a tributary of Zelah Brook.	Embankment constructed over and blocking the flow of the headwater stream	Culvert/ drainage blanket – this will also prevent water causing instability in the earthworks	Maintenance of current flow regime
Tolgroggan Earthworks 2	8+750 to 8+950	Headwater stream – spring 45m north-west feeds the headwaters before crossing at ch 8+910. Stream continues to flow east before joining a river network eventually merging with the River Allen.			
Zelah Earthworks 2	9+200 to 9+400	Spring and headwater stream – spring beneath or at the toe of the existing A30 embankment. Headwater crosses under the scheme at ch 9+250. Stream flows south-east before joining a river network eventually merging with the River Allen.			
Penny-Come-Quick Embankment	11+000 to 11+150	Headwater stream – flows south-east, crossing scheme at ch 11+040. Continues to flow south-east before joining the River Allen.			
Carland Cross Earthworks 2	13+400 to 13+850	Spring and headwater stream – flows north-east at ch 13+680 and continues north before joining the River Gannel.			

Surface Water Quality

13.10.7 The drainage design of the scheme directs runoff from the carriageway to 12 attenuation basins prior to discharge into surface waters via outfalls. The locations of the outfalls and water bodies are illustrated in Figure 13.1 and Figure 13-2.

13.10.8 Method-A of HD45/09 (HAWRAT) was used to assess the impact of the road drainage on the receiving watercourses, and to determine contaminant levels of outflows from the scheme. The methodology used for the Method-A assessment and the HAWRAT model is presented in Section 13.5.

13.10.9 A two-way Annual Average Daily Traffic (AADT) of 42,766 along the A30 has been predicted for 2038. This falls within the lowest range used in the HAWRAT assessment of between 10,000 and 50,000 AADT.

13.10.10 The water hardness was taken from the DWI map and gives a hardness for the region of less than 50mg $CaCO_3$, placing it within the Low category for HAWRAT.

13.10.11 Discharges from all basins would be to watercourses with assumed Q95 flows of 0.001 m^3/s.

13.10.12 Due to these low flows, it is likely that discharge from the drainage system would infiltrate to groundwater, particularly during summer months. It is therefore appropriate to assess the risk of this discharge to groundwater rather than surface watercourses. However, Method-A of HD45/09 ('Simple Assessment') has been used on a precautionary basis to assess the operational effects of the road surface runoff from the proposed outfalls, in the event that flows entered the watercourse directly. Method A has also been used to demonstrate that the mitigation will be sufficient to ensure that water quality is not compromised as part of the scheme. A cumulative assessment of impacts has not been undertaken as the outfalls either discharge to separate waterbodies or are greater than 1km apart.

13.10.13 The surface water quality of the undiluted runoff for all sections on the road fail Step 1 of the Method-A assessment because levels of sediment and dissolved metals in the runoff are above the threshold levels set in the HAWRAT model.

13.10.14 As shown in, at Step 2 of the Method-A assessment, the surface water quality for mainline ponds passes the HAWRAT assessment for copper at ch13+300m and ch13+500m but fails on all other counts for both sediment and dissolved metals. For side road attenuation ponds the pond at ch1+600 fails on all counts, all other ponds pass the assessment for copper concentrations and three ponds fail for zinc and sediment concentrations.

13.10.15 At Step 3 of the Method-A assessment, the three stage treatment train included in the proposed drainage design (see 13.9.7) is incorporated to the assessment as a mitigation. The percentage effectiveness of each element of the treatment train is shown in Table 13-5. With mitigation incorporated, all discharge locations pass the assessment for soluble pollutants and all side road ponds also pass for sediment concentration. Discharges from six out of the 12 mainline basins also pass for sediment, but the discharge from the remaining six marginally fail for sediments. The details of these results will be reported within the ES, which will accompany the DCO application to be made in Summer 2018. As mentioned above however, this has been undertaken on a precautionary basis and because of the low-flows, reference is made to Method-C.

Table 13-5 Treatment efficiencies of proposed carriageway runoff treatment trains

Treatment Step	Proposed Mitigation	Treatment Efficiency (% reduction)		
		Copper	Zinc	Sediment
Step 1	Grassed Swales (dry)	85	85	80
Step 2	Catchpits	0	0	40
Step 3	Detention Basin	65	65	77.5
Cumulative		90	90	90

Sources:

1. CIRIA C609: Table 3.7 for efficiency of Grassed swales (dry) and detention basins (median value used).
2. Auckland Regional Council: Quantification of Catchpit Sediments and Contaminants (October 2009), Table 1. Median value used.

NOTE: For cumulative efficiency the treatment stages were assumed to work at 50% of original efficiency for each subsequent step after step 1. This is based on the conservative cumulative removal efficiency recommended in CIRIA C609.

13.10.16 A long term impact assessment of surface water runoff from the highway has been undertaken by comparing the annual average concentrations of copper and zinc predicted in the HAWRAT results with the EQSs stated in the WFD (Standards and Classifications) Directions 2015. The predicted concentrations are under the EQS thresholds for both copper and zinc at all discharge locations.

13.10.17 It is therefore considered that the magnitude of impact of sediment and dissolved metals discharging into surface watercourses is negligible with a significance of effect of neutral.

Groundwater

Groundwater Levels

13.10.18 The groundwater level at cutting locations has been assessed through the groundwater monitoring data obtained as part of the Phase 1 GI carried out by Structural Soils in early 2017 (see summary Table 13-6). Based on this data it is anticipated that groundwater may be very close to pavement level at:

- Four Burrows Earthwork 1 (Ch 2+850 to 3+100m)
- Nanteague Cutting (Ch 6+450 to 6+650m)
- Marazanvose Cutting (Ch 6+900 to 7+250m)
- Two Barrows Cutting (Ch 7+500 to 7+850m)
- Penglaze Cutting (Ch 11+400 to 11+600m)
- Carland Cross Earthworks 3 (13+850 to 14+300)

13.10.19 Groundwater is anticipated to be above pavement level at the Quarry Retaining Wall (Ch 12+600 to 12+950m) and is anticipated to be to be well below the pavement level at all other cuttings.

13.10.20 Where groundwater control measures are required to control the ingress of groundwater (for example Quarry Retaining Wall) the groundwater level may be

affected. This may result in lowering of the groundwater level in proximity of the works.

Table 13-6 Assessment of cutting construction on groundwater levels

Cutting name	Chainage (m)	Max cutting depth (m)	Nearest borehole with groundwater monitoring	Chainage of borehole (m)	Highest recorded		Potential groundwater level (m below base of cutting)
					Depth (mbgl)	Level (mOD)	
Chiverton Cutting	0+600 to 0+950	2.4	Groundwater monitoring data for nearby BH-S-005 not available due to land access constraints. Water level recorded during the installation of the data logger at 8.7mbgl (135mOD).				Groundwater anticipated to be below base of cutting
Four Burrows Earthwork 1	2+850 to 3+100	2.8	BH-R-004	2+900	4.6	139.0	Groundwater anticipated to around 2.0m below base of cutting
Hillview Cutting	5+100 to 5+850	4.5	BH-R-013	5+800	Dry	Dry	Groundwater anticipated to be below base of cutting
Nanteague Cutting	6+450 to 6+650	3.6	BH-R-108	6+550	3.6	97.7	Groundwater anticipated to around 0.8m below base of cutting
Marazanvose Cutting	6+900 to 7+250	2.3	BH-R-017	7+100	3.2	76.2	Groundwater anticipated to around 1.1m below base of cutting
Two Barrows Cutting	7+500 to 7+850	4.1	Access not possible during Phase 1 GI, therefore no available ground or groundwater information.				Groundwater anticipated to be similar to that at Marazanvose Cutting.
Tolgroggan Earthworks	8+400 to 8+750	3.5	BH-S-032	8+700	Dry	Dry	Groundwater anticipated to be below base of cutting
Zelah Earthworks 1	8+950 to 9+200	4.5	No groundwater monitoring installations. Trial pits within this area were all dry.				Groundwater anticipated to be below base of cutting
Zelah Earthworks 3	9+400 to 9+500	3.6	No groundwater monitoring installations. Trial pits within this area were all dry.				Groundwater anticipated to be below base of cutting
Trevalso Crossing	10+150 to 10+300	3.3	BH-R026	10+280	6.0	107.6	Groundwater anticipated to be below base of cutting
Penglaze Cutting	11+400 to 11+600	3.8	BH-R-027	11+400	4.3	116.1	Groundwater anticipated to be 1.6m below base of cutting
Quarry Retaining Wall	12+600 to 12+950	5.5	BH-R-014	12+700	2.2	144.9	Groundwater anticipated to above pavement level

Cutting name	Chainage (m)	Max cutting depth (m)	Nearest borehole with groundwater monitoring	Chainage of borehole (m)	Highest recorded		Potential groundwater level (m below base of cutting)
					Depth (mbgl)	Level (mOD)	
Carland Cross Earthworks 3	13+850 to 14+300	2.3	BH-R-041	14+050	5.7	130.2	Groundwater anticipated to be 1.1m below base of cutting

Groundwater Quality

13.10.21 The proposed scheme design is for routine runoff to be discharged to attenuation basins with some infiltration prior to discharge to surface watercourses. The anticipated flow during summer months within the attenuation basins is likely to have a Q95 of less than or equal to 0.001 m^3/s and would therefore discharge to groundwater. Thus, the 'first flush' discharge into attenuation ponds and infiltration from the ponds results in little discharge entering the watercourse.

13.10.22 Therefore, following HD45/09, a Method-C assessment which considers the impact of infiltration of road runoff to groundwater is most appropriate. Assessments have been carried out for all discharge locations given in Table 13-13.

13.10.23 As stated in the HAWRAT analysis, an AADT of 42,766 is predicted for the A30 in 2038. This is in the low risk range (0-50,000 AADT) used in the standard Method-C approach for assessing pollution impacts from routine runoff to groundwater. On this basis, the assessments carried out for the scheme are likely to overstate the potential risk to groundwater quality.

13.10.24 The full Method-C assessments for the potential impacts to the groundwater body and specific receptors will be provided within the ES which will accompany the DCO application to be made in Summer 2018.

13.10.25 The overall risk score for the HD45/09 Method-C assessment for mainline basins is between 220 and 240 depending on water table depth. This is within the 150 to 250 suggested action class range, which indicates there is a '*medium*' risk of impact as a result of discharge to groundwater from routine runoff at these locations.

13.10.26 In accordance with the HD45/09 Method-C assessment, with a 'medium' risk of impact, depending on the quality of surface water, mitigation measures may be required for the protection of groundwater. If this were to be the case, the need for (and type) of any measures would be informed by additional risk assessment. However, the HAWRAT modelling undertaken for each pond location derived copper and zinc concentrations below the EQS threshold. This indicates that heavy metal concentrations measured in pond discharge would not pose a risk to groundwater quality. Therefore, no further assessment has been carried out.

Accidental Spillage

13.10.27 The Method-D spillage risk assessment outlined in the HD45/09 Volume 11, Section 3, Part 10 was carried out using vehicle numbers from the 2038 AADT flows to account for future growth.

13.10.28 On all roads, there is a risk that an accidental spillage or vehicle fire may lead to an acute pollution incident. It is generally accepted that the pollution risk on any road is linked to the risk of a HGV road traffic accident. Where a spillage does reach a surface watercourse the pollution effect can be *severe,* but is usually of short duration.

13.10.29 The acceptable risk of a pollution incident is stated in HD45/09. The acceptable risk of pollution reaching a sensitive watercourse or groundwater is: an annual probability of less than 1%; or a return period of 1 in 100 years.

13.10.30 Using the HD45/09 assessment method, the risk of spillages has been calculated for predicted future conditions. The greatest risk of accidental spillage at any location is below 0.03%, well within the acceptable limit. Based on the spillage assessment, the magnitude of potential impact on surface or groundwater is considered to be negligible. The significance of effect is therefore neutral. The full assessment will be provided within the ES which will accompany the DCO application to be made in Summer 2018.

WFD Compliance

13.10.31 The results of the WFD compliance assessment will be included in the ES upon completion.

Flood Risk

13.10.32 The results of the flood risk assessment will be provided in the ES upon completion.

Summary of Construction Effects

13.10.33 Detailed effects of construction on surface water quality, flood risk and ground water will be provided within the ES, which will accompany the DCO application to be made in Summer 2018. With comprehensive mitigation incorporated, impacts on surface water quality on all receptors listed in Table 13-1 would have a negligible magnitude and neutral significance of impact. Construction effects on flood risk would have no impact upon the proposed highway, residential properties and agricultural land. With the incorporation of construction effects on the underlying aquifer and the area within the source protection zone, there would be a negligible magnitude and neutral significance of impact upon groundwater receptors.

Summary of Operational Effects

13.10.34 Detailed results will be provided within the ES, which will accompany the DCO application to be made in Summer 2018. In summary, for the receptors outlined in Table 13-1, the significance of impact was neutral aside from new drainage outfalls at chainage 4400m and 6000m which were slight and slight/moderate respectively.

13.10.35 Using the same criteria, the operational effects on groundwater receptors had a negligible magnitude and neutral significance of impact. Detailed results will be provided within the ES, which will accompany the DCO application to be made in Summer 2018.

