

Welsh Government
M4 Corridor around Newport
Environmental Statement Volume 1
Chapter 12: Materials

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Contents

	Page
12 Materials	12-1
12.1 Introduction	12-1
12.2 Legislation and Policy Context	12-1
12.3 Assessment Methodology	12-5
12.4 Baseline Environment	12-11
12.5 Mitigation Measures Forming Part of the Scheme Design	12-15
12.6 Assessment of Potential Land Take Effects	12-15
12.7 Assessment of Potential Construction Effects	12-15
12.8 Assessment of Potential Operational Effects	12-26
12.9 Mitigation and Monitoring	12-27
12.10 Assessment of Land Take Effects	12-29
12.11 Assessment of Construction Effects	12-29
12.12 Assessment of Operational Effects	12-31
12.13 Assessment of Cumulative Effects	12-31
12.14 Inter-related Effects	12-31
12.15 Summary of Effects	12-32

12 Materials

12.1 Introduction

- 12.1.1** The purpose of this chapter is to provide information on the assessment of the likely significance of the environmental effects from the use of material resources and the generation and management of waste resulting from the Scheme.
- 12.1.2** The methodology and approach used in the assessment is described, followed by a description of the environmental baseline for the study area. The potential environmental effects are subsequently presented.
- 12.1.3** Material resources encompass the materials and construction products required for construction of the Scheme and include primary raw materials (such as aggregates), secondary or reused/recycled materials and manufactured construction products. These material resources can be generated by both onsite and off-site sources. The potential effects on material resources are considered for both the construction and operational phases of the Scheme, although it is anticipated that most of the effects on materials are likely to arise during construction. In the longer term, however, more limited effects could occur during the operational phase (for example, the disposal of materials arising from routine maintenance operations).
- 12.1.4** For material resource use, the potential environmental effects are associated with the extraction and transportation of primary raw materials, the manufacture of products and their subsequent transport to and use on construction sites. For waste materials, the potential environmental effects are associated with the production, movement, transport, processing and disposal of arisings from sites (Highways Agency, 2011). The assessment of the environmental effects from the use of material resources and the generation and management of waste, resulting from the construction and operation of the Scheme, has taken into account the following.
- Types and quantities of materials required for construction of the Scheme.
 - Cut and fill balance.
 - Material sources (both on and off site material resources required by the Scheme).
 - Movement of materials during construction (both to and from the Scheme).
 - Storage of materials during construction.
 - Treatment and processing of materials.
 - Management of waste.

12.2 Legislation and Policy Context

Relevant Legislation

- 12.2.1** The overarching policy in relation to the management of material resources along the Scheme is the EU Waste Framework Directive (Directive 2008/98/EC). This provides the framework legislation for the collection, transport, recovery and disposal of waste. It includes a common definition of 'waste', which is 'any

substance or object which the holder discards or intends to discard (Article 3(1)), with the term ‘discard’ including the disposal, recovery or recycling of a substance. The overall purpose of the Waste Framework Directive is to set out measures to protect the environment and human health by preventing or reducing the adverse effects of waste generation and its management and by improving the efficiency of resource use. Member States are required by the Directive to take all the necessary measures to ensure that waste is recovered or disposed of without endangering human health or causing harm to the environment. The Directive sets a number of high-level objectives, which have influenced national waste management policy and legislation. In particular, Article 11 of the Waste Framework Directive requires that Member States take the necessary measures to achieve 70% recycling of non-hazardous construction and demolition waste by 2020.

12.2.2 Application of the waste hierarchy provides a protocol to reduce waste generation at source and reduce the volume of waste that has to be sent to landfill through reuse and recycling.

12.2.3 In addition to the above Directive, reference has been made to the following legislation relating to material resources and waste management.

- The Waste (England and Wales) Regulations 2011. This implements revisions to the Waste Framework Directive in England and Wales.
- The Hazardous Waste (England and Wales) Regulations 2005.

Planning Policy Context

12.2.4 Chapter 6 of this ES provides an overarching and strategic policy context for the Scheme. It briefly describes key legislation and the main planning policies that are relevant to the Scheme at the national level, together with the development of planning policies published by the local planning authorities through which the Scheme passes. This section identifies those policies which are most relevant to waste and mineral resources.

