MetroWest

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Notice

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1 Environmental hazards and vulnerable receptors

List of Abbreviations

ALARP	As low as reasonably possible
CEMP	Construction Environmental Management Plan
CoCP	Code of Construction Practices
COMAH	Control of Major Accident Hazards
COSHH	Control of Substances Hazardous to Health
CSM-RA	Common Safety Method for Risk Assessment
CTMP	Construction Traffic Management Plan
ES	Environmental Statement
HDDG	Highways Development Design Guide
LOAEL	Lowest Observed Adverse Effect Level.
m2 route	metrobus scheme between Ashton Vale Park and Ride and Bristol city centre
NNR	National Nature Reserve
NPSNN	National Policy Statement for National Networks
NR	Network Rail
ORR	Office of Road and Rail (formerly Office of Rail Regulation)
SAC	Special Area of Conservation
SPA	Special Protection Area
SSSI	Special Site of Scientific Interest

SECTION 1

Introduction

1.1 Purpose of the assessment

1.1.1 This appendix to the Environmental Statement ("ES") reports the potential for a major accident or disaster resulting in a risk of significant effect on the environment for the Portishead Branch Line (MetroWest Phase 1) Development Consent Order Scheme ("the DCO Scheme").

1.1.2 The DCO Scheme is being promoted by North Somerset District Council ("NSDC") and the West of England Combined Authority ("WECA") on behalf of the West of England Authorities, which also comprise Bristol City Council ("BCC"), Bath and North East Somerset ("B&NES") and South Gloucestershire Council ("SGC").

1.1.3 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) ("EIA Regulations 2017") require: "*A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the project concerned*" (Schedule 4, paragraph 8).

1.1.4 The assessment considers two aspects, the vulnerability of the project to a major accident or disaster and the potential for the project to cause a major accident or disaster, which may occur during construction or the operational life of the DCO Scheme. The decommissioning phase has been scoped out of the assessment as explained in the ES Chapter 4 Description of the Proposed Works (DCO Document Reference 6.7).

1.1.5 The assessment of major accidents and disasters differs from other topics considered in the ES for the DCO Scheme as it focuses on identifying major risks in the context of potential for significant environmental effects.

1.2 Location and definition of the study area

1.2.1 The DCO Scheme is located along an existing railway corridor between Portishead and the outskirts of Bristol in the west of England. The original railway was built in the 1860s. The passenger services continued until 1964 and the freight service continued to 1981. With the cessation of services, the railway corridor was largely abandoned and became heavily overgrown. The Royal Portbury Dock opened in 1978 and in 2002 part of the former Portishead Branch Line was re-opened to service the port, including a new section about 0.5 km long from the old Portbury Junction into the port. Today, the section of the railway between Portishead and Pill is disused, while the section between Pill and the junction with the Bristol to Exter mainline at Parson Street Junction is an operational railway for freight.

1.2.2 Portishead is situated on the coast of North Somerset about 3 km south west, and downstream, from the confluence of the River Avon with the Severn Estuary. The railway corridor follows the River Avon upstream and through the Avon Gorge on its southern and western (left hand) flank towards the outskirts of Bristol. The branch line joins the main Bristol to

Exeter railway line at Parson Street Junction, located to the south west of Parson Street Station.

1.2.3 The study area for the assessment of the risk of major accidents and disasters associated with the DCO Scheme considers:

- Control of Major Accident Hazards ("COMAH") facilities within 3 km;
- Rail infrastructure within 1 km;
- Connections to existing road infrastructure;
- Utilities close to and crossing the DCO Scheme; and
- Natural features with the potential to create risks within 1 km.

1.2.4 The study area and features of interest are shown on Figure 1.

1.3 Methodology

1.3.1 There is no specific guidance on the assessment of the potential for major accidents or disasters for infrastructure projects. A precautionary approach for the purposes of this assessment has been adopted, which involves establishing the baseline, screening the risk of potential accidents and disasters that may give rise to likely significant effects, followed by further assessment of the risk, mitigation, and residual risk.

Baseline

1.3.2 The sensitive receptors and the main sources of potential major accidents and disasters were identified from a review of the Environmental Statement. COMAH sites were identified using the HSE COMAH 2015 Public Information Search.

1.3.3 Sensitive receptors at risk from potential major accidents or disasters from the DCO Scheme are:

- members of the public and local communities;
- the natural environment, including ecology and biodiversity, land and soil quality, air quality, surface and groundwater resources, land use, landscape and views;
- the historic environment, including archaeology and built heritage.

1.3.4 The main sources of potential major accidents and disasters were divided into the following categories:

- Man-made hazards from proposed, existing and former infrastructure and facilities (on both how they may impact the DCO Scheme and how the DCO Scheme may impact them); and
- Natural disasters, for instance flood risk and geo-technical risk.

1.3.5 Baseline conditions were reviewed to identify existing facilities, natural features or potential hazards which could lead to events associated with potential major accident or disasters in combination with the DCO Scheme.

Screening

1.3.6 The risks of potential major accidents and disasters were then screened to identify events requiring further consideration and those which could be

scoped out as not likely to have a significant effect on the environment. The screening was broadly based on accepted technical risk assessment methods and the source ➞pathway ➞receptor model to identify:

- Sources (potential hazards which may be associated with a major accident or disaster);
- Pathway (for transmission of the potential hazard to the receptor); and
- Receptors which could potentially be exposed to potential hazards (source).

Further Assessment

1.3.7 For risks of potential major accidents and disasters to be screened for further assessment all three components of the source ➞pathway ➞ receptor model need to be present to identify the events which could result in likely significant effects. The review also considered what barriers or embedded mitigation are in place to prevent the source ➞ pathway ➞ receptor event from occurring.

1.3.8 The assessment defines whether the potential event could comprise a potential major accident or disaster in accordance with the definitions presented in Table 1 below.

Table 1: Definition of the terms Major Accident and Natural Disaster

Term	Definition
Major Accident	The definition of a 'major accident' used in this assessment draws on the Control of Major Accident Hazards Regulations 2015 (COMAH 2015). These Regulations define a "major accident" as an occurrence such as a major emission, fire, or explosion resulting from uncontrolled developments during the operation of any establishment and has the potential to lead to serious danger to human health or the environment (whether immediate or delayed) inside or outside the establishment and involving one or more dangerous substances. The terms which define a major accident are as follows: • *Injury to persons and damage to property* - a death; six persons injured within the establishment and hospitalised for at least 24 hours; one person outside the establishment hospitalised for at least 24 hours; a dwelling outside the establishment damaged and unusable as a result of the accident; the evacuation or confinement of persons for more than 2 hours where the value (persons hours) is at least 500; or the interruption of drinking water, electricity, gas or telephone services for more than 2 hours where the value (persons hours) is at least 1,000). • *Immediate damage to the environment* - permanent or long-term damage to terrestrial habitats of 0.5 hectares or more of a habitat of environmental or conservation importance protected by legislation, or 10 or more

Term	Definition
	hectares of more widespread habitat, including agricultural land; significant or long-term damage to freshwater and marine habitats (10 km or more of river or canal; 1 hectare or more of a lake or pond; 2 hectares or more of delta; or 2 hectares or more of a coastline or open sea; or significant damage to an aquifer or underground water of 1 hectare or more). • *Damage to property:* damage to property in the establishment, to the value of at least EUR 2,000,000 (approximately £1,808,000)[1]; or damage to property outside the establishment, to the value of at least EUR 500,000 (approximately £452,000). • *Cross-border damage*: any major accident directly involving a dangerous substance giving rise to consequences outside the territory of the Member State concerned.
Natural disaster	A naturally occurring event such as extreme weather (storm, flooding) or a ground-related potential hazard event (subsidence, landslide, or earthquake) with the potential to cause an event or situation that meets the definition of major accident: *Immediate damage to the environment* • permanent or long-term damage to; o terrestrial habitats of 0.5 hectares, or o more than 0.5 hectares of a habitat of environmental or conservation importance protected by legislation, or o 10 or more hectares of more widespread habitat, including agricultural land; • significant or long-term damage to freshwater and marine habitats o 10 km or more of river or canal; o 1 hectare or more of a lake or pond; o 2 hectares or more of delta; or o 2 hectares or more of a coastline or open sea; or • significant damage to an aquifer or underground water of 1 hectare or more).

1.3.9 The National Policy Statement for National Networks ("NPSNN") does not list specific requirements for the consideration of potential major accidents and disasters within DCO applications. It notes that road and rail accidents

[1] Assumes an exchange rate of Euro to Pound sterling of 0.904 based on a 90 day average

have a major economic as well as social cost. It is the Government's policy, supported by legislation, to ensure that the risks of passenger and workforce accidents are reduced as low as reasonably practicable. Highway developments can also potentially generate significant accident reduction benefits when they are well designed. The consideration of road and rail accident avoidance is addressed in the Assessment of Construction and Operational Phase Effects sections within the ES Chapter 16 Transport, Access, and Non-Motorised Units (DCO Document Reference 6.19).

SECTION 2

Baseline

2.1 Introduction

2.1.1 This chapter briefly summarises potential sensitive receptors and natural and anthropogenic hazards in the study area.

2.2 Sensitive receptors

2.2.1 The following sections provide further information on the environmental receptors focussing on aspects of relevance to potential major accidents:

- Population and human health
- Ecology and biodiversity
- Land and soil quality
- Surface and groundwater resources
- Land use
- Landscape and views
- Cultural heritage

Population and human health

Population and human health

2.2.2 Baseline data on population, socio-economic issues and health are presented in the ES Chapter 14 Socio-economics and Economic Regeneration (DCO Document Reference 6.17) and in Appendix 14.2 Health Impact Assessment (DCO Document Reference 6.25).

2.2.3 The DCO Scheme would pass through the built up areas of Portishead, Pill and the outskirts of Bristol in Ashton Vale and Ashton Gate, while the sections of the route between Portishead and Pill, and along the Avon Gorge are sparsely populated.

2.2.4 The 2011 Census reveals that there were 1.1 million residents across the West of England in 2011, with 428,100 residents in Bristol, 24,000 residents in Portishead and 6,200 in Pill. Since 2001, the population of Portishead grew by 6,500, reflecting an annual growth rate of 3.30%. Rapid population growth in Portishead is attributed to development of the former docks into a vibrant community, combined with residential development elsewhere. This level of growth has continued more recently, with around 25% of all residential units delivered in North Somerset being located in Portishead according to North Somerset's Annual Monitoring Report (2015). In contrast, the population of Pill marginally declined at an annual growth rate of -0.2% between the Census periods. The population of Bristol is estimated to reach 500,000 by 2027.

2.2.5 In Portishead, the age structure is skewed towards certain vulnerable groups (in particular, young people and the elderly, both forming 19% of the total population). Elderly residents are particularly over-represented in Pill, forming 24% of the population. In Portishead, the future working age

population is likely to increase considerably given the current high proportion of young people.

2.2.6 The 2011 Census also indicates that the modal age bands differ between the West of England and nationally. For example, the West of England has a marginally higher proportion of residents concentrated in the 'working-age' bands (i.e. 66% aged 16-64) relative to England as a whole (65%). These findings suggest that a considerable proportion of residents in the West of England are currently at working age and are therefore likely to be economically active and commute to work.

2.2.7 In terms of disability, Portishead has a low proportion of residents for whom day to day activities are limited a lot (6.1%) or to some extent (8.6%), relative to England (8.3% and 9.3% respectively). Nevertheless, these figures still mean that around 15% of the Portishead population experience some degree of difficulty in their day to day activities. Residents in Pill are more likely than the national average to suffer from long term health problems or disabilities (with one-fifth of residents limited to some extent). This could relate to the age structure of the town, which is skewed towards elderly residents.