13.11 Monitoring

13.11.1 The monitoring requirements of the scheme will be developed and agreed in consultation with the Environment Agency.

13.12 Summary

13.12.1 The road drainage and water environment chapter in this PEIR describes the existing condition of the water environment in the study area before undertaking an assessment of the potential effects on the quality and quantity of surface and ground waters, flood risk and WFD compliance as a result of the scheme.

13.12.2 The assessment of effect on the water environment from the construction of the scheme has found that when incorporating the mitigation measures included in the Outline EMP, there would be a neutral impact. For operation of the scheme, the assessment of effects has indicated a neutral impact on the water environment as a result of the new embankments, cuttings and road drainage. The accidental spillage assessment has indicated that there is a negligible risk from the scheme and no further measures have been proposed.

13.12.3 Based on the current available baseline and design information, the assessment of effects to surface and ground waters from the construction and operation of the scheme has indicated an assessment of significance of neutral.

Table 13-7 Summary of assessment of effects due to construction

Description of potential impact	Embedded design, mitigation and enhancement measures	Sensitivity /value of receptor	Duration of impact	Magnitude of potential impact	Significance of potential impact	Additional mitigation	Residual magnitude of potential impact	Residual significance of potential impact
Surface Water								
Degradation of water quality (inc spillage)	Outline EMP	Low to Very High	Short & Long term	Minor adverse	**Moderate / Large adverse**	Surface water management, pollution control.	Negligible	**Neutral**
Temporary physical modification of water features	Outline EMP	Low to Very High	Short term	Negligible	**Neutral**	N/a	Negligible	**Neutral**
Groundwater								
Degradation of water quality (inc spillage)	Outline EMP	Medium to Very High	Short & Long term	Minor adverse	**Moderate / Large adverse**	Surface water management, pollution control.	Negligible	**Neutral**
Change in groundwater resource due to temporary dewatering	Outline EMP	Medium to Very High	Short term	Negligible	**Neutral**	N/a	Negligible	**Neutral**
WFD Compliance								
Any potential effects on WFD quality elements or objective as a result of the scheme will be described in the ES upon completion of the WFD compliance assessment.								

Description of potential impact	Embedded design, mitigation and enhancement measures	Sensitivity /value of receptor	Duration of impact	Magnitude of potential impact	Significance of potential impact	Additional mitigation	Residual magnitude of potential impact	Residual significance of potential impact
Flood Risk								
Any potential effects on flood risk as a result of the scheme will be described in the ES upon completion of the WFD compliance assessment.								

Table 13-8 Summary of assessment of effects due to operation

Description of potential impact	Embedded design, mitigation and enhancement measures	Sensitivity /value of receptor	Duration of impact	Magnitude of potential impact	Significance of potential impact	Additional mitigation	Residual magnitude of potential impact	Residual significance of potential impact
Surface Water								
Degradation of water quality from routine runoff	Treatment train in SUDS system	Low to Very High	Short & Long term	Negligible	**Neutral**	N/a	Negligible	**Neutral**
Degradation of water quality from accidental spillage	N/a	Low to Very High	Short term	Negligible	**Neutral**	N/a	Negligible	**Neutral**
Physical modification of water features (e.g. new culverts / outfalls)	Best practice detailed design of structures	Low to Very High	Short term	Negligible	**Neutral**	N/a	Negligible	**Neutral**

Description of potential impact	Embedded design, mitigation and enhancement measures	Sensitivity /value of receptor	Duration of impact	Magnitude of potential impact	Significance of potential impact	Additional mitigation	Residual magnitude of potential impact	Residual significance of potential impact
Change in surface water flows as a result of cuttings or embankments	Culverts / drainage blankets	Low to Very High	Long term	Negligible	**Neutral**	N/a	Negligible	**Neutral**
Groundwater								
Degradation of water quality from routine runoff	Treatment train in SUDS system	Medium to Very High	Short & Long term	Negligible	**Neutral**	N/a	Negligible	**Neutral**
Degradation of water quality from accidental spillage	N/a	Medium to Very High	Short term	Negligible	**Neutral**	N/a	Negligible	**Neutral**
Change in groundwater resource due to cuttings, embankments or road drainage	N/a	Medium to Very High	Long term	Negligible	**Neutral**	N/a	Negligible	**Neutral**
WFD Compliance								
Any potential effects on WFD quality elements or objective as a result of the scheme will be described in the ES upon completion of the WFD compliance assessment.								
Flood Risk								

Description of potential impact	Embedded design, mitigation and enhancement measures	Sensitivity /value of receptor	Duration of impact	Magnitude of potential impact	Significance of potential impact	Additional mitigation	Residual magnitude of potential impact	Residual significance of potential impact
Any potential effects on flood risk as a result of the scheme will be described in the ES upon completion of the WFD compliance assessment.								

Further Work

13.12.4 The WFD compliance assessment and flood risk assessment have yet to be finalised and are not included in this PEIR. They will be reported within the ES which will accompany the DCO application to be made in Summer 2018.

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[1] The Environment Agency, “Pollution prevention for businesses,” 12 07 2016. [Online]. Available: https://www.gov.uk/guidance/pollution-prevention-for-businesses. [Accessed 10 2017].

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[6] Centre for Ecology and Hydrology, “National River Flow Archive,” 10 2017. [Online]. Available: http://nrfa.ceh.ac.uk/data/station/meanflow/64001. [Accessed 10 2017].

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[11] Defra, “Map showing the rate of hardness in mg/l as Calcium Carbonate in England and Wales,” 2009. [Online]. Available: http://www.dwi.gov.uk/consumers/advice-leaflets/hardness_map.pdf . [Accessed 10 2017].

[12] The Coal Authority, “Coal Mining Reporting Area,” 2017. [Online]. Available: http://mapapps2.bgs.ac.uk/coalauthority/home.html. [Accessed 10 2017].

[13] Environment Agency, “Water Abstraction licences,” 2017. [Online]. Available: http://apps.environment-agency.gov.uk/wiyby/151261.aspx. [Accessed 2017].

[14] WSP, “Stage 3 Traffic Forecasting Report,” 2017.

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Preliminary Environmental Information Report

Chapter 14 Climate Change

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14 Climate Change

14.1 Introduction

14.1.1 This chapter of the PEIR presents the following assessments undertaken as part of the climate change topic:

- the greenhouse gases (GHG) assessment – called the carbon assessment;
- the climate change resilience (CCR) assessment.

14.1.2 These assessments are considered to be appropriate for the PEIR, in line with the latest legislation and regulatory requirements, as discussed in Section 14.2 of this PEIR chapter. The in-combination climate change impacts (ICCI) assessment is presented in Chapter 15 of this PEIR.

14.1.3 The carbon assessment quantifies and reports – in the form of a 'carbon footprint' – the reasonable worst case scenario carbon emissions associated with the construction and operation of the scheme. This chapter refers to 'carbon' as including all main greenhouse gases[1]. Greenhouse gas emissions are converted into tonnes of carbon dioxide equivalent (tCO_2e), which normalizes the global warming potential of the main GHG into one measure, based on the global warming potential of CO_2.

14.1.4 The climate change resilience assessment considers potential climate change impacts on the design, construction and operation of the scheme over its lifetime.

14.1.5 As stated in the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) Synthesis Report[2], mitigation (reducing carbon emissions), and adaptation (responding to climate change impacts), are complementary approaches to reducing risks of climate change impacts. Mitigation will in the middle/long term substantially reduce climate change impacts. Benefits from adaptation are realised now in addressing current events, and will further address emerging climate change risks in the future. Innovation and investments in environmentally sound infrastructure and their supporting technologies can both reduce carbon emissions and enhance resilience to climate change.

[1] The seven main GHGs are: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF_3). Source: National Atmospheric Emissions Inventory (2017), Overview of greenhouse gases. Available online at: http://naei.defra.gov.uk/overview/ghg-overview

[2] Intergovernmental Panel on Climate Change (IPCC), 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Available online at: http://ar5-syr.ipcc.ch/topic_summary.php

14.2 Legislative and Policy Framework

National

Carbon assessment

14.2.1 The scheme is assessed within the context of the UK's evolving strategies to carbon emissions mitigation. The Climate Change Act 2008[3] committed the UK to its first statutory carbon-reduction target to reduce emissions by at least 80% from 1990 levels by 2050. To ensure that regular progress is made towards the target the Climate Change Act established a system of carbon budgets. The first five carbon budgets, leading to 2032, have been set in law. Meeting the fourth (2023-27) and fifth (2028-2032) carbon budgets will require that carbon emissions are reduced by 50% (by 2025) and 57% (by 2030) relative to 1990 levels. The Government published a plan for meeting the legislated carbon budgets in October 2017[4].

14.2.2 The National Networks National Policy Statement (NN NPS)[5] emphasises the need to minimise carbon emissions within the transport sector, including road transport. Whilst the NN NPS points out that it is unlikely that the impact of any single road project, considered in isolation, would affect the Government's ability to meet the carbon targets, applicants should provide evidence of the carbon impact of the project and an assessment against the Government's carbon budgets. The effectiveness of any proposed carbon reduction measures will be considered by the Secretary of State to ensure that the carbon footprint is not unnecessarily high; the Secretary of State's view of the adequacy of the proposed carbon reduction measures relating to design and construction will be a material factor in the decision making process.

14.2.3 In December 2015, a global climate agreement – the Paris Agreement[6] – was adopted at the 21st Conference of the Parties (COP21). A central aim of the Paris Agreement is to strengthen the global response to climate change by limiting the global temperature increase this century to below 2 degrees Celsius above pre-industrial levels, and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. To achieve this aim, the Paris Agreement additionally sets a target for net zero[7] global carbon emissions in the second half of this century. The Paris Agreement was ratified and entered into force in November 2016. In line with the Paris Agreement, the Government has indicated it intends to set a UK target for reducing domestic emissions to net zero[8].

[3] Department of Energy & Climate Change, *The Carbon Plan – reducing greenhouse gas emissions*, 2011; https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/47621/1358-the-carbon-plan.pdf; Accessed: 4 August 2016

[4] HM Government, The Clean Growth Strategy – Leading the way to a low carbon future, 2017. https://www.gov.uk/government/publications/clean-growth-strategy; accessed 14th November 2017

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[6] Paris Agreement. Available online at: https://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf; Accessed 3 April 2017

[7] Net-zero means "a balance between anthropogenic emissions by sources and removals by sinks of carbon emissions in the second half of this century". Article 4 Paragraph 1. Available online at: https://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf

[8] Committee on Climate Change, *UK climate action following the Paris Agreement*, 2016

CCR assessment

14.2.4 At the European level, the EIA Directive 2011/92/EU[9] places a requirement upon projects which have the potential for significant effects on the surrounding environment and communities to make a formal assessment of these effects. The amended EIA Directive 2014 identifies the important role that the EIA process can play in assessing climate change impacts. It states that EIAs shall identify, describe and assess the direct and indirect significant effects of climate change relevant to the project (i.e. carbon, CCR and ICCI). The Directive 2014/52/EU entered into force on 15th May 2015 and contains the amendments to the 2011 Directive in full. The Regulations implementing this Directive were transposed into UK legislation in May 2017.

14.2.5 At a national level, the Climate Change Act 2008 requires the UK Government to undertake a national Climate Change Risk Assessment (CCRA) every five years. The second CCRA was published in 2017[10] and provides assessments of climate change risks for different sectors of society, including infrastructure, people and the built environment, natural environment and natural assets, business and industry as well as international dimensions and cross-cutting issues. The assessment builds upon the CCRA 2012[11] and aims to assess the urgency of further action to tackle different climate change risks for the UK, as well as realise potential opportunities. The most urgent climate change risks for the UK include flooding and coastal change risks; risks to health, well-being and productivity from high temperatures, risks of shortages in the public water supply and for agriculture, energy generation and industry, risks to natural capital, including terrestrial, coastal marine and freshwater ecosystems, soils and biodiversity, risks to domestic and international food production and trade, and new and emerging pests and diseases and invasive non-native species, affecting people, plants and animals.

14.2.6 Following the CCRA 2012, the first National Adaptation Programme (NAP)[12] was published, detailing the Government's long term strategy to address the main climate change risks and opportunities for the UK. The NAP is published every five years and is due to be updated in 2018. The Committee on Climate Change (CCC) and its Adaptation Sub-Committee conduct an independent assessment of progress by the NAP every two years[13]. These progress reports contribute towards the wider understanding of national climate change risks, including risks specific to the transport sector and rail infrastructure. Further understanding of UK climate change impacts can be obtained through the reports submitted under the UK Adaptation Reporting Power (ARP) in the first and second rounds of reporting. Reports are produced by organisations with functions of a public nature and statutory undertakers, including Highways England[14].

[9] Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment. Available online at: http://eur-lex.europa.eu/legalcontent/EN/TXT/?uri=celex%3A32014L0052

[10] Committee on Climate Change (2017),Progress in preparing for climate change. Available online at: https://www.theccc.org.uk/uk-climatechange-risk-assessment-2017/

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14.2.7 The NN NPS[6] specifies the need for new developments to consider climate change impacts when planning location, design, build and operation. New national networks infrastructure typically is a long-term investment, which will need to remain operational over the course of decades in the face of a changing climate. All relevant impacts of climate change need to be considered and addressed within an environmental statement, alongside any relevant adaptation measures to ensure the long-term resilience of a proposed development.