National Planning Policy

Waste

12.2.5 The overall waste management plan for Wales is set out in a series of policy and guidance documents.

- Planning Policy Wales (Edition 8) (Welsh Government, 2016).
- Technical Advice Note 21 Waste (Welsh Government, 2014).
- Towards Zero Waste, One Wales: One Planet and Waste Sector Plans (Welsh Assembly Government, 2010).

12.2.6 Planning Policy Wales (PPW) presents the Welsh Government’s land use policy, which should be taken into account when preparing development plans. The policy sets out the Welsh Government’s objectives in terms of waste management. The main focus of the policy is the provision of future waste management facilities by local planning authorities.

12.2.7 However, PPW states that the use of renewable resources, including sustainable materials (recycled and renewable materials and those with a lower embodied energy), should be maximised and, where it is judged necessary to use non-renewable resources, these should be used as efficiently as possible. It adds that '*the use of renewable resources and of sustainably produced materials from local sources should be encouraged and recycling and reuse levels arising from demolition and construction maximised and waste minimised*'.

12.2.8 PPW is supported by Technical Advice Note 21 Waste (Welsh Government, 2014). The guidance note provides advice on how the land use planning system should contribute towards sustainable waste management and resource efficiency.

12.2.9 The Welsh Government's general policy for waste management is contained in its overarching waste strategy document titled Towards Zero Waste and associated sector plans (Welsh Assembly Government, 2010). The document sets out a long term framework for resource efficiency and waste management in Wales up until 2050, taking into account social, economic and environmental outcomes. Achieving the aims in Towards Zero Waste relies on a suite of waste sector plans. These provide details on how the outcomes, targets and policies in Towards Zero Waste are to be implemented.

Minerals

12.2.10 Minerals Planning Policy Wales (MPPW) (National Assembly for Wales, 2000) provides the land use planning policy for minerals in Wales. This sets out policy in relation to short and long term future use and the safeguarding of mineral deposits. MPPW states that the aims for sustainability regarding minerals planning include the following.

- Effective protection of the environment by ensuring that environmental impacts caused by mineral extraction and transportation are within acceptable limits.
- Prudent use of natural resources: to help conserve non-renewable resources for future generations through efficient use, recycling and minimisation of waste; to protect renewable resources from serious harm or pollution.
- To ensure an adequate supply of minerals and to safeguard mineral resources for future generations.

12.2.11 MPPW is supported by the Minerals Technical Advice Note (Wales) 1: Aggregates (MTAN 1) (Welsh Assembly Government, 2004). MTAN 1 sets out detailed advice on the mechanisms for delivering the policy for aggregates extraction by Mineral Planning Authorities and the aggregates industry. MTAN 1 sets out that the regional consideration of supply and demand is carried out by the relevant Regional Aggregate Working Party. For the Scheme, the relevant Regional Aggregate Working Party is South Wales. Regional Aggregate Working Parties are tasked with creating Regional Technical Studies for their regions. The overall purpose of the Regional Technical Studies is to set out the strategy for the provision of aggregates in South Wales for the period until 2021.

12.2.12 National planning guidance requires that areas to be safeguarded are identified on the proposals map and that policies should protect potential minerals resources from other types of development that would sterilise or hinder

extraction in the future. To this end, the Welsh Government commissioned British Geological Survey to prepare a series of mineral resource maps (British Geological Survey, 2010a) and aggregates safeguarding maps (British Geological Survey, 2012a).

Local Policy

- 12.2.1** The assessment has had regard to the following local policy documents. It should be noted that whilst these documents provide context, they are not determinative.