2.2.8 The socio-economic profiles of Portishead, Pill and the wider West of England region point to a relatively prosperous, open economy with the travel to work area mainly contained within the sub-region, but little evidence of self-containment within individual towns. There are high levels of car ownership in the West of England, and a very high rate of car ownership is also reported in Portishead and Pill. The West of England is a relatively self-contained travel to work area, with 90% of residents also working within the sub-region and two-thirds of all residents who both live and work in the West of England travel to work using motor vehicles.

Pedestrians, Cyclists, and Equestrians

2.2.9 Baseline information on "non-motorised users", that is pedestrians, cyclists and equestrians is provided in Chapter 16 Transport, Access and Non-Motorised Users (DCO Document Reference 6.19).

2.2.10 There are several public rights of way and permissive paths along the railway corridor, including the following.

- There is an informal, at grade crossing over the disused railway near Trinity Primary School, Portishead which is well used by school children and adults.
- The Sustrans National Cycle Network ("NCN") 41 (the Avon Gorge Tow Path) runs along the western shore of the River Avon, next to the operational railway for much of its length through the Avon Gorge.
- NCN Route 26 uses (under licence from NRIL) short sections of the disused railway corridor between the M5 Avonmouth Viaduct and Royal Portbury Dock Road Bridge. Route 26 is on a dedicated bridleway to the north of and parallel to the railway line. At both the Royal Portbury Dock Road Bridge and Marsh Lane Bridge either the bridleway can be used to cross the roads at carriageway level or cycle and foot users can divert on to permissive paths under the road bridges using the disused railway. To provide a link to Pill a further licence permits cycle and foot users to pass alongside the railway under the M5 Avonmouth Viaduct.

2.2.11 In Pill a public right of way passes under the operational railway between Avon Road and Lodway Close. There are several permissive and historic crossings over the disused railway line.

2.2.12 These routes present a potential risk of people accessing the railway line.

Air quality

2.2.13 The Air Quality baseline is presented in ES Chapter 7, Section 7.4 (DCO Document Reference 6.10). Exposure to high concentrations of poor air quality may adversely affect human health.

2.2.14 The air quality along much of the route is well below the Air Quality Objectives for NO_2 and PM_{10}. NSDC has not declared any Air Quality Management Areas ("AQMA") for NO_2 and PM_{10} in the vicinity of the DCO Scheme. BCC has declared a single AQMA for NO_2 (1-hour mean and annual mean objectives) and PM_{10} (24-hour mean objective) that covers the city of Bristol and parts of the main radial roads. The DCO Scheme passes through the AQMA in the vicinity of Ashton Gate.

2.2.15 The ES concludes that construction and operation of the DCO Scheme is not predicted to result in likely significant effects on air quality and human receptors. While a major accident may result in a localised, short term peak in air quality, such an event is unlikely to lead to significant effects on air quality and indirectly on human health.

Noise pollution

2.2.16 The Noise and Vibration baseline is presented in ES Chapter 13, Section 13.4 (DCO Document Reference 6.16). The results of baseline monitoring and modelling data are presented in Figures 13.1 and 13.2 in the ES, Volume 3, Book of Figures (DCO Document Reference 6.24).

2.2.17 The existing ambient noise levels vary across the study area, tending to be higher in urban than rural areas, and higher during the day than at night. At Portishead and Sheepway multiple noise sources include the distant M5, local traffic, bird song, high aircraft, and a school. At Pill the multiple noise sources include motorway noise, local traffic, and bird song. Along the Avon Gorge the noise climate was dominated by traffic noise from the A4 Portway on the eastern bank of the river. In Ashton the main noise sources are local traffic.

2.2.18 Some construction works for the DCO Scheme may result in significant levels of noise, particularly noisy activities such as piling and working at night, which could cause disturbance to nearby residents and affect their well-being. Some works where property lie close to the railway may result in perceptible levels of vibration, but below levels that may affect the fabric of buildings. Noise and vibration impacts would be mitigated through best practical means as indicated in the ES Chapter 13 Noise and Vibration (DCO Document Reference 6.16) and Appendix 4.2 Master Construction Environmental Management Plan (DCO Document Reference 8.14).

2.2.19 The ES also identified significant levels of operational noise for residential property on the south side of the proposed Portishead station due to the combined effects of trains arriving at, idling, and leaving the station, and for the residents at Old Portbury Station during to the passage of trains, which will be mitigated through the provision of noise barriers. The predicted levels

of vibration at properties closest to the railway in Pill are below the level that may be considered as just perceptible in residential environments.

2.2.20 Overall, the effect of the DCO Scheme on noise levels and vibration is not considered to be significant in regards to the EIA Regulations. While a major accident may cause high noise levels, the effects would be short term and not alter the ambient noise levels.

Ecology and Biodiversity

2.2.21 The Ecology and Biodiversity baseline is presented in ES Chapter 9, Section 9.4 (DCO Document Reference 6.12). The location of internationally, nationally and locally designated sites are shown on Figures 9.1, 9.2 and 9.3 in the ES Volume 3 Book of Figures (DCO Document Reference 6.24). Supporting information on ecology and biodiversity are provided in Appendix Series 9 of the ES (DCO Document Reference 5.5, 6.25 and 8.12).

2.2.22 The DCO Scheme passes through or close to a variety of designated and non-designated sites. The natural conservation importance or value of those sites is determined in relation to their geographic context:

- International or European Importance: Natura 2000 sites including Special Protection Areas (“SPA”), Special Areas of Conservation (“SAC”), and Wetlands of International Importance (Ramsar Sites)
- National Importance: Sites of Special Scientific Interest (“SSSI”), National Nature Reserves (“NNR”), woodland listed within Natural England’s Ancient Woodland Inventory, and Nationally Rare and Nationally Scarce plants
- North Somerset / Bristol City District Importance: Sites of Nature Conservation Importance (“SNCI”), Country Wildlife Sites (“CWS”), and Local Nature Reserves (“LNR”) designated in the county or unitary authority area, and plants Nationally Uncommon plants.
- Local Importance: LNRs designated in the local context and Tree Preservation Orders (“TPO”).

2.2.23 The DCO Scheme would pass through the lower slopes of the Avon Gorge Woodlands SAC which is designated for its *Tilio-Acerion* forests of slopes, screes and ravines and semi-natural dry grasslands and scrubland facies on calcareous substrate *Festuco-Brometalia*.

2.2.24 The Avon Woods SSSI is co-incident in area with the SAC designation and includes the Leigh Woods NNR, both of which are designated for their nature conservation interest. Leigh Wood is also listed on Natural England’s Ancient Woodland Inventory. The Avon Woods SSSI supports an exceptional number of nationally rare and scarce plant species, including Whitebeams *Sorbus spp* and Small-leaved Lime *Tilia cordata*.

2.2.25 The Severn Estuary is designated as a SAC, SPA, Ramsar site and a SSSI. Designated areas include the sub-tidal and inter-tidal areas of the Severn Estuary and the lower reaches of the River Avon. The designated areas lie along the North Somerset coast within 1 km north of the DCO Scheme in the vicinity of Portishead and Sheepway and comes within 80 m of the DCO Scheme in the vicinity of Pill. Of relevance to the DCO Scheme are the large

populations of over-wintering wildfowl and waders, including protected species, which feed and roost on the foreshore along the Severn Estuary and the River Avon.

2.2.26 There are six European sites within 30 km of the DCO Scheme which have bats as a qualifying feature:

- the North Somerset and Mendip Bats SAC,
- the Mendips Limestone Grassland SAC,
- the Bath and Bradford-on-Avon Bats SAC,
- the Mells Valley SAC,
- the Wye Valley Woodlands, and
- the Wye Valley and Forest of Dean Bat Sites SAC.

2.2.27 There are three SSSIs designated for their nature conservation value within 2 km of the DCO Scheme. Weston Big Wood SSSI is a mixed deciduous ancient woodland to the southwest of Portishead. Horseshoe Bend at Shirehampton SSSI on the right hand bank of the River Avon (the opposite bank to the DCO scheme) supports saltmarsh and a wooded river cliff. Ashton Court SSSI, located about 80 m west of the DCO Scheme at the nearest point, is designated for the saproxylic invertebrate fauna (invertebrates dependent on decaying and dead wood) associated with the woodlands and ancient trees in the historic parkland.

2.2.28 There are 49 local wildlife sites within 500 m of the DCO Scheme, 16 of which adjoin the railway corridor. These include Portbury Wharf Nature Reserve Wildlife Site which lies on the eastern side of Portishead, between the railway corridor and the Severn Estuary SAC, SPA, Ramsar site, and SSSI and the Portishead Eco Park which separates the Nature Reserve from the housing on the outskirts of Portishead. Other wildlife sites include a number of fields between Sheepway and Pill, parts of the River Avon, the Avon Gorge and Leigh Woods and parts of the Portishead Branch.

2.2.29 A variety of species of fauna are known to occupy the habitats along and adjoining the railway corridor, which are protected under European and UK legislation. There are records of amphibians, including Great crested newts, Smooth newt, Common frog and Common toad. Reptiles are widespread, including Grass snake and Slow worm, as well as invertebrates. The mammals Badger, Otter, Water Vole, and various species of Bat are present. Dormice are recorded in the ancient woodlands in the Avon Gorge. Nesting birds are found throughout the area, including two species listed under Schedule 1 of the Wildlife and Countryside Act Barn owl and Peregrine falcon.

2.2.30 Overall, the ecological impact assessment completed to date indicates that the DCO Scheme, if unmitigated, will have a significant effect on some ecology and biodiversity features with respect to the EIA Regulations, particularly on horseshoe bats from the North Somerset and Mendip Bats SAC foraging /commuting along the Portishead to Pill section, the corridor of woodland and trees along the Portishead to Pill section, the horseshoe bat roost at Pill Station Arches, the horseshoe bat navigational route at Pill Station and the Avon Gorge Woodlands SAC.

2.2.31 Measures to mitigate likely significant adverse effects and, as appropriate, effects of lesser significance have been identified and mitigation and compensation measures have been developed.

2.2.32 Mitigation by retaining as much vegetation as possible and undertaking new planting on the Portishead to Pill section and infill planting within land owned by NSDC alongside the A369 Portbury Hundred highway will be undertaken. This will mitigate for the partial loss of woodland, trees and scrub on the Portishead to Pill section used as a navigational route by horseshoe bats, linked to the North Somerset and Mendips Bats SAC.

2.2.33 The Habitats Regulations Assessment (ES Appendix 9.12, DCO Document Reference 5.5) has identified mitigation measures that address some effects on the Avon Gorge Woodlands SAC and compensation by positive management of areas of the SAC within Network Rail's ownership affected by invasive non native species and scrub (or on Forestry Commission land outside of the Avon Gorge Woodlands SAC as an alternative) and planting rare whitebeam trees is proposed.

2.2.34 The residual effects of the DCO Scheme are not significant in relation to the EIA Regulations. A major accident along or close to the DCO Scheme could impact nature conservation sites designated at the European, national and local levels, and result in the loss of important habitats and protected species of flora and fauna. Notwithstanding, a serious accident such as a derailment is unlikely to affect an area of 0.5 ha of terrestrial habitat, which defines a major accident (see Table 1).

Land and soil quality

2.2.35 Information on land and soil quality is presented in the following chapters of the ES:

- Chapter 10 Geology, Hydrogeology, Ground Conditions and Contaminated Land, Section 10.4 (DCO Document Reference 6.13) and Figure 10.1 showing the location of features of interest in the ES Volume 3 Book of Figures (DCO Document Reference 6.24).
- Chapter 15 Soils, Agriculture, Land Use and Assets (DCO Document Reference 6.18).

2.2.36 The geology of the area between Portishead and Pill comprises the Mercia Mudstone Group for the most part overlain by Tidal Flat Deposits. There are deposits of artificial ground in Portishead. The higher ground of the Avon Gorge is composed of Carboniferous limestone. Coal bearing strata are found around Ashton Gate in Bristol.