Local

14.2.8 Cornwall Council has committed to assessing the risks associated with climate change and the implications for affected services and communities and adapting accordingly. Furthermore, Cornwall Council has committed to encouraging all sectors of the community to reduce their own greenhouse gas emissions and adapt to the impact of climate change[15].

Guidance

Carbon assessment

14.2.9 The Government's Construction Industry Strategy[16] presents the UK's low carbon construction aspirations. It includes the aspiration to decrease construction carbon emissions by 50% by 2025 based on 1990 levels, as reported in the Green Construction Board's Low Carbon Routemap for the Built Environment[17].

14.2.10 Although there is no specific standard for reporting infrastructure carbon emissions in EIA, a variety of existing standards have been used to guide this assessment:

- The Publicly Available Specification (PAS) 2080[18] on carbon management in infrastructure;
- BS EN 15804[19] which outlines the requirement for quantifying and reporting emissions at a product level;
- IEMA's guide to assessing carbon emissions and evaluating their significance in EIA[20];
- DMRB HA 207/07, which provides a calculation method for regional emissions[21]; and
- Highways England Interim Advice Note 185/15[22], which advises on emissions factors to be used to model carbon emissions from traffic.
- Highways England's Carbon emissions calculation tool, which provided emissions factors for the assessment[23].

[15] https://www.cornwall.gov.uk/environment-and-planning/sustainable-development/climate-change-and-energy/
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[22] Highways England (2015), Interim Advice Note 185/15: Updated traffic, air quality and noise advice on the assessment of link speeds and generation of vehicle data into 'speed-bands' for users of DMRB Volume 11, Section 3, Part 1 'Air Quality and Volume 11, Section 3. Part 7 Noise
[23] Highways England, Carbon emission calculation tool, September 2016. https://www.gov.uk/government/publications/carbon-tool; Accessed 2 October 2017

14.2.11 The carbon assessment has used the principles and methods set out in existing standards and guides as illustrated. It was supported by a combination of carbon modelling tools (Highways England carbon calculator), publicly available information including the University of Bath's Inventory of Carbon and Energy[24] on construction materials, and specific figures from environmental product declarations (EPDs).

CCR assessment

14.2.12 The European Commission (EC) has released sector specific guidance[25] on the interface between climate change and infrastructure, including projected impacts and resilience levels. This document accompanies the Communication "*An EU strategy for adaptation to climate change*"[26] and provides further background material supportive of the narrative and arguments put forward in the Communication. This working document also presents, for some areas, an outline of actions that the Commission will be undertaking, as announced in the Communication.

14.2.13 IEMA has published guidance[27] on climate change resilience and adaptation in response to the requirements specified in the amended EIA Directive 2014. This guidance provides an approach to undertaking assessments of in-combination climate change impacts and climate change resilience within the EIA process in the UK.

14.2.14 The Environment Agency[28] (EA) provides guidance on climate change allowances to be used in flood risk assessments as set out in the National Planning Policy Framework (NPPF). This advice includes climate change allowances for peak river flow and peak rainfall intensity for flood risk assessments for different UK river basin districts, flood zones and land use sensitivities. The assessments made of the implications of climate change for future flood risks associated with the scheme will take account of the content of this guidance.

14.3 Study Area

Study Area and Assessment Scenarios

Carbon assessment

14.3.1 For the assessment of capital carbon, the study area comprises the assets and infrastructure planned for the scheme. This consists of a large number of materials and construction works activities often in small amounts. It is unrealistic to include all, yet at the same time it is important that all significant sources of

[24] Hammond, G.P. and Jones, C.I, (2008,,), *Inventory of Carbon & Energy (ICE) Version 1.6a*, University of Bath, UK
[25] European Commission (2013), Adapting Infrastructure to Climate Change- Communication from the commission to the European Parliament, the council, the European economic and social committee and the committee of the regions: An EU Strategy on Adaptation to Climate Change. Available online at: https://ec.europa.eu/clima/sites/clima/files/adaptation/what/docs/swd_2013_137_en.pdf
[26] European Commission (2013), An EU strategy for adaptation to climate change. Available online at: https://ec.europa.eu/clima/sites/clima/files/docs/eu_strategy_en.pdf
[27] Institute of Environmental Management and Assessment (IEMA) (2015), IEMA Environmental Impact Assessment Guide To Climate Change Resilience And Adaptation. Available at: http://www.iema.net/system/files/iema_guidance_documents_eia_climate_change_resilience_and_adaptation.pdf
[28] Environment Agency (2017), Flood risk assessments: climate change allowances. Available online at: https://www.gov.uk/guidance/flood-riskassessments-climate-change-allowances

carbon emissions to the scheme are included. To ensure this, the convention[29] of 99% by mass input to the scheme has been applied.

14.3.2 The assessment of the operational carbon has adopted the same convention with 99% energy inputs to the scheme across the same study area. This covers all operational activities associated with the day to day running of the scheme, such as lighting and powered signage that are required up to the study cut-off year 2050[30].

14.3.3 For the assessment of user carbon (i.e. the tailpipe emissions from vehicles using the scheme) the study area covers the entire area modelled by the traffic model. This wider boundary captures the user emissions from the scheme, but also those arising from the outlying road network, and vehicle movements that have been indirectly influenced by the scheme (positively and negatively). Unlike the Air Quality study area, the assessment of user carbon includes the total emissions across the model, irrespective of presence and location of receptors. The temporal boundary is the same as that of the operational carbon.

14.3.4 The carbon emissions evaluation is based around a series of scenarios to 2050 taking the following structure:

- **Baseline -** the assessment is based on an existing status scenario, in which the road remains unaltered. This scenario uses 2016 as the baseline year and is akin to the highway continuing as normal benefiting only from standard maintenance practice into the future and accounting for a projection of ongoing operational energy demand (e.g. for lighting and signalling). In this scenario, user carbon emissions from vehicle traffic are estimated over the time period 2016 to 2050, and presented on both a time series (i.e. annualised reporting) and cumulative basis.
- **Opening year -** the assessment follows a 'do minimum' approach taking the scheme opening year (2023) and assuming only standard maintenance and operational energy demand to 2050. In this scenario, user carbon emissions from vehicle traffic are estimated over the time period 2023 to 2050, and presented on both a time series and cumulative basis.
- **Do something -** scenarios based on the scheme and variations thereof:
  - **Reference scheme -** this is the reference design of the scheme at the end of Stage 2 [(31)], pending project design approach and the decisions taken by the project team to close of Stage 2. The reference design may benefit from a degree of embedded carbon mitigation but at this stage the design is not advanced enough to take advantage of this (see Section 14.8). Notionally, the reference design is likely to represent a business as usual vision of the scheme. Maintenance need and operational energy demand to 2050 reflects reference design intent. In this scenario user carbon emissions from vehicle traffic are estimated over the time period 2023 (scheme opening) to 2050, and presented on both a time series and cumulative basis.

[29] BS EN 15804: 2012 Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products

[30] Aligns with the Governments objective of reduce national carbon emissions by 80% by 2050.

[31] As per the Project Control Framework (PCF) major projects life cycle; this will represent the Scheme preferred design after optioneering in Stages 1 and 2. The GHG emissions assessment will be based on design details from Stage 2, or preliminary design details from Stage 3. Cost and bill of quantities data from the Options Estimate from Stage 2 and the Preliminary Estimate from Stage 3 might also be used.

- **Embedded carbon emissions mitigation -** this assessment is based on the reference design but with incorporated interventions targeted at realising the ambitions set out in the Highways England low carbon routemap [32]. Interventions are associated with asset and infrastructure design, materials choice and selection, construction practice, and with how the scheme is operated. This scenario considers maintenance need and operational energy demand to 2050 reflective of the chosen design. In this scenario user carbon emissions from vehicle traffic are estimated over the time period 2023 (scheme opening) to 2050, and presented on both a time series and cumulative basis.

14.3.5 In all scenarios carbon emissions from highway users are based on those arising (directly and indirectly) from vehicles using the scheme. These are calculated based on traffic flow and average vehicle speeds from the traffic model developed for the scheme and wider study area. Carbon emission factors are taken from the Highways England interim advice note 185/15, which adjusts factors for different speed bands to assess the effects of congestion, and applied to the traffic model outputs. As these only provide guidance to 2030, they are extrapolated for the purposes of modelling to 2050. Where relevant, sensitivity testing of different study scenario projections has been applied. This was undertaken by using the traffic model outputs and applying different vehicle emission factors from those in IAN185/15. The variation in emissions factors and how they were calculated is discussed in more detail in Section 14.6.5.

CCR assessment

14.3.6 The study area of the CCR assessment includes all potential climate hazards for all infrastructure and assets associated with the scheme to the end of their design life and the identification of any significant climate change risks; a list of the climate hazards to be considered is summarised in paragraph 14.5.10.

14.3.7 Assessment scenarios are based on current and future climate baselines, as described in Section 14.6. In line with the approach presented in the Highways England Climate Adaptation Risk Assessment Progress Update – 2016[15], the CCR assessment is based on the 50th percentile of climate results associated with the high emissions scenario.

14.4 Potential Impacts

Carbon assessment

14.4.1 The scheme will have an impact on climate change due to carbon emissions during construction as well as operation. User carbon emissions are likely to increase as a result of the scheme. Carbon emissions associated with construction and operation are anticipated to be small, compared to the user carbon emissions.

CCR assessment

14.4.2 The A30 provides an important transport link for Cornwall and is a crucial part of the SRN in the region. The scheme is expected to increase the resilience of transport systems in Cornwall to a range of hazards, including climatic hazards

[32] http://assets.highways.gov.uk/specialist-information/knowledge-compendium/2013-2014-knowledge-programme/HACR_Infographic.pdf

and climate change, and hence provide benefit for the overall resilience of the region.

14.4.3 Assets and infrastructure designed and constructed as part of the scheme are likely to be impacted by climate change in a number of ways. The potential risks are expected to be mostly mitigated through the use of appropriate design standards as well as suitable asset management procedures during operation.

14.5 Assessment Methodology

Magnitude of Impacts

Carbon assessment

14.5.1 The assessment of the magnitude of carbon emissions is undertaken in accordance with the principal steps identified in PAS2080 and the IEMA carbon emissions guide. Consideration has also been given to TAG Unit A3 Environmental Impact Appraisal (DfT, 2015), Chapter 4 Greenhouse Gases.

14.5.2 A whole-life approach is adopted, capturing both direct and indirect carbon emissions arising as a result of the scheme across supply chain, construction, operation and use. End of life is not considered due to the long design life of the asset and given that emissions associated with end of life are commonly relatively small.

14.5.3 The appraisal estimates three types of carbon emission including:

- Works and supply chain (capital) carbon emissions for both initial construction and maintenance
- Operational emissions during scheme service life; and
- Traffic carbon emissions (user carbon) from vehicle tailpipes.

14.5.4 Emissions from these sources are compared to a baseline scenario (Section 14.3.4) to quantify the impact of the scheme.

14.5.5 The scheme assessment is based on the following information sources:

- Capital carbon is assessed, based on information from the bill of quantities and relevant drawings. The Highways England carbon calculation tool is used along with its carbon factors for the calculation. An estimation of maintenance is included;
- Operational carbon is taken as the emissions associated with lighting and signage on the new road. Information for this is obtained from the design documentation; and
- User carbon is based on vehicle tailpipe emissions. These are calculated from the traffic model with the study area being the same as that of the traffic model.

14.5.6 The carbon footprint of the scheme is therefore assessed as the difference between the emissions associated with the baseline scenario and that associated with the scheme.

14.5.7 The assessment of user carbon follows the principles of the regional assessment of pollutants outlined in DMRB HA207/07. This includes all road links of the transport (SATURN) model network without any screening of the carbon emissions. The analysis incorporates the latest DMRB requirements in

conjunction with applying emission rates for carbon to the outputs from the SATURN highway assignment component (discussed further in Section 14.6.5). By taking the average speed on a link-by-link basis along the route, the method makes allowance for the increase in emissions from acceleration / deceleration of vehicles due to congestion. The impact of junctions and gradient of road is also applied to the traffic model. As the model provides data for only three years (baseline year 2016, opening year 2023 and opening year +15 2038), traffic data between those years has been extrapolated linearly.

CCR assessment

14.5.8 The resilience of the scheme to climate change impacts is qualitatively assessed, based on professional expertise and judgement. A more detailed and quantitative assessment may be undertaken at future design stages but is outside the scope of the PEIR.

14.5.9 In the case of flood risk, detailed planning requirements and design guidance relating to climate change exist. Therefore, an assessment of climate change impacts on flood risk is carried out within the Road drainage and the water environment topic assessment, which is presented in Chapter 13 of this PEIR, taking into account current EA climate change allowances for increases in peak river flow and rainfall intensity.