Waste

- 12.2.2** The adopted Newport Local Development Plan (LDP) (Newport City Council, 2015) includes a policy on sustainable waste management. Strategic Policy 20 (Waste) states that '*the sustainable management of waste arisings in Newport will be facilitated by promoting and supporting additional treatment facilities that have regard to the waste hierarchy, the proximity principle and contribute to an integrated network of facilities*'.
- 12.2.3** An objective of Newport City Council as stated within the LDP is '*to ensure that waste management choices are based on the proximity principle, where appropriate, and a hierarchy of reduce, reuse, recovery and safe disposal, and that there is adequate provision for facilities to enable this to happen*'.
- 12.2.4** The adopted Monmouthshire County Council Local Development Plan (Monmouthshire County Council, 2014) includes a policy that requires the submission of a waste minimisation statement with planning applications for developments that generate significant demolition and/or construction waste material. According to Policy W1 - Waste Reduction, the statement should demonstrate that '*reasonable steps have been taken to minimise the waste produced, and manage the disposal of any avoidable waste in accordance with the principles of proximity, self-sufficiency and the waste hierarchy set out in national planning policy*'.
- 12.2.5** Additionally, Policy SD2 - Sustainable Construction and Energy Efficiency within the Monmouthshire LDP requires that '*All new development proposals will be required to incorporate efficient resource during construction, operation and maintenance*'.

Minerals

- 12.2.6** In Wales, the responsibility for mineral planning belongs to Mineral Planning Authorities (MPAs) who reside within unitary authorities. There are two MPAs relevant to this assessment: Newport City Council covers the area of the existing M4 and the new section of motorway between Castleton and the Caldicot Levels area and Monmouthshire County Council covers Magor and the area to the east. The MPAs are responsible for meeting the objectives of the Regional Technical Studies prepared by the Regional Aggregate Working Parties.
- 12.2.7** Policies relating to minerals are provided within the Newport LDP (Newport City Council, 2015) and the Monmouthshire LDP (Monmouthshire County Council, 2014).

- 12.2.8** To supplement the LDP, Newport City Council issued a Minerals Background Paper (Newport City Council, 2013). The paper introduces the aggregate apportionment process in Wales, the requirement to safeguard known mineral supply, how this relates to national policy, considers cross boundary consistency and sets out the designation proposals for Newport.
- 12.2.9** Strategic Policy SP21 (Minerals) of the Newport LDP states that the Plan will fulfil its contribution to the regional demand through the following measures.
- Safeguarding localised potential hard rock and sand & gravel resource blocks.
 - Protecting existing and potential wharves and existing rail infrastructure at Newport Docks to ensure the continued sustainable transportation of aggregate.
 - Encouraging the use of secondary and recycled aggregates where appropriate.
 - Considering proposals for the winning and working of minerals in the regional context, whilst having clear regard to local factors
- 12.2.10** Strategic Policy SP21 encourages developments to use secondary and recycled aggregates by keeping materials on site where possible. The supporting text also recommends that developers produce a Site Waste Management Plan '*to encourage resource efficiency and to reduce, recycle and reuse waste on site as sustainably as possible*'.
- 12.2.11** The Newport LDP supports national policy requirements that encourage a sustainable approach to minerals planning and seek to ensure that valuable finite resources are safeguarded for possible future extraction, and that the use of secondary and recycled aggregates is maximised in preference to primary aggregates.
- 12.2.12** The Monmouthshire LDP indicates that there is a need to ensure that Monmouthshire makes an appropriate contribution to the sustainable supply of aggregates for South Wales by ensuring that mineral resources are safeguarded and exploited in a sustainable fashion that also enables Monmouthshire to meet its obligation to make its contribution to the requirements of the South Wales region.

12.3 Assessment Methodology

Relevant Guidance

- 12.3.1** The assessment of the environmental effects associated with the use of material resources and the generation and management of waste resulting from the construction of the Scheme has been undertaken in accordance with the guidance provided within the Interim Advice Note (IAN) 153/11 (Highways Agency, 2011).
- 12.3.2** The Scheme is assessed as a large new construction project so requires a detailed assessment in the context of this guidance.
- 12.3.3** In addition, the following guidance documents have been taken into account.

- Interim Advice Note (IAN) 125/09(W) Supplementary Guidance for Users of DMRB Volume 11 'Environmental Assessment'. Wales Only (Welsh Assembly Government, 2009).
- Defra Environmental Permitting Guidance for the Environmental Permitting (England and Wales) Regulations 2010 (Defra, 2013).
- Towards Zero Waste, One Wales: One Planet (Welsh Assembly Government, 2010). This document is the overarching waste strategy document for Wales.
- Definition of Waste: Development Industry Code of Practice, Version 2 (Contaminated Land: Applications in Real Environments (CL:AIRE), 2011).