2.2.37 There are also two SSSIs designated specifically for their geological interest within 500 m of the DCO Scheme. The Ham Green SSSI comprises a railway cutting through which the Portishead Railway passes which has exposed a geological sequence through Pleistocene and Carboniferous sediments. Quarry Steps Durdham Downs SSSI, on the opposite side of the River Avon to the DCO Scheme, is designated for its fossil assemblage. While the Avon Gorge SSSI is primarily designated for the ecology, the citation also mentions the natural cliffs and quarry exposures of Carboniferous limestone.

2.2.38 The only soil map of the area is the 1:250,000 scale *Soil Map of South West England* published by the Soil Survey of England and Wales in 1983. This is accompanied by the Regional Bulletin, *Soils and their use in South West England*. Between Portishead and Pill the lower lying ground tends to support Newchurch soils characterised by waterlogged calcareous clayey and silty soils, while the higher ground supports Whimple soils characterised by moderately well drained loamy over clayey soils.

2.2.39 The provisional Agricultural Land Classification map (produced in the early 1970s) and available on Defra's MAGIC website shows the alluvial soils to be Grade 4 (poor quality agricultural land) and the higher ground to be Grade 2 (very good quality agricultural land). However, this ALC grading should be reassessed according to MAFF's 1988 Revised Guidelines for Grading the Quality of Agricultural Land. In this area the Newchurch soils are considered to be Grade 4 (poor quality land) and the Whimple soils are Grade 3a (good quality land).

2.2.40 Based on a review of historic land uses in the study area and site investigations undertaken for the DCO Scheme land quality is an issue along the DCO Scheme, as some of the ballast contains contaminants and will require appropriate handling and treatment. This is discussed further in Section 2.4.

Surface and groundwater resources

2.2.41 The main features of the surface water environment for the DCO Scheme comprise the River Avon, which is tidal throughout the study area and several watercourses and drains which form tributaries of the river. There is an extensive network of small drains and ditches, many unnamed, with a number of culverts under the existing railway track, particularly through the section between Portishead and Pill.

2.2.42 The surface watercourses in the study area are either artificial or heavily modified water bodies. Few watercourses have natural morphological features, such as the channel form and profile, bed substrate, and bank materials.

2.2.43 Two surface water bodies in the study area are included in the River Avon River Basin Management Plan (2015 classification), Portbury Ditch and the River Avon (transitional waterbody). For both water bodies, the current ecological quality is "Moderate" and the current chemical status is "Good".

2.2.44 The Carboniferous sediments are classified as a Principal aquifer; with high permeability, a high level of water storage and potential to support water supply and/or river base flow on a strategic scale. The Devonian sandstones are classified as Secondary A aquifers, with permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. The Mercia Mudstone is classified as a Secondary B aquifer - predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.

2.2.45 The River Avon River Basin Management Plan identified three ground water bodies within the study area, the Carboniferous Limestone, the Bristol

Triassic, and the Portishead Mercia Mudstone. The current quantitative quality for all three ground water bodies is “Good”, while the current chemical quality is “Good” for the Carboniferous limestone and the Portishead Mercia Mudstone, but “Poor” for the Bristol Triassic.

2.2.46 There are no groundwater source protection zones or groundwater abstraction licences within 250 m of the DCO Scheme railway alignment. There are two groundwater abstractions within 1 km, one within Portbury Docks off Marsh Lane and one for the motorway service area at Junction 19 on the M5.

2.2.47 During construction, the potential impact of the works on surface and groundwater quality will be mitigated through temporary drainage controls as indicated in the Surface Water Drainage Strategy (see ES Appendix 17.1 Flood Risk Assessment Appendix O, DCO Document Reference 5.6) and the Master Construction Environmental Management Plan (DCO Document Reference 8.14). During operation, surface water drainage off the highways and car parks, and the wastewater from Portishead station will be discharged to surface water drainage and the sewerage system respectively and as agreed with the relevant competent authority. Where old balast is being replaced at various sites along the railway, this removes the existing risk of historic contamination reaching receptors through the track drainage.

2.2.48 In the event of a major accident or hazard, there is potential for pollution of surface waters from leaks from the diesel multiple units. While a major accident may result in a localised, short term effect, such an event is unlikely to lead to significant permanent effects on surface and groundwater resources (see Table 1).

Land use

2.2.49 Baseline information on land use in the study area is presented in the ES Chapter 15 Soils, Agriculture, Land Use and Assets, Section 15.4 (DCO Document Reference 6.18).

2.2.50 The DCO Scheme passes through the urban areas of Portishead, Pill and south west Bristol, separated by areas of open countryside.

2.2.51 In Portishead the existing railway corridor lies between areas of recently developed commercial and residential properties. The railway then passes through agricultural and ecological amenity land and south of the extensive hard standing forming part of the Royal Portbury Dock.

2.2.52 After passing under the M5 the railway passes through the residential area of Pill Village. Areas of amenity land are at Jenny's Meadow, Victoria Park (beneath Pill Viaduct) and Watchhouse Hill, before Pill Tunnel is reached.

2.2.53 On the Eastern side of Pill Tunnel the railway is bounded by agricultural land, used mainly for grazing, before turning southwards to follow the River Avon on its western flank through the Avon Gorge. The railway runs mainly on embankment through the extensive woodlands designated as the Avon Gorge Woodlands SAC/SSSI, parallel to and in close proximity to the River Avon.

2.2.54 After passing under the Clifton Suspension Bridge the railway continues south with public open space at Rownham Ferry on the east side of the

railway and a private amenity area, used for private sports events, car boot sales and car parking on the west.

2.2.55 The railway then passes under the A379 Brunel Way before running parallel to Winterstoke Road, with the Ashton Vale Road Industrial Estate and the Alderman Moore's Allotments development site to the west, before finally passing through the residential area of Ashton and reaching Parson Street Junction.

2.2.56 The ES concludes that construction and operation of the DCO Scheme is not predicted to result in likely significant effects on land use. While a major accident may result in a localised, short term effect, such an event is unlikely to lead to significant permanent effects on land use over 10 ha (see Table 1).

Landscape and Views

2.2.57 The Landscape baseline is presented in ES Chapter 11 Landscape and Visual Impact Assessment, Section 11.4 (DCO Document Reference 6.14). Landscape features are illustrated in Figure 11.1, landscape character in Figure 11.2 and the visual envelope and views in Figure 11.3 in the ES Volume 3 Book of Figures (DCO Document Reference 6.24).

2.2.58 The urban land uses in the area include residential, commercial and industrial uses in Portishead, Pill and the outskirts of Bristol. The Royal Portbury Dock is a large scale utility landscape characterised by extensive areas of hard surfacing and lighting for the storage of imported goods, mostly vehicles in recent years but also including coal transit facilities. There are extensive areas of countryside, characterised by grazing pasture with fields bounded by hedgerows and patches of woodland.

2.2.59 Much of the countryside lies in the designated Green Belt, an important planning designation to protect the countryside from inappropriate development. There are no national or local landscape designations. The railway corridor passes through various historic landscape character areas.

2.2.60 Between Portishead and Pill, views to and from the DCO Scheme are restricted due to the low lying topography, hedge boundaries around many of the fields, and the trees and shrubs that have grown up along the railway corridor. Recent vegetation clearance within the railway corridor to allow surveys and geotechnical investigations has opened up views of the railway locally. Longer views along the railway corridor are possible from the road crossings and the M5.

2.2.61 The urban character of Pill with the elevated viaduct and cuttings and the locally complex landform at Ham Green, where the line passes into tunnel, result in complex views in and out from the railway line. There are longer views over fields towards Ham Green and across the River Avon to Shirehampton.

2.2.62 Views are constrained within the Avon Gorge and views down into the gorge are possible only at specific locations such as the Clifton Suspension Bridge and from certain locations on the edge of the gorge, for example from the Circular Road on The Downs in Bristol. Elsewhere, such as in Leigh Woods, views are constrained by the wooded slopes.

2.2.63 As the Avon Gorge opens out towards Bristol, there are longer views out towards Ashton Court Estate to the west and the housing in Clifton on the higher ground above Hotwells to the north east on the opposite side of the River Avon. Open views in the industrial and commercial areas of Ashton Gate are constrained by larger buildings and highway infrastructure such as the Winterstoke Road/Brunel Way junction. The dense urban nature at Ashton Vale with its larger scale retail and commercial buildings screen views to the railway line from the surroundings. Glimpsed views are possible between buildings, down roads and across car parking areas.

2.2.64 The ES concludes that construction of the DCO Scheme is predicted to result in likely significant effects on the character areas of the Avon Gorge, Portishead, Sheepway, and Pill, from temporary installation of site compounds, lighting, and site clearance. The operation of the DCO Scheme is predicted to result in likely significant effects in Pill due to the passenger service and associated infrastructure.

2.2.65 While a major accident may result in a localised, short term effect, such an event is unlikely to lead to significant permanent effects on landscape character and views.

Cultural heritage

2.2.66 The Cultural Heritage baseline is presented in ES Chapter 8, Section 8.4 (DCO Document Reference 6.11) and cultural heritage assets are illustrated on Figure 8.1 in the ES Volume 3 Book of Figures (DCO Document Reference 6.24).

2.2.67 There are no designated assets and few non-designated heritage assets within the railway land. Those assets pre-dating the railway were largely destroyed during the construction of the original railway in the 1860s. The non-designated assets that remain comprise features associated with the original railway such as former stations, Pill Viaduct and Clifton Bridge Tunnel.

2.2.68 Along the disused section of the existing railway between Portishead and Pill there are 12 listed buildings within 500 m of the railway, including St Mary's Church and churchyard (Grade I) in Portbury and the Church of St George (Grade II*) in Easton-in-Gordano. The remaining listed buildings within 500 m of the DCO Scheme are Grade II and include the White Lion Public House and former sea wall in Portishead, several farm houses (Moor Farmhouse, Elm Tree Farmhouse, Portbury Priors, and Court House Farmhouse), and Portbury Priory.

2.2.69 There are a number of listed buildings in and around Pill, all Grade II, including Lodway Croft, Mulberry House and Cottage, the Watch House, and a cluster of four buildings associated with the former Ham Green Hospital.

2.2.70 There are three Scheduled Monuments within 0.5 km of the DCO Scheme in the vicinity of the Avon Gorge. Stokeleigh Camp lies in Leigh Woods on the west flank of the River Avon above the Avon Gorge, about 120 m from the railway corridor and approximately 75 m above the DCO Scheme. The site of the Roman settlement of *Abonae* at Sea Mills is on the opposite side of the River Avon to the DCO Scheme. An Iron Age hill fort at Clifton Down

Camp is also located on the opposite side of the River Avon, close to the Clifton Suspension Bridge.

2.2.71 Six conservation areas are located in Bristol, which are from north to south, Shirehampton, Sea Mills, Sneyd Park, The Downs, Hotwells and Clifton, and City Docks. The boundaries of some of these conservation areas extend to the west side of the River Avon close to the DCO Scheme. Two conservation areas lie within 500 m of the DCO Scheme on the west side of the River Avon. Leigh Woods Conservation Area lies on higher ground above the railway while the railway forms the eastern boundary of the Bower Ashton Conservation Area.

2.2.72 There are many listed buildings within 500 m of the DCO Scheme, particularly in the conservation areas within Bristol, but only a few lie within 50 m of the DCO Scheme. The most famous is the Clifton Suspension Bridge, a Grade I listed structure, which crosses the Avon Gorge connecting Clifton in Bristol with the suburb of Leigh Woods. The railway corridor lies in tunnel at the foot of the bridge on the western bank of the River Avon. Other notable listed buildings mostly Grade II include the Engineer's House approximately 25-30 m from the Clifton Suspension Bridge, Burwalls on Bridge Road and now part of Burwalls College for Continuing Education in Leigh Woods, and six listed buildings in Bower Ashton. There are also a number of listed buildings outside the conservation areas within 500 m of the DCO Scheme.