14.5.10 The CCR assessment is composed of two parts: 1) the assessment of climate hazards; and 2) the risk and resilience assessment. As part of the assessment of climate hazards, the potential climate change impacts on all assets and infrastructure designed and constructed within the scheme are identified for the following climate hazards:

- high temperatures
- low temperature
- high precipitation
- low precipitation
- humidity
- insolation (solar irradiation)
- storms/lightning strikes; and
- wind

14.5.11 As part of the risk and resilience assessment, the potential likelihood and consequence of climate change risks to the infrastructure and assets associated with the scheme are scored using a qualitative five point scale as set out in Table 14-1 and Table 14-2 respectively.

Table 14-1 Qualitative five point scale of likelihood of climate change risks

Likelihood	Very unlikely	Unlikely	Possible	Likely	Very likely

Table 14-2 Qualitative five-point scale of consequences of climate change risks

Consequence	Very low	Low	Medium	High	Very high

14.5.12 The resulting risk level is scored using the risk matrix shown in Table 14-3; the risk score corresponds to a risk category, as shown in Table 14-4.

Table 14-3 Climate Change Risk matrix

Consequence						
	V. High	3	3	4	5	5
	High	2	3	3	5	5
	Medium	2	2	3	4	4
	Low	1	1	2	3	3
	V. Low	1	1	2	2	3
		V. Unlikely	Unlikely	Possible	Likely	V. Likely
		Likelihood				

Table 14-4 Climate change risk categories

Risk score	Risk Category
1	Very low
2	Low
3	Medium
4	High
5	Very high

14.5.13 A qualitative assessment of uncertainty is undertaken for each climate change risk, based on the uncertainty of the relevant climate change projections and the uncertainty in the respective effect on asset performance. This process has been adapted from the process for assessing uncertainty in climate change effects on road infrastructure presented in the Highways England Climate Adaptation Risk Assessment (2016)[15].

14.5.14 As part of the risk and resilience assessment, the need for any additional resilience measures to protect against the effects of climate change is identified. High level resilience measures will be developed in collaboration with relevant engineering and design teams as part of the ES.

Assessment of Significance

Carbon assessment

14.5.15 Significance of carbon emissions is not assessed as part of this PEIR and will be addressed in the final ES, which will accompany the DCO application.

CCR assessment

14.5.16 The significance of potential climate change impacts on infrastructure assets is assessed as part of the risk assessment, as described in paragraph 0. Any risk to the scheme categorised as ‘high’ or ‘very high’ according to Table 14-4 after mitigation is considered to be a significant climate change resilience effect.

14.6 Baseline Conditions

Carbon assessment

14.6.1 As discussed in paragraph 14.3.4, the baseline for the project is assumed as the "Do-Minimum" scenario, in which no construction activity is undertaken on any of the roads in the area other than that required to maintain the existing road.

14.6.2 Traffic modelling has been undertaken for a baseline year of 2016 and calibrated against measured data. Future predictions of traffic in the study area have been made for opening year 2023 and 2038.

14.6.3 Capital carbon over the study period denotes a fixed yearly carbon emission 85tCO_2 associated with maintenance of the existing road, which has been assumed on the basis that 25% of the road surface will require rebuilding in the study period. Over the study period, this equates to 3,070tCO_2.

14.6.4 For operational carbon, reductions are seen over time as a result of an expected reduction of carbon intensity of the UK electricity grid using the IAG dataset predictions discussed in Section 14.8.6; energy needed for operation is modelled as constant. Yearly operational carbon emissions reduce from 20tCO_2 in 2015 to 2tCO_2 in 2050. The value at opening in 2023 is 15tCO_2. This presents a steady increase in cumulative operational carbon emissions over the study period, to a total of 306tCO_2 over the period.

14.6.5 Three options have been considered for the estimation of user carbon to account for the variability in the prediction of vehicle emissions factors beyond 2030. For all three options, the predicted vehicle numbers are the same, with vehicle numbers beyond the latest year modelled in the SATURN traffic model (2038) extrapolated linearly based on the rate of increase between 2023 and 2038. Vehicle emission factors for all three models are the same up to 2030, using the data in IAN 185/15; beyond this they vary as follows:

- **Option A**: Emission factors remain constant at 2030 levels beyond 2030 to 2050.
- **Option B**: Emission factors for LDVs continue to decrease at the 2029-2030 rate linearly until 2050. HDV emissions factors remain constant.
- **Option C**: Emission factors for LDVs decrease based on the Grantham Institute[33] projections for Electric Vehicle (EV) uptake. Emissions factors for EVs are based on manufacturer assessments of efficiency and Department for Business, Energy & Industrial Strategy [34] future grid carbon intensity factors. Emissions factors for internal combustion vehicles are based on IAN 185/15 predictions for 2030 (assuming no further efficiency gain beyond 2030).

14.6.6 For Options A and B, yearly user carbon in the study area increases steadily from opening year to 2050. Option A shows increases from 178,275tCO_2 to 216,458tCO_2 between 2023 and 2050, and Option B increases from 178,275tCO_2 to 191,830tCO_2. For Option B, the benefit of the linearly reducing carbon factors beyond 2030 is not enough to offset the increasing traffic in the study area.

33 Grantham Institute (2017), Expect the Unexpected: The Disruptive Power of Low-carbon Technology
34 https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal - Accessed 27/10/2017

14.6.7 Option C, which assumes 86% of the fleet are EVs by 2050 shows a significant drop in user carbon beyond 2030, from 178,275tCO_2 in 2030 to 79,583 tCO_2 in 2050.

14.6.8 For all three options, user carbon for the baseline assessment is much higher than the capital and operational carbon by several orders of magnitude, as summarised in Table 14-5. The user component accounts for over 99% of the total carbon. These magnitudes make sense given the relatively low maintenance and operation requirements discussed above.

14.6.9 The baseline carbon over the study period 2016-2050 is summarised in Table 14-5 highlighting that the majority of carbon comes from road users.

Table 14-5 Summary of baseline carbon for study area

Carbon component	Estimated carbon over study period (t carbon)		Percentage (%)
Capital carbon	3070		<0.1
Operational carbon	310		<0.1
User carbon	Option A	6,964,000	>99.9
	Option B	6,664,000	>99.9
	Option C	5,371,000	>99.9
Total whole life carbon	**Option A**	**6,967,380**	100
	Option B	**6,667,380**	100
	Option C	**5,374,380**	100

Climate baselines –current climate

14.6.10 Table 14-6 presents historical climate data for the Chiverton and Carland Cross area, serving as the current climate baseline data for the scheme. The current baseline for average climate variables has been obtained from the MetOffice gridded observational data, made available as part of the United Kingdom Climate Projections 2009 (UKCP09) at a spatial resolution of 25km for the period 1961-1990[35].

14.6.11 Simulated baseline data for extreme weather events have been obtained from the UKCP09 Weather Generator (WG)[36]. The UKCP09 WG implements a statistical method based on simulated baseline data for creating synthetic time series of future daily climate that are consistent with climate change projections.

35 UKCP09 Gridded observation data sets. Available at: http://www.metoffice.gov.uk/climatechange/science/monitoring/ukcp09/. Accessed on 22 August 2017
36 UKCP09 Weather Generator. Available at: http://ukclimateprojections.metoffice.gov.uk/23261. Accessed on 22 August 2017

Table 14-6 Historical climate data for Chiverton and Carland Cross (1961-1990)

	Parameter	Long-term average (1961-1990)
Temperature	Mean winter daily temperature [°C]	6.27
	Mean summer daily temperature [°C]	15.26
	Mean daily summer maximum temperature [°C]	18.8
	Mean daily summer minimum temperature [°C]	11.69
	Mean daily winter maximum temperature [°C]	8.84
	Mean daily winter minimum temperature [°C]	3.73
Precipitation	Annual mean daily precipitation [mm/day]	2.96
	Winter mean daily precipitation [mm/day]	4.05
	Summer mean daily precipitation [mm/day]	2.04
Cloud	Annual cloud cover [%] (sunshine hours obtained from Newquay Cornwall Airport climate summary[37])	69% (1743 sunshine hours per year)
Extreme weather events (from UKCP09 WG)	Annual number of days when daily mean temperature is >25°C	0
	Annual number of days when daily mean temperature is 0°C or lower	2.27
	Annual number of day per year when precipitation is greater than 25mm per day (Met Office definition of 'heavy rain')	3.81
	Annual number of dry spells (10+ days with no precipitation)	2.80

14.6.12 A Local Climate Impacts Profile (LCLIP) for Cornwall Council was developed as part of a larger South West LCLIP (2010)[38]. The profile aims to provide an understanding of the nature of past extreme weather events and the impacts they have had on the community, environment and economy. The majority of weather impacts for Cornwall County are experienced in the transport and distribution networks. Floods and snow/ice events are most impactful to the region. However, impacts are exacerbated during high winds as these often coincide with high tides resulting in storm surges.

14.6.13 Table 14-7 summarises the primary weather events currently affecting the region and provides a high level overview of the types of impacts experienced.

37 Met Office Newquay Cornwall Airport climate. Available at: http://www.metoffice.gov.uk/public/weather/climate/gbuqyjzyd Accessed on 22 August 2017

38https://www.researchgate.net/profile/Alisdair_Cunningham/publication/256494335_South_West_Local_Climate_Impacts_Profile_LCLIP_Final_Report/data/0046352319b1e59aaa000000/CSW-LCLIP-Report-v3.pdf

Table 14-7 Summary of weather events and associated impacts for Cornwall

Weather event	Impacts
Heavy rain/ flash floods[39]	• Damage to highway infrastructure- main A&B road network • Damage to railway branch lines (short period) • Damage to coastal defence and boats[40] • Travel disruption and delay • Landslides/ mudslides[41] • Closure of schools • Household evacuations • Damage to green space and South west coastal path (tourism affected) • Power cuts
High winds/tornado[42]	• Closure of the Tamar Bridge • Reduced transport routes • Blocked road • Fallen trees • Cancelled Ferries • Power cuts
Heat wave	• Health warnings • Melting roads, rails and tracks • Fire[43] • Closure of schools
Lightning[44]	• Increased Fire Department calls • Lightning strikes to buildings in north Cornwall • Small fires
Snow and Ice	• Fallen trees • Closure of schools

Climate baselines – future climate

14.6.14 This section presents projected climate conditions and extreme weather events for the area encompassing Chiverton and Carland Cross for the 2020s and 2080s.

14.6.15 Using the historical baseline data, two methods are implemented to establish the future climate baseline. The changes in average climate conditions are obtained from the UKCP09 probabilistic projections of climate change[45]. The changes in extreme weather events are obtained using the UKCP09 WG[46].

14.6.16 Climate change projections for a range of meteorological parameters are presented for different probability levels and emission scenarios for the 2020s and 2080s. Table 14-8 presents expected changes in climate conditions, such as mean temperature and precipitation, and Table 14-9 presents changes in extreme weather events, such as number of heavy rain days.

39 https://www.cornwall.gov.uk/media/10579670/Cornwall-Storm-Impacts-update-19-Nov-2014-V1-3.pdf
40 http://www.bbc.co.uk/news/uk-england-26044323
41 https://www.theguardian.com/news/blog/2010/nov/17/cornwall-floods-live-updates
42 http://www.bbc.co.uk/programmes/b01pmb5h
43 http://www.express.co.uk/news/uk/819757/heatwave-fire-cornwall-firefighters-battle-gorse-blaze
44 https://www.piratefm.co.uk/news/latest-news/2297720/watch-lightning-and-floods-strike-cornwall/ http://www.dailymail.co.uk/news/article-4707272/UK-weather-Thunderstorms-month-s-rain-two-days.html
45 UKCP09 climate change projections. Available at: http://ukclimateprojections.metoffice.gov.uk/21684 ; Accessed on 22 August 2017
46 UKCP09 Weather Generator. Available at: http://ukclimateprojections.metoffice.gov.uk/22540 ; Accessed 22 August 2017

14.6.17 Temperatures in the area of Chiverton and Carland Cross are projected to increase in both winter and summer. The largest increase in temperature is projected to be in the mean daily maximum temperature in summer, which is expected to increase from 18.8°C to 24.6°C in the 2080s, in the high emissions scenario.

14.6.18 Annual average precipitation in the region is anticipated to remain largely unchanged throughout the century, increasing from 2.96mm/day to 3.00 mm/day. However, the projected changes in mean precipitation vary more substantially for winter and summer. Mean winter precipitation is expected to increase from 4.05mm/day for the baseline period to 4.3 mm/day for the 2020s and 4.9 mm/day for the 2080s, high emissions. The mean summer precipitation is expected to decrease from 2.04 mm/day for the baseline period to 1.9 mm/day for the 2020s and 1.4 mm/day for the 2080s.

14.6.19 The number of hot days, when the mean temperature is above 25°C, is anticipated to increase from 0 to 6.03 days per year in the 2080's for the high emission scenario. The average number of days in a given year, when the mean daily temperature is below 0°C, is anticipated to decrease from 2.27 to 0.2 until the end of the century under the high emissions scenario.