12.3.4 There is currently no specific defined methodology for assessing the environmental significance of a material resource or for determining the magnitude of the impact on such a resource. With this in mind, the guidance given in the Design Manual for Roads and Bridges (DMRB), Volume 11, Sections 1 and 2 has been taken into account. In particular, the guidance in Volume 11, Section 2, Part 5 (HA 205/08) (Highways Agency *et al.*, 2008) together with professional judgement, has been used to assess environmental value, magnitude of impact and the significance of environmental effects from the use of material resources.

12.3.5 An Outline Site Waste Management Plan has been prepared for the Scheme and would be implemented by the contractor during construction. The Outline Plan would form the basis of the final Site Waste Management Plan, which would set out how building materials and the resulting waste would be managed during construction of the Scheme. As Site Waste Management Plans are not a legal requirement in Wales, production of the Outline Plan has been undertaken to provide information on the basis of best practice. Related guidance taken into account in preparation of the Site Waste Management Plan has included the following.

- CIRIA C536 (CIRIA, 2001) Demonstrating Waste Minimisation Benefits During Construction.
- CIRIA SP133 (CIRIA, 1997) Waste Minimisation in Construction – Site Guide.
- CIRIA SP134 (CIRIA, 1998) Waste Minimisation and Recycling in Construction – Design Manual.

12.3.6 The Outline Site Waste Management Plan is provided within Appendix 3.2 of this ES.

Study Area

12.3.7 The study area for the assessment covers the construction and permanent land take areas associated with the proposed new section of motorway (see Figure 2.16). Where appropriate (e.g. where there would be works that may affect material resources), consideration has been given to areas affected by Complementary Measures.

12.3.8 The study area encompasses the spatial area over which the Scheme would be expected to have an effect. For material resources, this typically relates to the areas that would be impacted by the Scheme and includes both existing

resources along the route alignment and sites outside the road alignment, where materials may be excavated for use as construction material within the Scheme (borrow areas and nearby quarries). The potential effects of the supply and movement (import and export) of materials outside of the Scheme boundary are also considered. The area also includes the waste management facilities likely to be used by the Scheme.

- 12.3.9** Additionally, the study area includes land lying south of Llanwern Steelworks, where a significant amount of material would be generated with the potential for treatment and reuse as construction material within the Scheme.

Approach to Identification of Baseline Conditions

Ground Conditions

- 12.3.10** The baseline conditions relating to existing surface and sub-surface material resources within the study area are typically established from the findings of ground investigations. A number of historical ground investigations have been undertaken, details of which are presented in Chapter 11 (Geology and Soils) of this ES.

Mineral Resources

- 12.3.11** The following publications were reviewed to establish the presence and sensitivity of mineral resources within the study area.
- Minerals Background Paper, Newport Local Development Plan 2011-2016 (Newport City Council, 2013).
 - The Mineral Resource Maps of Wales, Open Report OR/10/032 (British Geological Survey, 2010a).
 - Mineral Resource Map of South East Wales (1:100,000), (British Geological Survey, 2010b).
 - Aggregates Safeguarding Maps of Wales, Commissioned Report CR/12/039 (British Geological Survey, 2012a).
 - Aggregates Safeguard Map of South East Wales (1:100,000), (British Geological Survey, 2012b).
 - South Wales Regionally Important Geodiversity Sites Audit, Commercial Report CR/12/033 (British Geological Survey, 2012c)
- 12.3.12** To prevent mineral resources from becoming sterilised (through restricted access) by other forms of development, the aggregates safeguarding maps provide a mechanism which allows for the consideration of mineral resources in the decision making process by MPAs.

Waste Management Facilities

- 12.3.13** Data searches were undertaken to establish the presence of waste management facilities within the study area.
- 12.3.14** The Environment Agency's (EA) online Waste Data Interrogator (EA, 2016) was utilised to identify sites which manage construction and demolition waste within the study area. This database compiles all site waste returns data and provides

a comprehensive record of wastes managed. The 2012 dataset is the latest version for reviewing site returns for Wales as the release of this data ceased once the regulator changed from the EA to Natural Resources Wales (NRW).