2.2.73 The operating railway corridor passes through Leigh Court Registered Park and Garden and close to Ashton Court Registered Park and Garden, which are both located on the western flank of the River Avon. There is also an unregistered Park and Garden associated with the former Ham Green hospital.

2.2.74 The ES concludes that construction and operation of the DCO Scheme is not predicted to result in likely significant effects on cultural heritage. While a major accident may result in a localised, short term effect, such an event is unlikely to lead to significant permanent effects on heritage assets or their setting given the lack of assets within close proximity of the railway.

2.3 Natural hazards

2.3.1 Two natural hazards have been identified in the study area, flood risk and geo-stability hazards in the Avon Gorge.

Flood risk

2.3.2 The Water Resources baseline is presented in ES Chapter 17, Section 17.4 (DCO Document Reference 6.20) and Appendix 17.1 Flood Risk Assessment ("FRA") (DCO Document Reference 5.6).

2.3.3 The Environment Agency's ("EA") Flood Map shows the DCO Scheme to be in Flood Zone 1 (lowest flood risk) except for the following locations:

- Defended Flood Zone 3 (highest flood risk) at the crossing of Portbury Ditch

- Flood zone 3 at the crossing of Markham Brook in Pill[2] and Chapel Pill watercourse;
- Partly in Flood Zone 2 and defended Flood Zone 3 between Portbury Ditch and Royal Portbury Dock Road;
- Partly in Flood Zones 2 and 3 between Royal Portbury Dock Road and the M5 Motorway crossing;
- Flood Zone 3 near Paradise Bottom;
- Flood Zones 2 and 3 near Bower Ashton; and
- Adjacent to Flood Zone 2 at Colliter's Brook culvert entrance adjacent to the Portbury Freight Line and Flood Zone 2 at the Portbury Freight line crossing of Longmoor Brook culvert, and adjacent areas.

2.3.4 The EA flood maps are derived from models. Hydraulic modelling undertaken for the flood risk assessment of the DCO Scheme has provided a more detailed assessment of flood risk than the modelling undertaken for the EA Flood Zones. The ES Appendix 17.1 FRA (DCO Document Reference 5.6) describes the main sources of flood risk that may impact the vicinity of the DCO Scheme.

- The EA Flood Map indicates that parts of the Portishead to Pill (disused section) are at risk of fluvial/tidal flooding (Flood Zones 2 and 3). However, the EA Flood Zones do not account for the presence of flood defences.
- Flood risk from the River Avon is tidally dominated adjacent to the DCO Scheme, where flooding of the existing railway alignment near Bower Ashton from the River Avon is estimated to occur every 5 to 10 years on average. The area around Bower Ashton lies in EA Flood Zone 3.
- Flood risk to the Portishead to Pill (disused section) between Portishead and the M5 motorway Junction 19 is due to coastal flood risk (including the defended Flood Zone 3 shown adjacent to Drove Rhyne).
- The EA Flood Map shows the Portishead to Pill (disused section) crosses Flood Zones 2 and 3 at Easton-in-Gordano Stream. Here the EA Flood Map estimates tidal flood risk by projecting simulated River Avon tidal flood levels up the Easton-in-Gordano Stream. The farm access track under the Portishead to Pill (disused section) at Cattle Creep Bridge, between Easton-in-Gordano stream and the M5 Motorway, acts as a flood relief flow path.
- The EA surface water flood map (https://flood-warning-information.service.gov.uk/long-term-flood-risk/map) indicates that there may be relatively small and localised areas in the vicinity of the DCO Scheme that could be vulnerable to surface water flooding during rainstorms.

[2] Markham Brook is culverted under Pill Viaduct, so flood risk is not a hazard to the railway in this location.

- Although some areas are located in areas of medium susceptibility to groundwater flooding the EA has indicated there are no specific groundwater flooding problems in the DCO Scheme area.
- The risk of flooding from breached canals or reservoirs is understood to be very low.
- In the vicinity of Colliter's Brook the Portbury Freight Line is in Flood Zone 2, but elsewhere (e.g. Chapel Pill and through the Avon Gorge) the railway is higher (by several metres) than the watercourse it crosses and hence potential fluvial flood risk is discounted at these locations.

2.3.5 The FRA provides details of the DCO Scheme specific modelling that has been undertaken to establish the baseline (2015) and future, post development represented by the year 2075 (as well as testing sensitivity for future year 2115) flood risk with a greater degree of accuracy. This includes updates to the EA's coastal flood model (covering flooding from the Severn Estuary), the Bristol City Council Central Area Flood Risk Assessment ("CAFRA") model (covering tidal and flooding from the Bristol Avon and its tributaries) and development of new hydraulic models to assess fluvial/tidal flood risk from Drove Rhyne and Easton-in-Gordano Stream.

2.3.6 Flood risk is projected to increase in the future as a result of climate change and sea level rise. The dominant increase in flood risk for the DCO Scheme is considered to be tidal flood risk resulting from increased sea levels.

2.3.7 Fluvial and surface water flood risk are expected to increase as a result of increased extreme rainfall depths, with increased fluvial and surface water flooding extents. Increased sea levels will increase the risk of tide locking of inland watercourses and drainage systems.

2.3.8 The FRA has considered impacts from climate change and has concluded the following points.

- The lifetime of the DCO Scheme is assumed to be 60 years (a 100 year climate change horizon has also been assessed as a sensitivity test). Projected climate change and sea level rise during the life of the DCO Scheme are notable, with projected sea level rise of approximately 0.59 m between 1990 and 2075 (and approximately 1.14 m between 1990 and 2115).
- The most significant flood risk is River Avon tidal flooding near Bower Ashton. For the future (2075) scenario, due to projected future sea level rise, the area will flood approximately once every year on average near Bower Ashton.
- Modelling indicates that for the future (2075) scenario the DCO Scheme between Portishead and Pill would experience coastal flooding less frequently than once every 1000 years on average (and once every 200 to 1000 years on average in 2115).
- Fluvial flood risk to the DCO Scheme from Portbury Ditch, Drove Rhyne and Easton-in-Gordano stream is not considered to be significant for the future (2075 and 2115) scenarios.

- For the future (2115) scenario the operational railway lies outside the Colliter's Brook and Longmoor/Ashton Brook 50-year return period flood extent, and within the 75-year return period flood extent.
- For the future (2075) scenario, the area which would become the Portishead station and car parks, and the pedestrian crossing of Portbury Ditch (providing a pedestrian route from the station to Portishead) is forecast to be outside of the 1000-year coastal flood level, and for the future (2115) scenario, above the 200-year coastal flood level.

Geo-stability hazards in the Avon Gorge

2.3.9 Slope instability is a known risk in the Avon Gorge, with recorded incidents of stones and boulders slipping downslope and rock falls. Some individual trees naturally become unstable and fall downslope, while others are damaged by rock fall. NRIL carries out regular visual inspections of the rock face throughout the gorge. Stone picking, rock bolting and catch nets are already applied in the gorge to protect the freight line services.

2.3.10 The DCO Scheme includes proposals for further stabilisation works on cliff faces within the Avon Gorge on Network Rail land and on third party land. A summary of the geotechnical works required is presented in the ES Appendix 4.4 (DCO Document Reference 6.25). These include vegetation clearances, light to heavy scaling (stone picking), and rock bolting. The need for catch fences has been identified at three locations.

2.3.11 The Ashton Vale area is located within the defined coal field and accordingly due consideration should be afforded to ground conditions and the potential for unstable land to be present in the development of the DCO Scheme. The Coal Authority has records of recorded mine entries in the vicinity and likely presence of historic unrecorded underground coal mining at shallow depth. A summary of historic mining in the area is presented in the ES Appendix 10.2 (DCO Document Reference 6.25). The works proposed in this area are mostly superficial works associated with the extension of the left hand flare on Winterstock Road onto Ashton Vale Road and MOVA upgrade for traffic lights. The proposed pedestrian and cycle ramp between Ashton Vale Road and Ashton Road will require piling for the piers. The ground conditions for the ramp are considered in the ES Appendix 10.2 (DCO Document Reference 6.25).

2.4 Anthropogenic hazards

2.4.1 The following anthropogenic hazards have been identified in the study area:

- poor land quality, including historic landfill sites, old track formation (ballast) containing contaminants,
- COMAH industrial sites,
- utilities infrastructure
- transport infrastructure near the DCO Scheme.

Land quality

2.4.2 A review of historic land uses has identified potential sources of contamination (starting from Portishead) as follows:

- A small gasworks, nail factory, paper bag factory, phosphorus factory – all located outside the footprint of the DCO Scheme and since redeveloped, so not considered further.
- A fuel depot located to the south of the railway and location of Portishead Station.
- Power station ash landfill, located to the north of the railway, east of Haven View.
- Priory Farm Landfill located between the A369 and the disused railway.
- Elm Tree Farm Landfill located in Sheeptway c250 m north of the disused railway.
- Yards near Pill Station.
- Landfills near Ashton Gate.

2.4.3 At Portishead the new station will be located on made ground, which may be contaminated due to historic land use. It is unlikely that any contamination would be so significant as to prevent development given the likely structures involved. Given alterations are required to Quays Avenue, there is more potential to encounter contamination, given the proximity to the former fuel storage depot.

2.4.4 At Pill Station the potential car parking area may be affected by residual contamination associated with use of the site as sidings.

2.4.5 The Priory Farm Landfill is located to the south of the disused railway, bounded to the west by Sheepway Road and to the south by the A369. This is an historical landfill operating in the late 1980s. The EnviroCheck report indicates that it may have received inert and non-hazardous wastes (although these may not be consistent with the modern definitions of wastes). The Environment Agency website indicates that the Priory Farm Landfill had leachate and gas controls.

2.4.6 The Elm Tree Farm Landfill is not considered to present a potential impact to the DCO Scheme due to the distance (c250 m) and intervening presence of housing.

2.4.7 The disused section was an established railway corridor for a considerable period and as such there is potential for the underlying ground to be affected by contaminants associated with railway use such as hydrocarbons, metals and asbestos. The existing ballast along the disused section between Portishead and Pill is no longer suitable and will have to be lifted and replaced with new stone. Some of the ballast is also contaminated and will require treatment prior to disposal or re-use elsewhere. The ballast along the operational railway between Ashton Junction and Royal Portbury Dock was refreshed in the early 2000s as part of works to reopen the line for freight and is less contaminated.

2.4.8 There are no hazardous waste landfill facilities within the plan area.

COMAH Sites

2.4.9 The Control of Major Accident Hazards ("COMAH") Regulations 2015 came into force on 1 June 2015.

2.4.10 COMAH applies mainly to the chemical industry, but also to some storage activities, explosives and nuclear sites, and other industries where the threshold quantities of dangerous substances identified in the Regulations are kept or used.

2.4.11 There are two tiers of establishment which are subject to COMAH, known as 'Upper Tier' and 'Lower Tier' depending on the quantity of dangerous substances they hold. Upper Tier establishments hold greater quantities of dangerous substances meaning that additional requirements are placed on them by the Regulations.

2.4.12 There are four COMAH sites within 3 km of the DCO Scheme. Information about these sites is presented in Table 2, including description of activities at the establishments, hazard classification of relevant dangerous substances and principle dangerous characteristics of such substances, and their locations are shown on Figure 1.