14.6.20 In the case of extreme precipitation, the number of days with heavy rain (precipitation greater than 25mm/day) in a given year is expected to increase from 3.81 in the baseline period to 6.16 by the 2080s. Similarly, the average annual number of dry spells (periods of at least 10 consecutive days with no precipitation) is projected to increase from 2.80 for the baseline period to 4.68 for the 2080s under the high emissions scenario.

Table 14-8 UKCP09 climate change projection for the area of Chiverton and Carland Cross for the 2020s and 2080s

	Parameter and baseline (in brackets, 1961-1990)	2020s (2010-2039)			2080s (2070-2099)		
		Medium emissions scenario	High emissions scenario	Range	Medium emissions scenario	High emissions scenario	Range
Temperature	Mean winter daily temperature [°C] (6.27°C)	7.5	7.4	6.8-8.2	9.0	9.5	7.8-11.2
	Mean summer daily temperature [°C] (15.26°C)	16.7	16.6	15.7-17.6	18.9	19.8	17.2-22.5
	Mean daily summer maximum temperature [°C] (18.8°C)	20.6	20.5	19.3-22.0	23.4	24.6	20.7-28.8
	Mean daily summer minimum temperature [°C] (11.69°C)	13.1	13.1	12.2-14.1	15.3	16.4	13.4-19.4
	Mean daily winter maximum temperature [°C] (8.84°C)	10.0	10.0	9.3-10.8	11.3	11.8	9.7-14.0
	Mean daily winter minimum	5.2	5.1	4.3-6.1	7.0	7.7	5.1-10.3

	Parameter and baseline (in brackets, 1961-1990)	2020s (2010-2039)			2080s (2070-2099)		
		Medium emissions scenario	High emissions scenario	Range	Medium emissions scenario	High emissions scenario	Range
	temperature [°C] (3.73°C)						
Precipitation	Annual mean daily precipitation (2.96 mm/day)	3.0	3.0	2.8-3.1	3.0	3.0	2.8-3.2
	Winter mean daily precipitation (4.05 mm/ day)	4.3	4.3	3.9-4.9	4.8	4.9	4.0-6.5
	Summer mean daily precipitation (2.04 mm/day)	1.9	1.9	1.5-2.4	1.5	1.4	1.0-2.1
Wind	Change in winter mean daily wind speed	-	-	-	-	-	-
	Change in summer mean daily wind speed	-	-	-	-	-	-
Relative humidity	Annual relative humidity	84.2	84.3	83.2-85.2	83.2	82.7	81.1-84.9
Cloud cover	Annual cloud cover [%] (69%)	69	69	67-71	67	67	64-70

Table 14-9 Projected changes in extreme weather events

Parameter and baseline (in brackets, 1961-1990)		2020s (2010-2039)			2080s (2070-2099)		
		Medium emissions scenario	High emissions scenario	Range[47]	Medium emissions scenario	High emissions scenario	Range
Temperature	Annual number of days when daily mean temperature is >25°C (0)	0.02	0.02	0-0.08	2.20	6.03	0-18.80
	Annual number days, when daily mean temperature is 0°C or lower) (2.27)	0.80	0.96	0.20-1.68	0.27	0.20	0-0.74
Precipitation	Annual number of days per year when precipitation is greater than 25mm per day (Met Office definition of 'heavy rain')	4.50	4.54	3.47-5.54	5.91	6.16	4.23-8.06

47 The range is obtained by comparing the 10% and 90% level for medium and high emissions and selecting the widest range of these values.

	(3.81)						
	Annual number of dry spells (10+ day with no precipitation) (2.80)	3.42	3.39	2.35-4.47	4.35	4.68	2.83-6.25

Value of Receptor

Carbon assessment

14.6.21 Monetary valuation of changes in the carbon emissions is not undertaken as part of this PEIR. Carbon emissions are responsible for global climate change, which is estimated to have large potential negative cost impacts, which will be burdened by society at large, and in some instances they will impact the scheme directly, as explored by the CCR assessment.

CCR assessment

14.6.22 There is currently no guidance within the DMRB on placing value on climate change resilience and this is not assessed in this PEIR.

14.7 Consultation

14.7.1 A Scoping Report for the EIA for the scheme was issued to the Planning Inspectorate in August 2017. This provided key statutory and non-statutory bodies an opportunity to comment on the proposed approach, methodology, baseline conditions and anticipated potential effects associated with the scheme which were known at that time. No changes to the scope or approach of addressing the two climate change assessments set out in this PEIR were made as a result of the Scoping Opinion issued by the Planning Inspectorate.

14.8 Assessment Assumptions and Limitations

Carbon assessment

14.8.1 This chapter forms the basis for the carbon assessment undertaken for the PEIR. Updates will be undertaken for the ES when new information becomes available.

14.8.2 It has been assumed that the existing A30 road continues to be operational right up until opening year 2023, i.e. no allowance for disruption to the study area due to construction has been allowed for. This effect will be small and is not expected to significantly reduce the accuracy of the model.

14.8.3 No allowance for carbon offsetting measures (such as planting trees) have been made at this stage as the scheme is not yet advanced enough to accurately quantify any positive or negative impact this may provide.

14.8.4 For capital carbon calculation, design progression at the time of documenting the PEIR is limited and a bill of quantities is not yet available. The capital carbon calculations are based on the available information from the design team up to 20 October 2017 and includes:

- Drainage (linear metres)
- Fencing (linear metres)

- Kerbs (linear metres)
- Landscaping – assumed that all material required for landscaping can be site-won. No allowance for the benefit to carbon emissions from the planting of new plants/trees has been made.
- Lighting (number)
- Pavement – assumed that as part of routine maintenance 10% and 25% of the mainline and side roads respectively are rebuilt before the end of the 2050 study period and 50mm of resurfacing is undertaken on the remainder of the roads. Allowance has been made to import material to create an unbound sub base.
- Traffic signs (number and size)
- Earthworks – assumed at least 80% of the cut material can be reused as fill and is transported no more than 5km across the site to its placement location. A 40km transportation distance to landfill has been assumed for surplus fill. No allowance has been made for soil improvement (e.g. lime stabilisation)
- Civil structures – as design information is limited, for over- and under-bridges these have typically been assessed by using a standard carbon factor per m2 of deck.
- Vehicular restraint system (linear metres)
- Construction traffic – an allowance has been made based upon professional experience from previous projects.
- Waste – a 5% uplift in carbon emissions has been taken to account for waste on site.
- No allowance has been made for employee travel to and from site.
- Transport of materials to site – assumed HGVs will be used to transport all materials to site a distance of 40km.

14.8.5 For user carbon, the following assumptions have been made:

- There is no impact on the road network from the scheme outside of the traffic model study boundary areas.
- Uncertainties or limitations related to transport data are discussed within the Traffic Forecasting Report (TFR), it outlines the forecasting assumptions and deals with uncertainty in forecasting by discussing low and high growth. The Local Model Validation Report (LMVR) also outlines modelling assumptions for the development of the base model. The Traffic Data Collection Report (TDCR) reports on the data collection for the traffic model. These limitations have been overcome as far as possible by verifying the modelled concentrations against monitoring results in appropriate locations.
- There is uncertainty regarding predictions of future emission factors used within the carbon assessment for vehicle tailpipe emissions. Beyond the factors available up to 2030 from IAN 185/15, emissions factors have been kept constant. As this is likely to overestimate the carbon emissions given the trend towards decreasing emissions for LDVs and predicted electric vehicle uptake, additional emission projection profiles beyond 2030 have been made to provide comparison (14.6.5).
- Vehicle numbers change linearly between the modelled years of 2016, 2023 and 2038, and continue to change linearly on the same trajectory after 2038.

14.8.6 For operational carbon, the following assumptions have been made:

- Carbon intensity of the UK electricity grid reduces in line with Interdepartmental Analysts Group (IAG) dataset predictions.

- Do-Minimum operational carbon – the existing street lights run between sunset and sunrise (an average of 12.3 hours/day) but are turned off between midnight and 5am. Each light consumes 400W. No other significant uses of power have been considered.
- Do-Something operational carbon – the scheme street lights run between sunset and sunrise but are turned off between midnight and 5am. The power consumption of each light is based on the specified lighting solution (180-278W). No other significant uses of power have been considered.

CCR assessment

14.8.7 The CCR assessment has been informed by the following assumptions:

- The assessment has assumed that mitigation measures relevant to different assets will be implemented effectively.
- The assessment is affected by assumptions associated with climate modelling and climate change projections, incorporated in UKCP09.

14.8.8 The CCR assessment has the following limitations:

- The assessment is largely qualitative, with the exception of assessment relevant to drainage assets and flood risk, which have been informed by the Environment Agency climate change allowances for increases in peak river flow and rainfall intensity.
- There is inherent uncertainty in climate change projections. This study has been quantified using UKCP09, the latest set of probabilistic climate projections for the UK (but these are now ten years old).
- There is often uncertainty in the relationship between changes in climate hazards and the respective response in terms of asset performance. This uncertainty has been assessed qualitatively.
- The evidence relating to climate change impacts for some categories of assets and infrastructure is limited. In these cases, the assessment has been informed by professional judgement.

14.9 Design Mitigation and Enhancement Measures

Construction Mitigation

Carbon assessment

14.9.1 Mitigation measures will be developed and described as part of the final ES.

CCR assessment

14.9.2 Resilience mitigation measures are set out in the Outline EMP, providing a level of resilience to the scheme throughout the construction stage.

Operational Mitigation

Carbon assessment

14.9.3 Mitigation measures will be developed and described as part of the final ES.

CCR assessment

14.9.4 On three occasions the assessment has identified the need for potential additional mitigation measures, which may be considered in the design in order to increase the resilience of the scheme during its operation:

1. The need to review design temperature ranges for structure expansion joints, in line with projected increases in summer temperatures;
2. The potential to use a different road surface material in order to increase performance in hotter weather conditions;
3. The potential to add surge protection to main electrical installations in order to increase resilience associated with lightning strikes, accounting for a projected increase in frequency and severity of storms. Current design only allows for surge protection at LED luminaires.

14.10 Assessment of Effects

14.10.1 This section provides a summary of the main predicted climate change effects associated with the scheme. For the CCR assessment only a summary of the preliminary assessment conclusions is presented; details about the assessment will be presented within the final ES. These results are preliminary and may be updated for the final ES.

Construction Effects

Carbon assessment

14.10.2 As discussed in Section 14.3, an assessment of the capital carbon for the scheme has been undertaken using the factors from the Highway's England carbon emissions calculation tool.

14.10.3 The carbon emissions from the construction of the scheme are estimated to be 75,160tCO_2.

14.10.4 These are split into the categories listed in Table 14-10, and show that the majority of the carbon is produced in the creation of the materials used to build the scheme. Labour and plant form the second largest amount.

Table 14-10 Components of capital carbon for the scheme

Component	tCO_2		Contribution to total carbon emissions (%)
Materials	Original Construction	36,830	57
	Maintenance	5,880	
Transport (exc. earthworks)		7,860	10
Waste		2,530	3
Labour and plant		15,690	21
Earthworks (transport + plant)		6,370	9
Total		**75,160**	**100**

14.10.5 A breakdown of the materials component of the capital carbon is included in Table 14-11.

Table 14-11 Components of carbon for materials for the scheme

Component	tCO_2	Percentage (%)
Fencing	1130	3
Drainage	2190	5
Pavement	24990	59
Pavement maintenance	5880	14
Kerb	160	<1
Lighting	70	<1
Traffic signage	90	<1
Civil structures	8200	19

CCR assessment

14.10.6 The preliminary CCR assessment has identified no significant climate change resilience effects during the construction stage and no further climate change resilience measures are proposed[48].

Operation and User Effects

Carbon assessment – Operation

14.10.7 Unlike capital carbon, the components of operational and user carbon are from the same sources as those discussed in Section 14.6; however, their magnitudes are changed by the construction of the scheme.

14.10.8 Up to 2023, both user and operational carbon for the “Do Something” scenario are identical to the “Do Nothing” scenario as it has been assumed for this assessment that the study area is unaffected until the scheme opens in 2023.

14.10.9 For operational carbon, the emissions change due to the introduction of the scheme. On opening year (2023), the carbon emissions increase from the “Do Minimum” scenario of 14.7 tCO_2, to the “Do Something” scenario with 17.2 tCO_2 as, although the new scheme is assumed to have more efficient street lighting, the overall number of street lights in the new scheme is almost double that of the current scheme. An overall downward trend in operational carbon emissions following 2023 is a result of the predicted reduction in grid carbon intensity, rather than any reduction in power consumption of the lights themselves, reducing to 1.9 tCO_2 in 2050.The cumulative carbon emission with the “Do Something” scenario is 334 tCO_2.

14.10.10 Operational carbon remains several orders of magnitude smaller than capital or user carbon.

Carbon assessment – User

14.10.11 The user carbon results highlight that through constructing the scheme, the user carbon increases. This is down to the traffic model, which, despite predicting a reduction in congestion in the study area, shows that the scheme also attracts increased numbers of vehicles compared to the do minimum baseline case,

48 The potentially significant in-combination climate change effect relevant to the Geology and soils topic, discussed in Chapter 15, may have implications on the CCR assessment. However, this is can be sufficiently covered under the ICCI assessment.

likely related to reduced journey times. The three options analysed are the same as those detailed in paragraph 14.6.5.