Table 2: COMAH sites within 3 km of the DCO Scheme alignment

Operator Name and Address	Upper or Lower Tier	Activities at the Establishment	Hazard Classification of Relevant Dangerous Substances	Principle Dangerous Characteristics of These Substances in Simple Terms
Brenntag UK Limited, Old Brick Works, Bristol Road, Portishead, BS20 6QG	Lower Tier	Chemical installations – distribution Chemical installations - storage/warehousing Chemicals manufacture/production and/or disposal - general (not otherwise specified in the list)	Flammable liquids and gases Hazardous to the aquatic environment Oxidising liquids and/or solids Toxic	Causes damage to organs Causes skin burns and eye damage Fire/explosion Flammable - gas, aerosol, liquid Heating may cause fire/explosion May cause an allergic skin reaction May cause cancer May cause respiratory irritation Toxic if inhaled Toxic if swallowed Toxic in contact with skin Toxic to aquatic life

Table 2: COMAH sites within 3 km of the DCO Scheme alignment

Operator Name and Address	Upper or Lower Tier	Activities at the Establishment	Hazard Classification of Relevant Dangerous Substances	Principle Dangerous Characteristics of These Substances in Simple Terms
A-Gas (UK) Limited, Barnyard Road, Portbury West, BS20 7XH	Lower Tier	Chemical installations – distribution Chemical installations - storage / warehousing Chemicals manufacture / production and / or disposal - general (not otherwise specified in the list) Waste storage, treatment and disposal	Flammable liquids and gases	Fire/explosion Flammable - gas, aerosol, liquid Gases under pressure Heating may cause fire/explosion
Bristol Port Company, Bristol, BS11 9DQ	Lower Tier	Handling and transportation centres (ports, airports, lorry parks, marshalling yards, etc)	Dangerous substances / mixtures that react adversely with water	Fire / explosion Heating may cause fire explosion
Yara UK Limited, St Andrews Road, Avonmouth, BS11 9HW	Lower Tier	Production and / or storage of fertilizers	Oxidising liquids and/or solids	Heating may cause fire/explosion

Utilities infrastructure

2.4.13 Utilities comprise over and underground cables and pipelines for high and low voltage electricity, gas, oil, telecommunications, drinking water supply, and foul sewage. Highway drainage conveys road drainage to suitable outfalls to surface waters. A schedule of known utilities has been developed for the DCO Scheme, based on information provided by the utility companies.

2.4.14 This section provides a brief overview of the types of utilities affected by the DCO Scheme and locations where the presence of utilities has influenced the scheme or where their location or need for diversions has environmental implications. This section does not provide an exhaustive list of all the utilities affected by the DCO Scheme.

2.4.15 There are many utilities near the proposed location for Portishead Station, including along Quays Avenue and Harbour Road and along the southern and northern sides of the railway corridor in eastern Portishead. There is a Wessex Water pumping station on the north side of the railway, accessed off Phoenix Way, and between Quays Avenue and Tansy Lane.

2.4.16 Buried utilities in Harbour Road, Phoenix Road and Quays Avenue include an 11 kv electricity cable, Bristol Water pipeline for drinking water supply, Wessex Water foul sewer, Openreach cables, GTC gas pipeline and a stormwater drain. All these services will need to be diverted along the revised highway layout and within the Order limits. There are no environmental designations in this area. Reptiles and other wildlife inhabit the scrub on the proposed site for car park B to the south of Harbour Road and west of Quays Avenue. Human receptors comprise vehicle users, pedestrians, nearby residents and visitors to community health centre and shops.

2.4.17 The Wessex Water foul sewer along Quays Avenue connects into the existing Wessex Water pumping station off Phoenix Way and continues along the north side of the railway corridor. The location of the Portishead station platform will lie over the alignment of the sewer, which will need to be afforded suitable protection to avoid damage during piling and platform construction, which is an integral consideration to the design.

2.4.18 There is a disused Ministry of Defence oil pipeline under the proposed site for car park B. The location will be confirmed prior to construction through survey and trenching. As no Purge Certificate has been found for the pipeline it will be treated as a live pipeline during construction with appropriate mitigation measures taken to avoid a pollution incident.

2.4.19 The proposed Trinity Primary School Bridge is located close to four Western Power Distribution (“WPD”) high voltage electricity cables and a drainage ditch on the south side of the railway corridor and a Wessex Water foul sewer and 11 kv voltage electricity cable along the north side of the railway corridor. The locations of the high voltage electricity cables have been confirmed on site with WPD and should not be affected by the location of the Trinity Primary School Bridge. The drainage ditch is culverted across the high voltage cables and under the railway corridor and continues westwards along the north side of the railway corridor. At this location, residential areas lie to the north and the south of the railway corridor and the proposed bridge

will replace a permissive at grade crossing over the railway which is heavily used by adults and schoolchildren. The bridge will connect with open space and footpaths on either side of the crossing used for informal recreation. Site investigations and site meetings with Wessex Water and WPD have been carried out to establish the location and depth of these services. The information collected will be reviewed during detailed design to minimise impacting these utilities and to avoid health and safety issues for the workforce and the local community.

2.4.20 A major oil pipeline serving Royal Portbury Dock crosses the disused railway section south of Sheepway. Supervised trial trenches have been carried out to establish the depth and assess the present condition of the concrete protection. Mitigation measures need to be agreed with CLH and their land agents prior to any works near the pipeline.

2.4.21 A wastewater pumping station operated by Wessex Water is located near the disused railway on the south side of the railway corridor. There is an existing flood problem in this area, and in recent winters, Wessex Water has pumped the flood waters over the disused railway to the drainage ditch on the north side of the railway. De-silting the culverts under the disused railway as part of the DCO Scheme should mitigate the flood risk in the vicinity of the pumping station.

2.4.22 A high pressure gas main and water main cross the DCO Scheme through Cattle Creep Bridge between Marsh Lane and the M5. The arch of Cattle Creep Bridge will be reinforced and protected by the addition of a concrete saddle as part of the DCO Scheme. Openreach cables also run along the southern side of the railway. It is proposed that these are diverted to be carried within ducts included in the concrete saddle across Cattle Creep Bridge. The field south of the bridge is a local wildlife site designated for its marshy habitat. There is also a CLH oil pipeline beneath the proposed construction site under the M5 Avonmouth bridge.

2.4.23 A high and low voltage cable, water main and foul sewer pass under Avon Road Bridge, with the railway passing overhead. The bridge has to be widened to accommodate the new track from Portishead, so it will be demolished and rebuilt. The works will be designed and constructed to minimise impacts on the utilities, as well as disruption to nearby residents.

2.4.24 Various services cross and lie close to the railway corridor through Pill and Ham Green. At the Pill station car park site, the utilities in Monmouth Road consist of a drinking water supply pipeline, a gas pipeline, and Openreach cable. There is also an overhead low voltage cable. The works to modify the yard into a car park should not affect the utilities in Monmouth Road. On Station Road fronting the proposed new forecourt and entrance to Pill Station there are a gas pipeline, low and high voltage electricity cables and an Openreach cable. Trial trenches have been carried out to establish the exact location and depth of these utilities. This information will be incorporated into the access design for the station forecourt. There are no environmental constraints in this area, but the works need to take account of pedestrians, cyclists, vehicle users and nearby residents.

2.4.25 There are few services close to the railway in the rural section between Pill and the outskirts of Bristol. High voltage overhead cables cross the railway near Chapel Pill Lane. Two foul sewers cross the railway south of Quarry

Bridge No. 2 and a telecommunications cable follows the railway alignment in the southern part of Leigh Wood and Rownham Hill. These locations lie within the Avon Gorge Woodlands SAC and Avon Woods SSSI, denoting their international and national importance for nature conservation.

2.4.26 Between A369 Rownham Hill and the A370 Brunel Way various utilities cross and or follow the railway line, including telecommunications cables, water mains, foul sewer, and electricity cables. The environmental constraints in this area are the Bower Ashton Conservation Area whose eastern boundary extends to the railway boundary, a small number of listed buildings, and the non-statutory wildlife sites on the playing fields and allotments on both sides of the railway.

2.4.27 There are numerous utilities in the Ashton Gate area on the outskirts of Bristol, along Winterstoke Road and Ashton Vale Road into the Ashton Vale Industrial Estate. The underground services include 11 kv and 33 kv high voltage electricity cables, low voltage electric cables, street lighting cables, Openreach and Virgin Media cables, low and medium pressure gas pipelines, foul water, storm water, and drinking water.

2.4.28 The modifications required to alter Winterstoke Road to provide adequate queuing while the Ashton Vale level crossing is closed will be designed taking account of the location and depth of the underground utilities. There are no environmental constraints in this area likely to be affected by the works. The main issues are to minimise disruption to other road users during the works.

2.4.29 A Wessex Water foul sewer, Openreach cable and surface water drainage ditch are located on railway land in the location of the proposed pedestrian ramp from Ashton Vale Road to Ashton Road. There are also several mature trees and a stand of dead stems of the invasive weed Japanese knotweed which has been treated. The utilities may need to be diverted and vegetation cleared, including appropriate handling and disposal of the Japanese knotweed.

Transport infrastructure

2.4.30 The transport baseline is presented in ES Chapter 16 Transport, Traffic and Non-Motorised Users, Section 16.4 (DCO Document 6.19).

2.4.31 From the junction with the Bristol to Exeter Railway at Parson Street, the Portishead Branch Line curves to the north and lies in a slight cutting passing under Liberty Lane Bridge and rising onto embankment to pass over Ashton Drive. Through the outskirts of Bristol to the southern end of the Avon Gorge, the railway is either on a slight embankment or is at grade. The railway generally lies on embankment through the Avon Gorge, heading north-west with a steep drop to the River Avon Tow Path and the River Avon on the east side and a deep cess and cliff face of the gorge on the west side. At the north end of the Avon Gorge the railway leaves the river bank then curves around to the south west then west and generally continues on embankment, within a cutting approaching Ham Green. The railway passes through three tunnels in the Avon Gorge and a fourth between Ham Green and Pill, before crossing a six span brick viaduct at Pill. The site of Pill station is in a deep cutting.

2.4.32 The railway comes out of cutting and onto embankment at Avon Road before a slight embankment between the Portbury Dock Junction and the M5 Avonmouth Viaduct. Between the M5 and Portishead the railway is either at grade or on a slight embankment. The railway is crossed by two bridges carrying the highways of Marsh Lane and Royal Portbury Dock Road whilst heading south west, running parallel to the fence of the Bristol Port Company's Royal Portbury Dock and the highway known as The Portbury Hundred. At the next highway bridge, carrying Station Road, the site of the former Portbury station is reached. The railway thereafter runs west towards Portishead passing under the highway of Sheepway before terminating in Portishead.

2.4.33 There is an existing level crossing over the railway on Ashton Vale Road which connects the A3029 Winterstoke Road and the Ashton Vale Industrial Estate. The level crossing would remain open under the DCO Scheme, but the barriers would be closed more frequently than at present. To reduce the impact on vehicle travellers on Winterstoke Road wishing to turn into the Industrial Estate, the left hand flare lane on Winterstoke Road will be extended and the traffic lights in the area will be improved with MOVA installed. The Barons Close Pedestrian Crossing, which was closed during the construction of m2 metrobus would remain closed under the DCO Scheme and pedestrians directed towards the Ashton Vale Level Crossing.

SECTION 3

Design Measures

3.1 Design Standards

3.1.1 The railway designs for the DCO Scheme comply with relevant Network Rail, Rail Industry and International Standards.

3.1.2 The highway designs comply with:

- *Design Manual for Roads and Bridges* ("DMRB") by The Department for Transport,
- *Manual for Streets 1* by the Department for Transport and the Ministry for Housing Communities and Local Government, and
- *Manual for Streets 2* by the Chartered Institution of Highways and Transportation in collaboration with the Department for Transport and the Welsh Assembly Government.
- *Highways Development Design Guide* ("HDDG") North Somerset Council

3.1.3 The current design is based on the feasibility design. The detailed design is programmed for 2020-21.

3.2 Brief Description of the DCO Scheme

3.2.1 The DCO Scheme extends over a 13.7 km section of railway, between Portishead and Ashton Junction (see Figure 1). The DCO Scheme comprises the nationally significant infrastructure project ("NSIP") and its Associated Development.