14.10.12 In all of the three scenarios analysed, despite changing the emissions factors, the do something scenario always results in larger carbon emissions. Reducing the emissions factor only reduces the magnitude of the difference.

14.10.13 Over the whole study period, the difference in user carbon between the do minimum and do something scenarios varies between 248,000 and 411,000t carbon. This is three to five times larger than the calculated capital carbon.

14.10.14 Table 14-10 summarises the carbon emissions from all sources, comparing them to the baseline Do Minimum scenario. The increase in total carbon emitted over the study period is between 320,000 and 474,000tCO_2.

14.10.15 The increase in carbon over the study period showed capital carbon for the scheme accounts for 15-23% of the overall increase in carbon, with Option C showing the largest proportion of capital carbon. As this option represents the biggest drop in vehicle emissions over time, this demonstrates that a faster decarbonisation of the vehicle fleet leads to capital carbon representing a larger proportion of total carbon.

Table 14-12 Summary of Do Something carbon for study area

Carbon component	Estimated carbon over study period – Do Something Scenario (tCO_2)		Estimated carbon over study period – Do Minimum Scenario (tCO_2)	Increase in carbon as a result of the scheme (tCO_2)
Cap carbon		75,160	3,070	72,090
Op carbon		330	310	20
Use carbon	Option A	7,366,000	6,964,000	402,000
	Option B	7,075,000	6,664,000	411,000
	Option C	5,619,000	5,371,000	248,000
Total carbon	**Option A**	**7,441,490**	**6,967,380**	**474,110**
	Option B	**7,150,490**	**6,667,380**	**483,110**
	Option C	**5,694,490**	**5,374,380**	**320,110**

14.10.16 The total carbon emissions exhibit a spike in yearly carbon emissions in the years 2020-2022, to 201,699tCO_2, associated with the construction of the scheme. From 2023, the trend of total carbon emissions follows a very similar steady upward trend to the user carbon results, as these dominate.

CCR assessment

14.10.17 The preliminary CCR assessment has identified no significant climate change resilience effects during the operation stage and no further climate change resilience measures are proposed[51].

14.11 Monitoring

14.11.1 Monitoring requirements will be specified within the ES accompanying the DCO.

14.12 Summary

14.12.1 The climate change chapter in this PEIR describes two separate assessments: the carbon assessment and the CCR assessment. Table 14-13 summarises the

potentially significant effects identified in each of the two assessments. The in-combination climate change impact assessment is discussed in Chapter 15.

Table 14-13 Summary of potentially significant climate change effects

Assessment	Description of potential significant effect	Potential additional mitigation
Carbon	Significance of carbon emissions will be assessed in the final ES. Annual user carbon emissions are likely to increase by 7-11% by 2050 as a result of the scheme. This is a result of a number of factors, including increased capacity and, consequentially, the capital carbon invested in the scheme will not be 'paid back' by a reduction in user carbon. Preliminary calculation suggests that during construction 75,000 tonnes of carbon would be emitted, equivalent to 42% of the annual user carbon for the baseline year (2016). Emissions associated with the operation of the scheme are negligible.	Potential mitigation measures will be discussed in the ES.
CCR	No significant climate change resilience effects have been identified.	On three occasions the assessment has identified the potential for additional mitigation measures, which may be considered in the design in order to increase the resilience of the scheme during its operation: - Potential need to review design temperature ranges for structure expansion joints, in line with projected increases in summer temperatures; - Potential to use a different road surface material in order to increase performance in hotter weather conditions; - Potential to add surge protection to main electrical installations in order to increase resilience associated with lightning strikes, accounting for a projected changes in frequency and severity of storms.

Further work

14.12.2 The information presented in this chapter is preliminary and is based on the 2017 scheme design, as described in Chapter 2. Further EIA work is currently being undertaken to confirm the scale and significance of predicted environmental impacts arising from the scheme design, including in-combination climate change impacts, carbon emissions and impacts relevant to the resilience of the scheme. The final EIA work will be presented within the ES, which will accompany the DCO application to be made later in 2018.

14.12.3 Table 14-14 presents a summary of environmental information that has been excluded from this PEIR and will be addressed in the ES.

Table 14-14 Summary of gaps in the PEIR that will be addressed in the ES

Gaps in PEIR	Description
Construction carbon assessment based on approximate plans and data.	As design develops and the quantities of materials become clearer, the model will be updated.
Carbon significance and mitigation	Significance of carbon emissions will be assessed within the final ES. Potential measures to reduce carbon emissions will also be discussed in the ES.
CCR mitigation measures are only indicative or not yet delivered	Mitigation measures relevant to the CCR assessment taken into account in this PEIR are only indicative or not yet delivered. This reflects the maturity of design and environmental topic assessments at the time of drafting of this chapter. Details about the relevant mitigation and resilience measures will be confirmed and updated as part of the ES.
Monitoring requirements not included	Details around any monitoring requirements for any of the the assessments will be specified and documented within the ES.

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Chapter 15 Consideration of Cumulative Effects

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15 Consideration of Cumulative Effects

15.1 Introduction

15.1.1 Cumulative effects are those that arise as a result of impacts from more than one project (under construction or reasonably foreseeable projects), combining together to have an effect on a receptor (or group of receptors) that may be larger than if the effect were considered separately. Broadly, reasonably foreseeable projects are those that are known to the planning system or are already consented (but not yet built).

15.1.2 This PEIR discusses the approach to cumulative assessment that will be used to undertake an assessment of cumulative effects arising from the proposed A30 Chiverton to Carland Cross scheme in combination with other reasonably foreseeable projects in the local area. A list of other developments that will be considered by each environmental topic in the assessment and an assessment of these developments will be provided in the Environment Statement (ES) accompanying the DCO application.

15.1.3 An in-combination climate change impact (ICCI) assessment has also been undertaken as part of this chapter which considers the combined effect of the scheme and potential climate change impacts on the receiving environment during construction and operation[1].

15.2 Legislative context

15.2.1 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 sets out in Schedule 4 Part 5 that the ES should include 'the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources'.

15.2.2 The requirement for cumulative effects is also outlined in planning policy. The National Policy Statement for National Networks, paragraph 4.3 states that:

'In considering any proposed development, and in particular, when weighing its adverse impacts against its benefits, the Examining Authority and the Secretary of State should take into account:

- *its potential benefits, including the facilitation of economic development, including job creation, housing and environmental improvement, and any long-term or wider benefits;*
- *its potential adverse impacts, including any longer-term and cumulative adverse impacts, as well as any measures to avoid, reduce or compensate for any adverse impacts.'*

15.2.3 DMRB Volume 11 Section 2 Part 5 HA 205/08 provides guidance for assessment of cumulative impacts and defines cumulative effects as *'Impacts from different projects cumulative with the project being assessed – the impact arises from the combined action of a number of different projects, cumulative with the project being assessed, on a single resource / receptor. This can include multiple impacts*

[1] The term 'in-combination climate change impacts' refers to the combined effect of the impacts of the scheme and potential climate change impacts on the receiving environment. It is not to be confused with the EIA terms 'combined effects' or 'cumulative effects'. The term 'potential climate change impacts' is not to be confused with the EIA term 'future predicted baseline'.

of the same of similar type from a number of projects upon the same resource / receptor.'

ICCI legislation and policy

15.2.4 The legislative and policy framework for the ICCI assessment is set out in the climate change resilience (CCR) assessment, presented in Chapter 14.2 of this PEIR. In addition, the European Commission guidance on Integrating Climate Change and Biodiversity into EIAs[2] carried out under the amended EIA Directive 2014, includes climate change and biodiversity related guidance for screening and scoping, analysing evolving baseline trends, identifying alternative and baseline measures, monitoring and adaptive management. There are also several publications by the EC addressing climate change impacts for EIA topics, such as agriculture, ecology, health, landscape and water. The publications provide background information on climate change impacts in Europe and suggest potential mitigation measures. The EC is currently undertaking an evaluation of the EU Adaptation Strategy, which will be completed by the end of 2018.

15.3 Cumulative effects assessment methodology

15.3.1 There is currently no standard methodology for cumulative effects assessment (CEA) and combined effects although there is a range of guidance available. The following guidance has been taken into consideration during the preparation of this PEIR and will also be employed in production of the ES:

- Advice Note 17: Cumulative effects assessment relevant to nationally significant infrastructure projects (Planning Inspectorate, 2015).
- Advice Note Nine: Rochdale Envelope (Planning Inspectorate, 2012).

15.3.2 Planning Inspectorate Advice Note 17 (Planning Inspectorate, 2015) provides a systematic approach to cumulative effects assessment which can be split into four distinct phases explained in Table 15-1. The guidance notes that the recommended process focusses on cumulative effects with 'other developments'. It should not be confused with the assessment of interrelationships between topics, which are assessed within the individual specialist topic chapters.

Table 15-1 Stages of Cumulative Effects Assessment

CEA stage	Activity
Stage 1: Establish the scheme's Zone of Influence (ZOI) and identify long list of 'other developments'	Identify the ZOI for each of the environmental topics covered by the ES; Identify a long list of other developments in the vicinity of the scheme which may have cumulative effects; Undertake desktop review of available environmental information for identified cumulative developments
Stage 2: Identify short list of 'other developments'.	Identify which of the identified other developments from Stage 1 has the potential to give rise to significant cumulative effects by virtue of overlaps in temporal scope, due to the scale and nature of the 'other development'/receiving environment; or any other relevant factors.
Stage 3: Information gathering	Information related to the shortlisted cumulative developments is gathered and reviewed

[2] European Commission, (2013), Integrating Climate Change and Biodiversity into Environmental Impact Assessment; http://ec.europa.eu/environment/eia/pdf/EIA%20Guidance.pdf ; Accessed: 22 November 2017

Stage 4: Assessment	CEA of shortlisted cumulative development is undertaken. Each individual 'other development' is reviewed in turn to identify whether there is potential for significant cumulative effects; Mitigation measures are identified.

Stage 1 Establish the NSIP's ZOI and Long List of 'Other Development'

15.3.3 The ZOI refers to the spatial area over which an effect from a project is likely to be experienced. The ZOI for the proposed scheme varies for each environmental topic

15.3.4 The ZOI has been set out in the study area for each environmental topic assessment. These are presented in the preceding chapters of the PEIR for each topic.

Establishing the long list of 'other developments'

15.3.5 The Planning Inspectorate guidance recommends that a wide range of future projects is included within the CEA which can be tiered (from Tier 1 – 3) according to how far advanced the development is within the planning system and to the level of detail that is likely to be available for each tier. These are set out in Table 15-2.

Table 15-2 Project tiering for the purpose of CEA

Tier 1	Projects under construction; Permitted application(s) but not yet implemented; Submitted application(s) but not yet determined;	**Decreasing level of detail likely to be available**.
Tier 2	Projects on the Planning Inspectorate's Programme of Projects where a scoping report has been submitted.	
Tier 3	Projects on the Planning Inspectorate's Programme of Projects where a scoping report has not been submitted. Identified in the relevant Development Plan (and emerging Development Plans - with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited; and Identified in other plans and programmes (as appropriate) which set the framework for future development consents/approvals, where such development is reasonably likely to come forward.	

15.3.6 The less information that is available for the future projects (i.e. environmental impacts predicted, project definition), the less likely that the CEA will be able to make any robust assessment in relation to these projects. Reasonable steps will be taken to review publicly available information when conducting the CEA.

15.3.7 Whilst projects that are Tier 2 and Tier 3, as defined by the Planning Inspectorate guidance are referenced within this assessment, it is considered that there is limited value in including schemes for which there is no environmental assessment information available as it will not be possible to assess environmental effects arising from those projects. Moreover, it will be challenging

to determine the timeframe (temporal scope as noted in Table 15-4) within which effects arising from these schemes are likely to occur.

15.3.8 The identification of 'other development' will be identified from a review of the Cornwall Council Planning website, the National Infrastructure Planning website, and through consultation with Cornwall Council. The list of 'other developments' will be provided in the ES accompanying the DCO.

Stage 2 Identify Shortlist of 'Other Development' for CEA

15.3.9 For this PEIR, the long list of other developments which has been identified under Stage 1 has been subject to further threshold and criteria to identify a proportionate list of developments to be assessed within the CEA. This will be revisited for the ES.

15.3.10 The threshold and criteria considered in shortlisting development is outlined below. Criteria has been adapted from the Planning Inspectorate guidance and the EIA Regulations 2017:

Table 15-3 Criteria for shortlist of 'Other Development'

Threshold	Description
The temporal scope of 'other development' potential for interaction.	Consideration of relative construction, operation and decommissioning programmes of the 'other development' identified in the ZOI with the scheme programme, to establish whether there is overlap, or similar temporal scope for construction and operation phases, and any potential for interaction.
The scale and nature of 'other development'	• Consideration of whether the scale and nature of the developments identified in the ZOI are likely to interact with the proposed scheme and to result in a cumulative effect. • Characteristics of other developments in relation to use of natural resources, pollution and nuisances, and risks to human health. • The scale of developments which are more than 1 hectare of urban development which is not a dwelling development; or the development includes more than 150 dwellings; or the overall area of the development exceeds 5 hectares.
Any other relevant factors	• Nature and/or capacity of the receiving environment that would make a significant cumulative effect with 'other development'. The sensitivity of the receiving environment includes whether the sites are within: a. wetlands, riparian areas, river mouths; b. coastal zones and the marine environment; c. mountain and forest areas; d. nature reserves and parks; e. European sites and other areas classified or protected under national legislation f. areas in which there has already been a failure to meet the environmental quality standards, laid down in Union legislation and relevant to the project, or in which it is considered that there is such a failure; g. densely populated areas; h. landscapes and sites of historical, cultural or archaeological significance. • The relative abundance, availability, quality and regenerative capacity of natural resources in the area.