3.2.2 The NSIP works comprise a section of railway from a new station at Portishead to a new junction (Pill Junction), between Pill Viaduct and Pill Tunnel. The works run from Portishead to the existing (but out of use and to be removed) Portbury Dock Junction (approximately 4.7 km), where the new railway would then run parallel with the existing Portbury Freight Line (which would be slewed to create space for the new line) for approximately 900 m through Pill, with the two lines then joining and the NSIP terminating at the new Pill Junction.

3.2.3 The Associated Development works include:

- a new railway station at Portishead;
- car parks, pedestrian / cycle / highway infrastructure at Portishead including re-alignment of Quays Avenue and a new bridge near Trinity Primary School;
- re-opening the former Pill station (southern platform) including demolition of the existing station house for a new station forecourt, a separate main car park, pedestrian / cycle and highway infrastructure;
- new permanent maintenance compounds from Portishead to Ashton Junction;
- temporary construction compounds between Portishead and Ashton Junction;

- works to upgrade the existing Portbury Freight Line from Pill Junction to Ashton Junction, to enable operation of both passenger train and freight train services; and associated works to pedestrian / cycle / highway infrastructure including modifications to the NCN26 and closing the Barons Close (also called the Ashton Containers Crossing) pedestrian level crossing;
- works within the Avon Gorge including catch fences and rock bolting;
- Ashton Vale level crossing, with barriers, remains operational and while no alterations will be undertaken to the level crossing itself, the following works are proposed to reduce the highway traffic impact from the increased use of the level crossing:
    - extension of the left turn lane on Winterstoke Road,
    - optimisation of the Ashton Vale Road signals (now that South Bristol Link is open), and upgrade of signals to a MOVA system, and
    - provision of a pedestrian and cycle ramp from Ashton Vale Road to Ashton Road.

3.2.4 In connection with the Works listed above, further associated development within the Order limits would be sought, including:

- permanent way (rail tracks) electrical equipment, power supply cubicles, cables, telecommunications apparatus, railway mobile communications masts and apparatus and signalling;
- ramps, means of access (including temporary haul roads) and construction compounds;
- embankments, aprons, abutments, shafts, foundations, retaining walls and structures, drainage, wing walls, fences, acoustic fences, catch fences, paths, access steps and culverts;
- works to alter, divert, maintain, replace and repair apparatus (including statutory undertakers' apparatus), including mains, sewers, pipes, drains and cables or for their protection;
- works to clear, maintain and interfere with water courses other than a navigable water course;
- landscaping and other works (including the creation of ponds) to mitigate any adverse effects of the construction, maintenance or operation of the authorised development described in the environmental statement;
- works for the benefit or protection of land affected by the authorised development;
- works required for the strengthening, improvement, maintenance or reconstruction of any streets;
- works to level crossings;
- works for the temporary diversion of public footpaths shown in the permanent and temporary stopping up and diversion plan;

- trenching and cabling associated with the new signalling and communications masts;
- strengthening earthworks and reconstructing retaining walls;
- vegetation clearance, rock bolting and rock dowels and safeguarding of unstable slopes or rock faces by stone-picking and removal of loose rocks;
- replacement or renewal of fencing;
- repairs to existing bridges, adding barriers to bridge parapets and raising of bridge parapets;
- alteration of the layout of any street permanently or temporarily, including but not limited to increasing or reducing the width of the carriageway of the street by increasing or reducing the width of any kerb, footway, cycle track or verge within the street or removing replacing, altering or providing splitter islands in streets;
- works to place alter remove or maintain road furniture;
- works to place, alter, divert, relocate, protect, remove or maintain the position of apparatus (including statutory undertakers' apparatus), services, plant and other equipment in, under or above a street, or in other land, including mains, sewers, drains, pipes, lights, cables, cofferdams, fencing and other boundary treatments and to provide connections to adjoining land and buildings;
- landscaping, re-grading, re-profiling, contouring, noise barriers, works associated with the provision of ecological and archaeological mitigation and other works to mitigate any adverse effects of the construction, maintenance or operation of the authorised development:
- site preparation works, site clearance (including fencing and other boundary treatments, vegetation removal, demolition of existing structures and the creation of alternative highways or footpaths); earthworks (including soil stripping and storage and site levelling);
- establishment of site construction compounds and working sites, temporary structures, storage areas (including storage of excavated material and other materials), temporary vehicle parking, construction fencing, perimeter enclosure, security fencing, construction related buildings, welfare facilities, office facilities, other ancillary accommodation, construction lighting, haulage roads and other buildings, machinery, apparatus, drainage systems, temporary bridges over watercourses, storage ponds, processing plant, works and conveniences;
- pavement, kerbing and paved areas;
- signing, signals, street lighting, road markings, traffic management measures including temporary roads and such other works as are associated with the construction of the authorised development; and
- such other works, including working sites and works compounds, as may be necessary or expedient for the purposes of or in connection with the construction of the authorised development and which do not give rise to

any materially new or materially worse adverse environmental effects to those assessed in the environmental statement.

3.3 Measures to Manage Environmental Impacts

3.3.1 Measures that form part of the DCO Scheme fall within three broad categories.

- Careful designing of the scheme to ensure that key receptors are avoided where possible and that measures to mitigate likely significant environmental effects are designed into the DCO Scheme where appropriate.
- The use of standard construction or operational management measures that would occur whether or not the DCO Scheme had been subject to EIA. NRIL has established processes for construction activities, many of which are usually undertaken under permitted development rights and for operational activities. These measures are identified in the Code of Construction Practice ("CoCP") (ES Appendix 4.1, DCO Document Reference 8.15), the Master Construction Environmental Management Plan ("CEMP") (ES Appendix 4.2, DCO Document Reference 8.14), and the Construction Transport Management Plan (“CTMP”) (ES Appendix 16.1, DCO Document Reference 8.13). These measures would reduce and/or avoid commonly occurring environmental effects.
- Measures required in order to comply with regulatory and legislative regimes that would occur whether or not the DCO Scheme was subject to EIA. Other regulatory regimes and regulators will determine the measures required and the process to be followed to secure necessary consents or measures. The list of Other Consents and Licences relevant to the DCO Scheme is set out in DCO Document Reference 5.3 and include drainage discharge licences, works governed by the environmental permitting and statutory nuisance regimes of the Environmental Protection Act 1990 and other environmental legislation. Shadow ecological licences will be prepared for badger, bats and great crested newts.

3.3.2 In addition to the above, environmental mitigation measures have been developed to avoid, reduce, remedy, or compensate for likely significant effects identified through the environmental impact assessment process. These include acoustic barriers at Portishead Station and old Portbury Station House, an archaeological written scheme of investigation including a watching brief during top soil stripping at green field construction compound sites, new ponds for ecological mitigation and flood compensation areas, and extensive ecological mitigation. Measures to mitigate likely significant environmental effects are summarised in the Schedule of Mitigation (ES Appendix 4.3) (DCO Document Reference 6.31).

3.4 Operation and Maintenance

3.4.1 A new passenger train service will be provided between Portishead, Pill and Bristol Temple Meads. It is anticipated that the train service will operate hourly between 0600 and 2400, Monday to Saturday. On Sundays an hourly service is envisaged from 0900 to 1900. An alternative hourly service plus for the Portishead Branch Line entails; passenger trains operating every 45 minutes during the am and pm peak and hourly off peak, between Portishead and Bristol Temple Meads, calling at Pill, Parson Street, and Bedminster.

3.4.2 Portishead and Pill stations and car parks will be lit during dusk and at night. It is policy that platform and car park lighting will be at the minimum safe level in its ‘rest’ state. When movement is detected it will become brighter, dimming again after a period of inactivity. It would not turn off completely during the hours of darkness.

3.4.3 The service will be operated with either class 165/6 trains or class 150/3 trains initially in three-car formations (that is, with three carriages).

3.4.4 Freight trains will continue to operate although their operation will be co-ordinated with the passenger service timetable. Trains to Royal Portbury Dock will continue to have their existing number of train paths. Where necessary freight trains will be required to wait on the Portbury Dock spur line for clearance prior to despatch in the ‘Up’ direction (to Bristol) or at the Bedminster Down Relief Line in the ‘Down’ to Portbury Dock. Freight trains will be limited to a maximum of 30 mph throughout the entire branch line, which is the current line speed.

3.4.5 All Network Rail assets are subject to routine maintenance, inspections and examinations. The existing maintenance regime will be increased due to the introduction of passenger services between Parson Street Junction and Portishead. Network Rail will also maintain the line clear of vegetation and implement a vegetation management plan for works through the Avon Gorge Woodlands SAC / Avon Gorge SSSI.

SECTION 4

Screening

4.1.1 Screening involved reviewing sources of potential hazards to determine whether there is a source ➞pathway ➞receptor connection to environmental receptors. Where a pathway between the source of potential hazard and receptors is identified, the environmental potential hazard is taken forward for further assessment in Section 4.

4.1.2 The sources of potential hazards arising from the construction and operation of the DCO Scheme which may affect the environment were taken from NRIL's risk management *Hazards Information* document. External natural and anthropogenic hazards that could affect the construction and operation of the DCO Scheme were identified from the baseline studies described in Section 2.

4.1.3 Screening also considered the presence of environmental receptors and COMAH sites identified in the baseline in Section 2.

4.1.4 The potential hazard events taken forward for further assessment are summarised below. This assessment has considered the worst case scenarios of a major accident or disaster.

Construction Phase

- Rupture of utilities infrastructure.
- Flood risk.
- Major road traffic accidents involving construction plant or vehicles.
- Ground contamination and landfill gas.
- The potential for an event at COMAH site(s) to affect construction works.

Operational Phase

- Flood risk.
- Train derailment / collision.
- Fire in Pill Tunnel.
- Slope stability in the Avon Gorge.
- The potential for an event at a COMAH site(s) affecting the DCO Scheme.

SECTION 5

Further Assessment

5.1.1 Table 4 sets out potential hazards (source and pathway), the reasonable worse case consequence for the environmental receptor, and the mitigation and risk management actions. The last three columns identify whether the event could constitute a major accident or natural disaster, whether the risk of the event occurring with the mitigation and risk management is as low as reasonably practical ("ALARP"), and the overall outcome.

5.1.2 The idea of "reasonably practical" lies at the core of ALARP which considers the risk on one side and the effort required to avert the risk (for example in terms of money, time or effort) on the other. Determining ALARP involves considering whether measures to avert risk are proportionate and require the exercise of judgement.

5.1.3 Under Health and Safety legislation, all duty holders have a general duty to minimise risks to health and safety "so far as reasonably practicable". Specific duties are placed on duty holders where a duty is strict, for example in respect of overhead power lines. The approach taken in presenting information on major accidents and disasters for the purposes of the EIA Regulations 2017 has also had regard to the approach taken in the identification and management of risks in Health and Safety legislation, specifically through risk identification, evaluation of likelihood, nature and extent of impact and the controls and measures that can be identified to manage risks.

Table 4 Further assessment of potential major accidents and natural disasters

Risk	Potential hazard / disaster Source and/or Pathway	Consequence (for the receptor)	Embedded Mitigation and Risk Management	Categories of Receptors	Could the risk, if eventuated, constitute a major accident or disaster?	Is the residual risk ALARP with existing mitigation?	Comments
Construction Phase							
Rupture of utilities infrastructure	Severance or damage to buried utilities in Harbour Road, Phoenix Road and Quays Avenue including an 11 kv electricity cable, Bristol Water pipeline for drinking water supply, Wessex Water foul sewer, Openreach cables, GTC gas pipeline and a stormwater drain during highway modifications. Damage to the Wessex Water main sewer during construction of Portishead station and platform especially during piling. Damage to the Wessex Water pumping station by The Cut north of the railway during highway drainage connections. Accidental discharge from the disused Ministry of Defence oil pipeline during construction of the proposed Portishead car park B. Severance or damage to high voltage electricity cables, drainage ditches, foul sewer, and 11 kv voltage electricity cable during the construction of the proposed Trinity Primary School Bridge and associated paths. Damage to Wessex Water wastewater pumping station off the A369 Portbury Hundred	Potential for injury and fatalities for construction workers and passers by. Potential environmental pollution of land and receiving waters and indirect effects on aquatic ecology. Potential interruption of supplies (electricity, drinking water, telecoms, etc). Potential contamination of drinking water supply and health risk to consumers. Risk of fire ignition from electricity / cable works and subsequent discharge of water and foams to the surrounding environment following use of fire extinguishers.	The requirements for protection of the individual services have been identified in a utility tracker. “C3” outline design has been undertaken. The location and depth of utilities in the construction areas will be surveyed to determine their precise location. Based on that information, specific measures for the C4 detailed design will be undertaken to protect utilities during construction activities. Where necessary utilities would be diverted to accommodate the DCO Scheme, and health and safety measures implemented to protect the workforce and members of the community from accidents. All the works carried out in the vicinity of the utilities require special care, including trial trenching to confirm the exact location of utilities and the preparation of risk assessments and method statements “RAMS”). Contractor to develop and implement protocols for safe working near utilities and diversions in consultation with the utility companies. Special care during piling works to avoid damaging the main sewer at Portishead station. Works near the CLH oil pipelines will be supervised by a CLH	Human health Soils and Agriculture Ecological sites and protected species Ground conditions Hydrology Socio-economics Landscape and views	Yes	Yes – with the existing mitigation and risk minimisation undertaken as part of the DCO Scheme and further work during detailed design the probability of a hazard occurring is low.	The Applicant will continue to liaise with utility companies to ensure they are informed, as appropriate, of any risks arising from the construction of the DCO Scheme that are relevant to the discharge of their own duties, and to ensure that the Applicant is made aware of any information held by utility companies that may be relevant to the probability, nature or extent of a hazard eventuating. Where utility diversions are required, the Contractor will consult with the relevant utility company to ensure that all parties are adequately informed about risks, undertake non-invasive and invasive tests to identify location of utilities, and agree methods of working with utility companies.

Risk	Potential hazard / disaster Source and/or Pathway	Consequence (for the receptor)	Embedded Mitigation and Risk Management	Categories of Receptors	Could the risk, if eventuated, constitute a major accident or disaster?	Is the residual risk ALARP with existing mitigation?	Comments
	during construction of the railway or new parking areas. Damage or rupture of the CLH oil pipe which crosses the DCO Scheme at two locations near Sheepway and under the M5 during railway works. Damage or rupture to a trunk water main and high-pressure gas main which pass under Cattle Creep bridge during repairs to the bridge, railway works and excavation of a small pond for ecological mitigation. Rupture of fibre optic Openreach cables, currently along the tracks between Marsh Lane and M5, which have to be shifted during construction. Damage or rupture of a high and low voltage cable, water main and foul sewer during the demolition and construction of the Avon Road Bridge. Rupture of the utilities in Monmouth Road and Station Road in Pill during the construction of the station, car park and street works. Rupture of various utilities alongside or crossing the railway between Pill and Bower Ashton during minor works along the track. Rupture of utilities during the modification of Winterstoke Road and construction of the Ashton Vale Road ramp.		engineer and a RAMS provided prior to any works. The works at Cattle Creep Bridge affecting the trunk water main and high-pressure gas main to be supervised by Bristol Water and Wales and West Utilities respectively. All DCO Scheme plans will identify easements in place and contractors will prepare methods of working to be adopted should works be required in these areas. No unsuitable planting or buildings will be progressed over (or under) the infrastructure. Adherence to HSE guidance on Fire Safety in Construction.				

Risk	Potential hazard / disaster Source and/or Pathway	Consequence (for the receptor)	Embedded Mitigation and Risk Management	Categories of Receptors	Could the risk, if eventuated, constitute a major accident or disaster?	Is the residual risk ALARP with existing mitigation?	Comments
Flood Risk	Inundation of Clanage Road construction compound which is in Flood Zone 3b due to tidal flooding.	Temporary inundation of the site. Potential soil erosion and offsite siltation. Loss of any plant or materials stored at the site, obstruction of drainage lines, off site flooding, and contamination of receiving waters (River Avon). Health risk to construction workers.	A Flood Plan for the construction phase has been prepared for the Clanage Road construction compound which is the only construction compound within Flood Zone 3b. The use of the Clanage Road construction compound will be agreed with the Environment Agency through permitting. This is likely to cover activities, structures and storage of plant and materials, and emergency preparedness and response procedures. The Contractor will prepare their own Flood Plan to set out in detail how they will manage the site compliant with the requirements of the Applicant and the Environment Agency.	Human health Ground Conditions Water Quality	Yes	Yes – with the existing mitigation and risk minimisation undertaken as part of the DCO Scheme and further detailed design the probability of a hazard occurring is low.	The DCO Scheme is predominantly within an area of low probability of flooding. The proposed Clanage Road Construction is the only suitable site south of the Avon Gorge and lies in flood zone 3. The use of this site during construction will be consented by the Environment Agency through the Environmental Permitting Regulations. The management of the site is likely to include restrictions on its use, use of the Environment Agency's flood warning system, and protocols for evacuation in the event of a forecast flood.
Major road traffic accident involving construction plant or vehicles	Incident associated with construction Heavy Goods Vehicle ("HGV") or light goods vehicles ("LGV") or cars. Potential conflict between construction traffic and equestrians using bridleways, cyclists using the National Cycling Network and local roads, and pedestrians in village and town centres, residential areas, and on public rights of way. Two types of risk have been identified: those on site and those arising as construction plant and vehicles move between the site and the public highway.	Potential for injury or fatality to the vehicle occupants, cyclists or pedestrians. Spillage of the vehicle load on the road, such as ballast formation, and entering highway drainage.	Suitably competent contractors for all tasks will be appointed to undertake the construction works. Construction traffic movements will be controlled as part of the Construction Traffic Management Plan ("CTMP") (DCO Document Reference 8.13).	Human Health Socio-economics Highways	Yes	Yes – with the existing mitigation and risk minimisation undertaken as part of the DCO Scheme and further detailed design the probability of a hazard occurring is low. In particular, measures to be secured through the DCO will ensure that: suitable and sufficient	The transport of waste and materials will be made by train where practicable. The ES Chapter 16 Transport, Traffic and Non-Motorised Users (DCO Document Reference 6.19) and Appendix 16.1 the Transport Assessment (DCO Document Reference 6.25) evaluates the potential impacts and sets out mitigation. Mitigation is reflected in the CTMP (DCO Document Reference 8.13) which is annexed to the Transport Assessment (DCO Document Reference 6.25).

Risk	Potential hazard / disaster Source and/or Pathway	Consequence (for the receptor)	Embedded Mitigation and Risk Management	Categories of Receptors	Could the risk, if eventuated, constitute a major accident or disaster?	Is the residual risk ALARP with existing mitigation?	Comments
						assessment of risks on, into and out of construction sites will be secured; and suitable and sufficient measures will be put in place and followed.	
Ground contamination and landfill gas	Disruption of historic Priory Farm Landfill site leading to the emission of methane or discharge of leachate to controlled waters / site works. H&S risk for the construction workforce. Historic contamination in the Portishead station area (although much has been cleaned up following redevelopment). The yards at Pill Station to be developed as the station car park. Landfill sites in the Ashton Gate area.	Potential health risk to the construction workforce due to the release of methane or leachate, or the ingestion of contaminated matter. Contamination of the drainage ditches by leachate and indirect effect on aquatic ecology.	Construction will be in accordance with the Code of Construction Practice and the Master Construction Environmental Management Plan. Any constraints relating to contamination relating to Portishead station will be addressed through project design, e.g through further ground investigation and risk assessment, including piling risk assessment. The risk of elevated concentrations of carbon dioxides in the ground at Portishead Station and car park is unlikely, and the risk would be eliminated through standard industry practices such as further investigation, control of access to excavations and gas alarms during construction. If ground gas issues are identified, for example at Priory Farm landfill site, appropriate monitoring will be undertaken and/or appropriate ground gas protection measures provided by the contractor(s). If required, gas	Human Health Agriculture Ground Conditions Hydrology	No	Yes – with the existing mitigation and risk minimisation undertaken as part of the DCO Scheme and further detailed design the probability of a hazard occurring is low.	The works near Priory Farm Landfill consist of ballast replacement and new rails, and clearance/ reforming of ditches. With appropriate mitigation and use of personal protection equipment (“PPE”), gas and leachate from the Priory Farm Landfill, should they be present, are unlikely to materially affect construction of the DCO Scheme.

Risk	Potential hazard / disaster Source and/or Pathway	Consequence (for the receptor)	Embedded Mitigation and Risk Management	Categories of Receptors	Could the risk, if eventuated, constitute a major accident or disaster?	Is the residual risk ALARP with existing mitigation?	Comments
			monitoring will be undertaken in accordance with BS8576:2013 Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds ("VOCs") (BSI, 2013). Works near known landfill sites will follow industry standard procedures to manage health and safety and contamination risks.				
	Removal of non-hazardous and potentially hazardous waste arising from the DCO Scheme including: - Sediments in drainage ditches - Railway formation including ballast contaminated with organic matters, metals and asbestos - Timber sleepers - Asphalt - Electrical equipment	Mobilisation of contaminants to surface and ground water during construction. Contamination of temporary construction compounds. H&S risk to workforce following inappropriate handling of wastes.	NRIL procedures for the removal of non-hazardous and potentially hazardous waste. Temporary storage of ballast on the construction site may be exempt from Environment Agency permitting. However, temporary storage would require management, including pre- and post ground analysis, basal and covering layers and control of runoff. Removal of ballast to one of NRIL's central processing centres for treatment, recycling and reuse, or disposal. Scope for recycling construction waste.	Agriculture Ground conditions Hydrology	No	Yes – with the existing mitigation and risk minimisation undertaken as part of the DCO Scheme and further detailed design the probability of a hazard occurrence is low.	NRIL has standard procedures for the safe removal of potentially contaminated material. There will be no significant impact on the railway, the stations and car parks from the underlying ground conditions. The risk from track formation materials arises during the construction phase when materials are being disturbed and moved. As sections of formation and ballast would have been replaced with new it is likely that residual risk following the construction will be comparable or favourable to that for any operational railway. There is no post-construction risk once the temporary construction sites have been removed and restored to their previous use.