Threshold	Description
	• Potential for creation of source-pathway-receptor impacts. • The likely significance of effects where environmental assessments have been undertaken for the 'other developments' as having moderate to large significance.

15.3.11 Professional judgement has also been applied to 'other development' that exceeds the thresholds but do not give rise to discernible effects. The reasons for excluding any 'other development' from further consideration will be outlined within the ES.

Stage 3 Information Gathering

15.3.12 Information on the 'other developments' will be compiled from publicly available documents on Cornwall Council's website, the Planning Inspectorate's website and through direct liaison with Cornwall Council.

Stage 4 Assessment

15.3.13 The assessment of significance of the combined and cumulative effects will be presented in the ES and is determined in accordance with the significance assessment as detailed under Chapter 4 of this PEIR.

15.3.14 For the purposes of the CEA, the value of a resource and magnitude of impact will be determined according to the criteria set within the preceding chapters of this PEIR and to be set out in full within the ES accompanying the DCO. The significance of effect is then carried forward from preceding chapters to enable an 'on balance' assessment of combined significance upon environmental receptors, as well as to identify the significance of cumulative effects with other developments.

15.3.15 DRMB (HD 205/08) recommends that the significance criteria for cumulative effect is standardised into five categories. This is set out in Table 15-4 and will be used in the assessment set out within the ES.

Table 15-4 Determining Significance of Cumulative Effects (DMRB Volume 11, Section 2, Part 5 (HA 205/08))

Significance	Effect
Severe	Effects that the decision-maker must take into account as the receptor/resource is irretrievably compromised.
Major	Effects that may become key decision-making issue.
Moderate	Effects that are unlikely to become issues on whether the project design should be selected, but where future work may be needed to improve on current performance.
Minor	Effects that are locally significant.
Not Significant	Effects that are beyond the current forecasting ability or are within the ability of the resource to absorb such change.

15.3.16 The assessment of cumulative effects will vary depending on each topic. The results of the CEA will be provided in the ES.

15.3.17 Where significant cumulative effects beyond those identified as residual effects from the scheme in isolation are identified, an assessment of the need for additional mitigation will be undertaken.

Combined Effects

15.3.18 Cumulative impacts from the combined action of a number of different impacts upon a single resource / receptor (including the interrelationship of visual, noise and air quality impacts on residential, commercial, ecological and heritage receptors) have also been considered for this PEIR and will be presented within the ES. As mentioned in the stage 4 CEA methodology above, the assessment of combined effects is based on the significance assessment as detailed under Chapter 4 of this PEIR.

15.3.19 The study area for the assessment of combined effects reflects the study areas, also termed the spatial ZOI i.e. corresponding to the spatial area over which an effect from a project is likely to be experienced.

In-combination Climate Change Impacts

15.3.20 Potential climate change impacts relevant to the scheme are considered for all environmental topics; this forms the basis for an ICCI assessment. Through considering preliminary assessments of all environmental topics in the context of current and future climate conditions, high level qualitative statements of potential climate change impacts are made, taking into account existing mitigation measures. The ICCI assessment identifies environmental topics to remain scoped in for a more detailed assessment to be undertaken and documented in the ES. Where appropriate, recommendations for additional mitigation measures as well as allowances for future monitoring to ensure continued resilience of environmental receptors and resources are also provided.

15.3.21 Following the ICCI assessment, topics are categorised into one of five categories, based on the number and significance of potential in-combination impacts, as summarised in Table 15-5.

Table 15-5 Topic categories for ICCI assessment

Category	Description
1	At least one potential in-combination climate change effect with high significance (to remain scoped in)
2	More than five potential in-combination climate change effects with medium significance (to remain scoped in)
3	Five or fewer potential in-combination climate change effects with medium significance (to be scoped out)
4	Potential in-combination climate change effects with low significance only (to be scoped out)
5	No potential in-combination climate change effects (to be scoped out)

15.3.22 As part of the final ES a more detailed assessment will be undertaken for the topics that remain scoped in. This will include an assessment of each topic's respective significant effects and a determination of whether they could potentially be exacerbated or improved by climate change impacts. If existing mitigation

measures[3] are considered insufficient to address the ability of resources and receptors to adapt, then additional mitigation measures will be developed by the climate change topic specialists in collaboration with the environmental topic specialists.

15.3.23 Significance of the in-combination climate change impacts is assessed based on the impact's likelihood and consequence for the relevant environmental topic, as shown in Table 15-6. If a potential in-combination climate change impact score is 4 or 5 in accordance with Table 15-6, it is a significant in-combination climate change effect.

Table 15-6 Significance scores for in-combination climate change impacts

Consequence						
	V. High	3	3	4	5	5
	High	2	3	3	5	5
	Medium	2	2	3	4	4
	Low	1	1	2	3	3
	V. Low	1	1	2	2	3
		V. Unlikely	Unlikely	Possible	Likely	V. Likely
		Likelihood				

Baseline conditions

15.3.24 Baseline conditions for the ICCI assessment are the same as the baseline conditions for the CCR assessment, as discussed in Chapter 14.6.

Design mitigation and enhancement measures

15.3.25 Additional mitigation measures relevant to the ICCI assessment will be developed and described within the final ES. Consultation.

15.3.26 A working list of projects to inform the CEA is being obtained through consultation with Cornwall Council. Ongoing consultation will be undertaken in order to finalise a list of other approved developments from the last three years for consideration in the CEA presented in the ES. Environmental information relating to each of the developments will be obtained from the Cornwall Council planning register and from publicly available reports. These information sources will be revisited to inform the CEA presented in the ES.

15.4 Limitations and assumptions

15.4.1 For this PEIR, a full cumulative effects assessment and combined effects assessment has not been undertaken because not all the scheme environmental assessments have been finalized at this stage. Therefore, this chapter presents the methodology to undertake a CEA through a four stage process which will be completed and included in the ES.

15.4.2 Assessment of cumulative effects is limited by the level of information that is available for each of the topic assessments. When consideration is given to effects that may arise as a result of impacts from other developments, the

[3] Existing mitigation measures refers to embedded design mitigation measures and environmental mitigation measures identified by topics as part of their assessments.

assessment becomes limited by the amount of information that is made publicly available.

ICCI assessment limitations and assumptions

15.4.3 The ICCI assessment has been informed by the following assumptions:

- The measures set out in the Outline EMP will provide appropriate mitigation for extreme weather related effects during construction.
- Assumptions associated with climate modelling and climate change projections, incorporated in UKCP09.

15.4.4 The ICCI assessment has the following limitations:

- The ICCI assessment is qualitative with the exception of the assessment of Road Drainage and the Water Environment, which is quantitative and takes into account current Environment Agency climate change allowances for increases in peak rainfall intensity.
- The evidence base relating to climate change impacts for some environmental topics (e.g. air quality, geology and soils) is limited, due to material uncertainty in projections for specific climate variables.
- The relationship between changes in climatic drivers and effects on environmental resources and receptors has sometimes been uncertain and the assessment is based on professional judgement.
- There is inherent uncertainty in climate change projections. This has been quantified using UKCP09, the latest set of probabilistic climate projections for the UK.

15.5 Summary of ICCI assessment

15.5.1 Three potentially significant in-combination climate change effects have been identified. These will be explored in further detail in the final ES.

15.5.2 Firstly, as a result of projected increased summer temperatures and increased frequency and severity of drought events, there may be an adverse effect on air quality, associated with increased dust pollution during construction. Additionally, during a drought there may be reduced water availability, limiting the ability to implement planned mitigation measures, associated with dampening of soil to reduce the spread of dust. The Air quality topic has been categorised as category 1: ‘at least one potential in-combination climate change effect with high significance (to remain scoped in)’. As a result, the Air quality topic is scoped in for more detailed ICCI assessment for the ES.

15.5.3 The Geology and soils topic has also remained scoped in for detailed ICCI assessment, due to the unknown presence of mining features under the scheme. Ground stability associated with such features would be further impacted by increased winter precipitation, as well as prolonged dry spells in the summer, followed by intensive rainfall. This may represent a significant in-combination climate change effect, relevant to both the construction and operation phases. The Geology and soils topic has been categorised as category 1: ‘at least one potential in-combination climate change effect with high significance (to remain scoped in)’.

15.5.4 The third topic that has remained scoped in for detailed ICCI assessment is People and communities. Projected decreases in summer precipitation may

affect the quality and capability of soils and potential to harvest. This may introduce challenges associated with reinstating soils to their previous condition and thus represents a significant in-combination climate change effect, relevant to both the construction and operation phases. The People and Communities topic has been categorised as category 1: ‘at least one potential in-combination climate change effect with high significance (to remain scoped in)’.

15.5.5 All in-combination climate change impacts relevant to other topics will be mitigated through measures already embedded within individual assessments and thus all topics except Air quality, Geology and soils and People and communities have been scoped out of the more detailed ICCI assessment.

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Chapter 16 Environmental Management

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16 Environmental Management

16.1 Introduction and Purpose

16.1.1 The Environmental Management chapter describes the environmental management process to manage the environmental effects of the scheme and to demonstrate compliance with environmental legislation. It provides the framework for recording environmental risks, commitments and other environmental constraints and to clearly identify the structures and processes that will be used to manage and control these aspects.

16.2 Environmental Management Plan

16.2.1 The Environmental Management Plan (EMP) will seek to ensure compliance with relevant environmental legislation, government policy objectives and scheme specific environmental objectives. It will be the fundamental document for monitoring, reviewing and auditing environmental performance and compliance.

16.2.2 The EMP will be prepared in accordance with DMRB Volume 11 Section 2 Part 6 HD 48/08 and DMRB Interim Advice Note (IAN) 183/14.

16.2.3 An Outline Environmental Management Plan (Outline EMP) will be developed as part of the EIA and presented as an appendix in the Environmental Statement.

16.2.4 It will later be refined and expanded by the contractor into a Construction Environmental Management Plan (CEMP) as more information becomes available and there is more certainty in terms of the proposed project layout, construction methods, programme and the likely environmental effects.

16.2.5 Towards the end of the construction period the CEMP will be refined into a Handover Environmental Management Plan (HEMP) which will contain essential environmental information needed by the body responsible for the future maintenance and operation of the asset.

16.2.6 The purpose of an EMP is to manage the environmental effects of the scheme. The key aims are to:

- Act as a continuous link and main reference document for environmental issues between the design, construction and the maintenance and operation stages of a project;
- Demonstrate how construction activities and supporting design will properly integrate the requirements of environmental legislation, policy, good practice. and those of the environmental regulatory authorities and third parties;
- Record environmental risks and identify how they will be managed during the construction period;
- Record the objectives, commitments and mitigation measures to be implemented together with the programme and date of achievement;
- Identify the key staff structures and responsibilities associated with the delivery of the project and environmental control and communication and training requirements as necessary;
- Describe the contractor's proposals for ensuring that the requirements of the environmental design are achieved, or are in the process of being achieved, during the Contract Period;
- Act as a vehicle for transferring key environmental information into the Handover Environmental Management Plan (HEMP) for operational

management. This will include details of the asset, short and long term management requirements and any monitoring or other environmental commitments; and

- Provide a review, monitoring and audit mechanism to determine effectiveness of, and compliance with, environmental control measures and how any necessary corrective action will take place.

16.2.7 The EMP will be a 'live' document that would be regularly updated and revised to take account of new information, changing external factors, feedback from reviews and consultation with the Statutory Environmental Bodies.

16.2.8 The Outline EMP will capture and collate all available information on the scheme specific environmental objectives, environmental risks, proposed mitigation and commitments that will need to be addressed prior to receiving "development consent" and transposing these requirements into a series of clear environmental actions to ensure that each action is fully considered during the following stages. To facilitate this, the EMP will contain a Register of Environmental Actions and Commitments (REAC) as outlined in Section 16.3.

16.2.9 Table 16-1 provides an overview of how the EMP is developed and the responsible owner for each Stage of the scheme.