Risk	Potential hazard / disaster Source and/or Pathway	Consequence (for the receptor)	Embedded Mitigation and Risk Management	Categories of Receptors	Could the risk, if eventuated, constitute a major accident or disaster?	Is the residual risk ALARP with existing mitigation?	Comments
	Works in a coal mining area of Ashton Vale affected by land instability	Damage to railway assets. Potential to harm to people in the event of subsidence.	A review of historic coal mining has been undertaken and considered as part of the engineering design (see ES Appendix 10.2 (DCO Document Reference 6.25).	Railway assets Human health	No	Yes – with the existing mitigation and risk minimisation undertaken as part of the DCO Scheme and further detailed design the probability of a hazard occurring is low.	The DCO Scheme has been designed bearing in mind historic coal mining in the Ashton Vale area. The proposed engineering works in this area would depend on the overlap of the coal mining risk area and the flood risk area.
The potential for an event at COMAH site(s) to affect construction works.	Potential for an explosion or fire from a COMAH site affecting the construction works.	Potential damage to the works site and plant. Potential health risk to construction workforce.	All COMAH operators are expected to ensure and maintain their own legal compliance with all regulations (i.e. COMAH 2015 Hazardous Substance Consent) and have appropriate insurance. This assessment assumes that COMAH sites are complying with the requirements placed on them.	Human Health Socio-economic	No	Yes – assuming that operators of COMAH sites are managing their sites in compliance of the COMAH Regulations.	Operators of COMAH sites are expected to implement and maintain suitable and sufficient operational management plans to cover incidents. All COMAH sites within 3 km of the DCO Scheme are lower tier establishments.
Operation Phase							
Flood Risk	The DCO Scheme is predicted to become increasingly vulnerable to tidal flood events related to climate change due to rising sea levels. The DCO Scheme is not predicted to increase the flood risk to third parties.	Temporary disruption to service. Potential for a train derailment and associated injury or fatalities if the service is operated during a flood.	Most of the route is not affected by flooding for the 1:200 year event in 2115. The section along the River Avon is well above high tide level and none of the tunnels is at risk from coastal, tidal or river flooding. The main area at risk is Bower Ashton which is located in Flood Zone 3 and is at risk from tidal flooding from the River Avon. Flood risk during operation will be managed through NRIL's Standard Maintenance Procedure NR/L3/TRK/1010, Issue 02 August 2008 Management of responses to	Human Health Socio-Economic Agriculture Ground Conditions Hydrology	Yes	Yes – with the existing mitigation and risk minimisation undertaken as part of the DCO Scheme and further detailed design the probability of a hazard occurring is low.	At present tidal River Avon flooding of the DCO Scheme at Bower Ashton occurs approximately once every 5 to 10 years. For the future case (2075) the site is predicted to flood once a year due to future sea level rise. Over time, the services would be suspended more frequently due to flooding.

Risk	Potential hazard / disaster Source and/or Pathway	Consequence (for the receptor)	Embedded Mitigation and Risk Management	Categories of Receptors	Could the risk, if eventuated, constitute a major accident or disaster?	Is the residual risk ALARP with existing mitigation?	Comments
			extreme weather conditions at structures, earthworks and other key locations to safeguard passengers and railway assets. NRIL has prepared an Operational Draft Flood Plan appendixed to the ES Appendix 17.1 Flood Risk Assessment (DCO Document Reference 5.6), which is based on the above procedure and briefly summarises the potential flood risks which may be faced during the operation of the DCO Scheme, together with an overview of how flood waters may affect critical scheme infrastructure and the approach that NRIL will adopt in response to flood warnings and floods themselves.				
Train derailment / collision	Obstruction on the line due to: - the failure of bridge structures - inadequate track stability - inadequate track alignment, or - track condition not suitable for proposed line speeds.	Potential for Off-track and outside boundary derailment causing - severe disruption to rail transportation - injury and fatalities for staff and passengers - physical damage to lineside vegetation, - contamination of nearby drains from fuel leaks.	The DCO Scheme interface between freight operating companies and logistic service providers will be defined in accordance with Office of Road and Rail (“ORR”) requirements and standards laid down by RSSB. The DCO Scheme will be operated in accordance with the Network Licence. Emergency response procedures and plans will be developed. The ORR will only authorise the interface of the DCO Scheme with existing rail infrastructure before it is placed into service, on the basis of an accepted and independently assessed application of the Common Safety Method for Risk	Human Health Ecology Socio-economic Highways	Yes	Yes – with the existing mitigation and risk minimisation undertaken as part of the DCO Scheme and further detailed design the probability of a hazard occurring is low.	The proposed design and environmental mitigation and management meet NRIL standards to comply with health and safety, operational and maintenance requirements. In the event of a train derailment, a train travelling at 30 mph should stop with the front of the train about 100 m from the point of impact. The length of the derailment site would then be about 150 m long. The train would be expected to remain reasonably upright (as is the case with almost all accidents). As a worse case the train could roll down onto its side one

Risk	Potential hazard / disaster Source and/or Pathway	Consequence (for the receptor)	Embedded Mitigation and Risk Management	Categories of Receptors	Could the risk, if eventuated, constitute a major accident or disaster?	Is the residual risk ALARP with existing mitigation?	Comments
			Assessment (“CSM-RA”) (which therefore must ensure that all risks are mitigated to be ALARP). Without this authorisation, the DCO Scheme would not be granted a licence to operate. The DCO Scheme has been designed and will be built and operated to minimise the risk of derailment and provide access for emergency vehicles at several locations including new Road Rail Access Points (“RRAP”) at Sheepway, Pill maintenance compound, Pill Tunnel Eastern Portal and Clanage Road. The railway will be inspected periodically, including after flood events and other incidents.				vehicle width so 25 m. The crash site might be 150 x 25m or 0.375 ha. This is less than the threshold given in Table 1 for a major hazard affecting a habitat of environmental or conservation importance protected by legislation
Fire on a train in Pill Tunnel	Risk of a fire occurring on a train in Pill Tunnel forcing the train to stop within the tunnel	Loss of train and rail assets within Pill Tunnel Potential loss of life and injury.	The probability of a fire on the train or fire in Pill Tunnel forcing a train to come to a halt is considered to be extremely low: - The signalling system will only allow one train into the tunnel at a time. There will be no signal to stop a passenger train in the tunnel. - All passenger rolling stock designed to achieve continual operation for a minimum of 5 mins after the outbreak of any fire. As the tunnel is only 609 m long, any train on fire would have sufficient time to pass through the tunnel at reduced power supply or free wheeling. All passenger rolling stock	Human health	Yes	Yes – with the existing mitigation and risk minimisation undertaken as part of the DCO Scheme and further detailed design the probability of a hazard occurring is low.	Only Pill Tunnel is long enough to require a Fire Safety assessment. A fire strategy has been developed to address the requirements of the Regulatory Reform (Fire Safety) Order 2005 using the Common Safety Method set out by the ORR.

Risk	Potential hazard / disaster Source and/or Pathway	Consequence (for the receptor)	Embedded Mitigation and Risk Management	Categories of Receptors	Could the risk, if eventuated, constitute a major accident or disaster?	Is the residual risk ALARP with existing mitigation?	Comments
			proposed are provided with automatic fire detection systems so the driver can pick up a detection signal from the cab and respond accordingly. - All passenger rolling stock proposed are diesel multiple units where a serious fire affecting a single carriage and a single engine should not affect the other sections of the train. A fire strategy has been completed for Pill Tunnel and the following features have been incorporated into the design: - A compacted ballast walkway along the length of the tunnel and emergency lighting to allow passengers to evacuate the tunnel from either end. - Access for emergency vehicles to the Western and Eastern Tunnel Portals . - Signage at 50 m intervals at head height on both sides of the tunnel with distance and direction to both portals. - GSM-R system to enable the driver to communicate from the cab to the Thames Valley Signalling Centre at Didcot.				
Slope stability in the Avon Gorge	Movement of loose stones, large rocks, mass movement	Potential damage to the fences, a passing train,	Geotechnical stabilisation works on cliff faces on Network Rail and	Human Health	Yes	Yes – with the existing	Cliff stability is a known issue in the Avon Gorge.

Risk	Potential hazard / disaster Source and/or Pathway	Consequence (for the receptor)	Embedded Mitigation and Risk Management	Categories of Receptors	Could the risk, if eventuated, constitute a major accident or disaster?	Is the residual risk ALARP with existing mitigation?	Comments
	and rock slides, with objects potentially falling onto the railway.	or derailment leading to injury or loss of life of passengers. Tree throw and physical damage to vegetation including in the Avon Gorge Woodlands SAC / Avon Gorge SSSI.	third party land. The main activities are: - Partial de-vegetation of the cliff faces - Loose rock picking off cliff faces, - Rock bolting, Four sections of new catch fences, each 2 m high and between about 30 and 160 m long to the foot of the cliff secured by anchors.	Ground Conditions Ecology		mitigation and risk minimisation undertaken as part of the DCO Scheme and further detailed design the probability of a hazard occurring is low.	Geotechnical works will be undertaken during the construction phase. During the operation phase, Network Rail will continue to inspect the line and identify the need for future geotechnical works, for example following rock fall, as and when required.
The potential for an event at COMAH site(s) to affect the DCO Scheme.	Potential for explosion or fire from a COMAH site affecting the DCO Scheme.	Potential damage to a passing train, derailment and injury or loss of life of passengers.	All COMAH operators are expected to ensure and maintain their own legal compliance with all regulations (i.e. COMAH 2015 Hazardous Substance Consent) and have appropriate insurance. This assessment assumes that COMAH sites are complying with the requirements placed on them.	Human Health Socio-economic	No.	Yes – assuming that operators of COMAH sites are managing their sites in compliance of the COMAH Regulations.	COMAH sites are expected to implement and maintain suitable and sufficient operational management plans to cover incidents. All COMAH sites within 3 km of the DCO Scheme are lower tier establishments.

SECTION 6

Conclusions

6.1.1 This appendix reports the potential for a major accident or disaster resulting in a risk of significant effects on the environment.

6.1.2 This assessment has considered the worst case scenarios of a major accident or disaster.

6.1.3 No likely significant effects of the development on the environment are predicted during construction and operation of the DCO Scheme, from the vulnerability of the development to risks of potential major accidents and/or potential disasters which are relevant to the project concerned.

SECTION 7

References

Health and Safety Executive. 2010. HSE guidance on Fire Safety in Construction, HSG168.

North Somerset Council. Highways Development Design Guide.

Rail Safety and Standards Board. (undated). Standards and the rail industry.

Figure

N

ST ANDREWS ROAD

YARA UK LTD

BRISTOL PORT COMPANY

AVONMOUTH

SHIREHAMPTON

SEA MILLS

BRENNTAG UK LTD

A-GAS UK LTD

REDLAND

MONTPELIER

CLIFTON DOWN

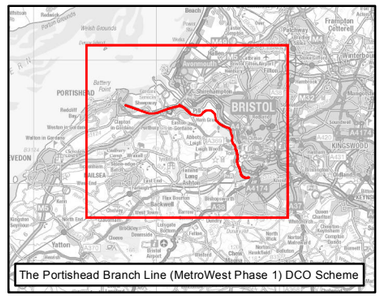
BRISTOL TEMPLE MEADS

BOWER ASHTON

BEDMINSTER

PARSON STREET

NAILSEA & BACKWELL



The Portishead Branch Line (MetroWest Phase 1) DCO Scheme

KEY

Radius 1km

Radius 3km

Existing Railway

Existing Railway Station

Portishead Branch Line

The Nationally Significant Infrastructure Project (NSIP) Works

The Associated Development Works

Section in Tunnel

New Station

Environmental Constraints

Air Quality Management Area

Avon Gorge Woodlands (SAC)

Avon Gorge (SSSI)

COMAH Site (Lower Tier)

Flood zone 3

Areas Benefiting from Defence

Ground Conditions

CEOB Ash Landfill (Various Dates)

Elm Tree Farm Landfill 1979

Factories / Wharfs

Fuel Depot

Gas Works

Nail Factory

Priory Farm Landfill 1987

Sewage Bed Disused

Warehouses / Depots

Historic Landfill Sites

Rev	By	Chkd	Apprvd	Date	Description
ES-A	MPC	LA	CF	04/06/2019	First draft

Client

travelwest

Bath & North East Somerset, Bristol, North Somerset and South Gloucestershire Councils working together to improve your local transport

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Project :

Portishead Branch Line (MetroWest Phase 1)

Drawing : Figure 1
Environmental hazards and vulnerable receptors

Drawn By :	Martin Costello	Date: 04/06/2019
Checked By :	Laura Anastassiades	Date: 04/06/2019
Approved By :	Carolyn Francis	Date: 04/06/2019

Drawing No. : 674946-008-001-A

Revision ES-A

Drawing Scale : 1:50,000 @ A3

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