Table 16-1 EMP development and responsibilities

Project Stage	Description	Status of Environmental Management Plan	Responsibility
Stage 0	Strategy, Shaping and Prioritisation	None	Client
Stage 1	Option Identification		
Stage 2	Option Selection		
Stage 3	Preliminary Design	Outline Environmental Management Plan (Outline EMP)	Designer
Stage 4	Statutory Procedures and Powers		
Stage 5	Construction	Construction Environmental Management Plan (CEMP)	Contractor
Stage 6	Commissioning and Handover	Handover Environmental Management Plan (HEMP)	Contractor
Stage 7	Operation and Maintenance		

16.3 Register of Environmental Actions and Commitments

16.3.1 A Register of Environmental Actions and Commitments (REAC) will be created and included in the Outline EMP as part of the final ES. This will be critical to the success of the EMP as it will form a record of the scheme specific environmental actions and commitments to be implemented and managed through all stages of the scheme. The REAC will lists actions and commitments identified from a number of sources, such as in the ES (principally taken from the mitigation sections of each chapter), ecological surveys, heritage or tree reports, contaminated land assessments or standard requirements such as Environment Agency consents.

16.3.2 The REAC will be provided in table format and will include:

- Identification of the environmental action or commitment;
- The objective of the action or commitment;
- A clear and specific description of how the action or commitment is to be implemented/achieved;
- The source of the action, including references for source documentation;
- Naming of the person responsible for the action i.e. Contractor or Environmental Manager;
- Achievement criteria and reporting requirements;
- The project stage or date or implementation and/or achievement;
- Details of any monitoring required, what should be monitored and how results should be used to effect necessary action; and
- Date and signature for completion of action.

16.3.3 Where it is required that mitigation/action must be monitored to determine success, the details of monitoring, success criteria, reporting requirements and trigger level for remedial works should be clearly defined.

16.4 Construction Environmental Management Plan

16.4.1 The Construction Environmental Management Plan (CEMP) will be produced by the Contractor and will be an expanded and more detailed version of the Outline EMP. It will contain all the information required for the appropriate management of environmental effects during construction of the project. The CEMP should be prepared by the Contractor supported by the designer and the environmental coordinator, as appropriate.

16.4.2 The CEMP will build upon the environmental actions identified in the REAC of the outline EMP by updating existing, or identifying new actions in light of information available at the construction phase. This may include environmental commitments made during the construction phase, risks and other information such as time constraints. It should describe the way these will be controlled and dealt with to comply with legislation and policy requirements and how adverse effects will be mitigated and managed during construction.

16.4.3 Highways England requires Contractors to produce a CEMP certified to BS EN ISO14001 Environmental Management System (EMS)[1].

16.4.4 The CEMP should include roles and responsibilities, together with appropriate control measures, training and briefing procedures, method statements, risk assessments and monitoring systems to be employed during planning and constructing the works for all relevant topic areas. Indicative contents of a CEMP are recommended in Annex B of IAN 183/14.

16.5 Handover Environmental Management Plan

16.5.1 On completion of construction, the Contractor shall produce a Handover Environmental Management Plan (HEMP), written in accordance with DMRB requirements. This is the package of information that needs to be handed over to those responsible for the future management and operation of the scheme. It should be developed by the contractor during the construction phase, in

[1] BSI, 2015, BS EN ISO 14001: Environmental Management (amended)

consultation with the organisation that will be responsible for future management and operation to ensure that its requirements are clear and meet their needs. It is important that it is substantially completed while environmental specialists responsible for key aspects of design and implementation such as archaeologists, ecologists and drainage specialists are still actively involved in the project and before any establishment maintenance period commences.

16.5.2 The HEMP should provide the relevant information on existing and future environmental commitments and objectives that need to be honoured, ongoing actions and risks that need to continue to be managed. The structure of the HEMP will align with the indicative contents recommended in Annex C of IAN 183/14. It should focus on the future management requirements, ongoing commitments and risk management requirements. It should include as built information and other details in a form that can be utilised by the body responsible for long term management so they can update their environmental management plans for the operational phase.

16.6 Environmental Masterplan

16.6.1 The key environmental mitigation measures incorporated within the design of the scheme are illustrated on the draft Environmental Masterplans (see Figure 7.6). The draft Environmental Masterplan drawings have been prepared in accordance with the Design Manual for Roads and Bridges (DMRB) Volume 10, Section 0, Parts 1 to 8, The draft Environmental Masterplans will be revised for the ES to account for any outstanding assessment and subsequent mitigation identified as being required.

16.6.2 DMRB sets out a system of Environmental Functions, Landscape Elements, Environmental Elements and Planning Policy features to describe areas shown on the Environmental Masterplan drawings. These are described in detail in Chapter 7 Landscape in Section 7.10.

16.7 Licences and Consents

16.7.1 A list of potential licences and consents required as part of the scheme are listed below. These could be subject to change as the scheme develops.

Topic	Consent / Licence	Regulatory Regime	Consenting Authority	Status / Comment
Nature Conservation and Biodiversity	Badger – Licence to interfere with a sett	Protection of Badgers Act 1992	Natural England	The presence of badgers will be confirmed by a species survey.
	Bats – European Protected Species Licences	Conservation of Habitats and Species Regulations 2010	Natural England	In the event that badgers are found to be effected by the development, the relevant licence applications will be made
	Otters - European Protected Species Licences	Conservation of Habitats and Species Regulations 2010	Natural England	The presence of bats will be confirmed by species surveys. In the event that a bat roost is found to be effected by the development, the relevant licence applications will be made.

Topic	Consent / Licence	Regulatory Regime	Consenting Authority	Status / Comment
	Barns Owls – Licence is required to disturb breeding sites.	Wildlife and Countryside Act 1981	Natural England	The presence of otters will be confirmed by species surveys. In the event that an otter resting or breeding site is found to be effected by the development, the relevant licence applications will be made.
Noise	Section 61 Consent	Control of Pollution Act 1974	Cornwall Council	For noise generating activities during the construction phase, prior consent will be required.
Water	Ordinary Watercourse Consent	Flood and Water Management Act 2010	Cornwall Council	Required for works in all watercourses that are not Main Rivers.
	Environmental Permit to discharge to surface/ground waters	The Environmental Permitting Regulations 2016	Environment Agency	Discharge of treated site runoff during construction

16.8 Summary

16.8.1 In line with the requirements under DMRB and IS0 14001, the Environmental Management of the scheme is an ongoing process during design, construction, operation and maintenance. The EMP will ensure there is a comprehensive management plan in place on the scheme to reduce any unforeseen environmental impacts.

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Chapter 17 Summary and Next Steps

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17 Summary and Next Steps

17.1 Summary of Potential Effects

17.1.1 Based on this preliminary assessment, the scale and location of the scheme means that several different aspects of the environment would potentially be affected. Some of these effects would occur during construction, such as the loss of land, vegetation and wildlife habitat, and the generation of dust and noise. Other impacts would occur during operation, such as noise from traffic, changes to travel conditions and development of new habitats from the landscape and ecological mitigation proposals.

17.1.2 The ongoing EIA will consider these effects and assess their significance, taking into account proposed mitigation measures. This will be presented in the ES prepared to accompany the DCO application.

17.2 Next Steps

17.2.1 Highways England wishes to obtain the views of statutory consultees and other stakeholders on the draft proposals for the scheme, given the amendments to the proposed design since the Preferred Route Announcement and submission of the Scoping Report. Highways England will hold a statutory period of consultation in accordance with the Planning Act 2008. This will be for a period of six weeks from 29 January to 11 March 2018.

17.2.2 Details of the consultation events are available in the Statement of Community Consultation which can be accessed through the following link:

www.highways.gov.uk/a30Chiverton

17.2.3 Details of how the process works can be found on the National Infrastructure Planning website[1].

17.2.4 After the consultation period, all responses will be considered in finalising the scheme design and the ES. A report will be prepared on the responses received and how they have been taken into account, including whether or not they have led to changes in the scheme.

[1] https://infrastructure.planninginspectorate.gov.uk/application-process/the-process/

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Chapter 18 Abbreviations

19 Abbreviations

Table 19-1 Table of Abbreviations

Abbreviation	In Full
AADT	Annual Average Daily Traffic
AGLV	Area of Great Landscape Value
AIES	Assessment of Implication of European Sites
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
AQAPs	Air Quality Action Plans
AQMA	Air Quality Management Areas
AR5	Fifth Assessment Report
ARN	Affected Road Network
ARS	Active Roost Sites
BGS	British Geological Survey
CBC	Common Bird Census
CCC	Cornwall County Council
CCR	Climate change resilience
CEA	cumulative effects assessment
CEMP	Construction Environmental Management Plan
CERC	Cambridge Environmental Research Consultants
CFMP	West Cornwall Catchment Flood Management Plan 2012
CIEEM	Chartered Institute of Ecology and Environmental Management
CISLCS	Cornwall and Isles of Scilly Landscape Character Study
CNA	Community Neighbourhood Area
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COP21	21st Conference of the Parties
COSHH	Control of Substances Hazardous to Health Regulations
CRTN	Calculation of Road Traffic Noise
CRVI	Cornwall Roadside Verge Inventory
CSM	Common Standards Monitoring
CWS	County Wildlife Sites
D2AP	Two lane all-purpose dual carriageway
DAS	Discretionary Advice Survey
DCO	Development Consent Order
DECC	Department of Energy and Climate Change
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
DTM	Digital Terrain Map
EC	European Commission

Abbreviation	In Full
ECI	Early Contractor Involvement
EIA	Environmental Impact Assessment
ELC	European Landscape Convention
EMP	Environmental Management Plan
EPDs	Environmental product declarations
ERCCIS	Environmental Record Centre for Cornwall and the Isle of Scilly
ES	Environmental Statement
ESCR	Earth Science Conservation Review
FEQS	Freshwater Environmental Quality Standards
FRA	Flood Risk Assessment
FSC	Forest Stewardship Council
GAC	Generic Assessment Criteria
GCR	Geological Conservation Review
GHG	Greenhouse gases
GIR	Ground Investigation Report
GIS	Geographical Information Systems
GQRA	Generic Quantitative Risk Assessment
HA	Highways England
HAWRAT	Highways Agency Water Risk Assessment Tool
HGVs	Heavy Goods Vehicles
HPIs	Habitats of Principal Importance
HRA	Habitats Regulations Assessment
IAN	Scheme Air Quality Action Plans
IAQM	Institute of Air Quality Management
ICCI	In-combination climate change impact
IEEM	Institute of Ecology and Environmental Management
IEMA	Institute of Environmental Management and Assessment
IP	Inter-Peak
IPCC	Intergovernmental Panel on Climate Change
JNCC	Joint Nature Conservation Committee
KPI	Key Performance Indicator
LAQM	Local Air Quality Management
LCLIP	Local Climate Impacts Profile
LDV	Light Duty Vehicles
LLFA	Local Lead Flood Authority
LNR	Local Nature Reserves
LOAEL	Lowest Observed Adverse Effect Levels
LOD	Limit of Detection
LSOA	Lower Super Output Areas
LVIA	Landscape and Visual Assessment
MAGIC	Multi-Agency Geographic Information for the Countryside
MMP	Materials Management Plan

Abbreviation	In Full
NAQS	National Air Quality Strategy
NFH	Nancarrow Farmhouse
NH_3	Ammonia
NIR	Noise Insulation Regulations
NMUs	Non-Motorised Users
NN NPS	National Policy Statement for National Networks
NNR	National Nature Reserves
NO_2	Nitrogen Dioxide
NOx	Nitrogen Oxides
NPPF	National Planning Policy Framework
NPSE	Noise Policy Statement for England
NSIP	Nationally Significant Infrastructure Project
NVC	National Vegetation Classification Survey
OBS	Observed Breeding Sites
OP	Off-Peak
PAH	Polycyclic Aromatic
PAS	Publically Available Specification
PCF	Project Control Framework
PEFC	Programme for the Endorsement of Forest Certification
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
PM10	Fine Particulates
PNS	Potential Nest Site
PPE	Personal Protective Equipment
PPG	National Planning Practice Guidance
PPGs	Pollution Prevention Guidelines
PPV	Peak Particle Velocity
PRF	Potential Roosting Feature
PRoW	Public Rights of Way
RBD	River Basin Districts
RBMPs	River basin management plans
RIGS	Regionally Important Geological and Geomorphological Sites
RTC	Road Traffic Collision
SAC	Special Area of Conservation
SEB	Statutory Environmental Bodies
SINC	Sites of Importance for Nature Conservation
SO2	Sulphur Dioxide
SOAEL	Significant Observed Adverse Effect Levels
SoCG	Statement of Common Ground
SoS	Secretary of State
SPA	Special Protection Area

Abbreviation	In Full
SPIs	Species of Principal Importance
SPZ	Source Protection Zone
SRN	Strategic Road Network
SSSI	Site of Special Scientific Interest
SuDs	Sustainable Drainage Systems
SWMP	Site Waste Management Plan
tCO2e	tonnes of carbon dioxide equivalent
The act	The Planning Act 2008
The Scheme	proposed A30 Chiverton to Carland Cross scheme
TPH	Total Petroleum Hydrocarbons
TRS	Temporary Rest Site
UAEL	Unacceptable Adverse Effect Levels
UKCP09	United Kingdom Climate Projections 2009
UKDWS	UK Drinking Water Standards
UNECE	United Nations Economic Commission for Europe
VDV	Vibration dose value
VPs	Viewpoints
WFD	Water Framework Directive 2000/60/EC
WG	Weather Generator
WHO	World Health Organisation
WRA	Water Resources Act 1991
ZOI	Zone of Influence
ZTV	Zone of Theoretical Visibility

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