- 12.3.15** Civic Amenity sites have been excluded from the study due to their scale and the restrictions on accepting trade waste. Transfer stations have also been excluded as the final point of treatment has been considered.

Consultation

- 12.3.16** A summary of the consultation undertaken and the responses received is provided in Table 12.1.

Table 12.1: Consultation Responses Relevant to this Chapter

Date	Consultee and Issue Raised	How/Where Addressed
Letter 18 th September 2015	NRW confirmed support in principle to the managed retention of soils on site for use	Considered as part of the overall management of material reuse for the Scheme.
Letter 18 th September 2015	NRW requested clarification as to why Docksway Landfill was identified as a material resource for the Scheme when this site would not be directly affected.	The permitted area of Docks Way landfill is likely to be affected by the Scheme. However, this is not expected to impact the landfill engineering works. Further details are provided in Chapter 11.
Letter 18 th September 2015	NRW recommended inclusion of a record of various smaller scale waste sites that have been identified as being within the route corridor, which may need to be considered.	These sites will be incorporated within the Permitting Strategy for the Scheme.
Letter 13 th October 2016	Newport City Council – no comment at scoping stage on Materials	Not Applicable.
Email 1 st October 2015	Cadw - no comment at Scoping stage on Materials.	Not Applicable.
February 2016	NRW comment on Land Contamination Management Strategy.	NRW agreed regarding overall strategy (see Appendix 11.3) albeit NRW need to confirm their regulatory position on waste status of Tata lagoons in terms of treatment and reuse of materials.

- 12.3.17** Scoping represents a key stage in the consultation process. Responses in relation to this topic area were limited. Comments in relation to materials in the context of potential land contamination are further summarised in Chapter 11 of this Environmental Statement (ES).

- 12.3.18** The responses demonstrate NRW agreement in principle to the use of the approach set out in the Definition of Waste: Development Industry Code of Practice (CL:AIRE 2011).

Assessment Criteria and Assignment of Significance

Methodology for Assessment of Effects

- 12.3.19** The first stage of the assessment involves assessing the value (sensitivity) of material resources (and other receptors affected by the use of material resources and the generation and management of waste) that would be affected by the Scheme.
- 12.3.20** The second stage of the assessment involves assessing the impact (magnitude of impact) of the material resources (and other receptors) at the Scheme, an assessment without mitigation measures of the impact upon material resources (and other receptors) has been undertaken.
- 12.3.21** The assessment of the value (sensitivity) and the magnitude of impacts, when combined, lead ultimately to arriving at the significance of an effect.
- 12.3.22** Taking into account the assessment of the environmental effects, mitigation measures have been identified and residual effects assessed following incorporation of the mitigation measures.
- 12.3.23** The assessment of the environmental effects associated with the use of material resources and the generation and management of waste resulting from the construction of the Scheme has taken into account the following.
- Types and quantities of materials required for construction of the Scheme.
 - Cut and fill balance.
 - Material sources (both on and off site material resources required by the Scheme).
 - Movement of materials during construction (both to and from the Scheme).
 - Storage of materials during construction.
 - Treatment and processing of materials.
 - Management of waste.

Sensitivity

- 12.3.24** The value (sensitivity) of material resources is determined on the basis of the descriptions set out in Table 2.1 of HA 205/08 as follows.

Table 12.2: Environmental Value (or Sensitivity)

Value (sensitivity)	Typical Descriptors
Very high	Very high importance and rarity, international scale and very limited potential for substitution.
High	High importance and rarity, national scale, and limited potential for substitution.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution.
Low (or Lower)	Low or medium importance and rarity, local scale.
Negligible	Very low importance and rarity, local scale.

Magnitude of Impact

- 12.3.25** The magnitude of the impact has been determined on the basis of the descriptions derived from Table 2.2 of HA 205/08 as follows.

Table 12.3: Magnitude of Impact

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

Significance of Effect

- 12.3.26** The significance has been derived in accordance with Table 12.4 (based on Table 2.4 of HA 205/08).

Table 12.4: Approach to Evaluating Significance of Effect

Value/Sensitivity	Magnitude of Impact				
	No Change	Negligible	Minor	Moderate	Major
Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight
Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or Moderate
Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or Large
High	Neutral	Slight	Slight or moderate	Moderate or Large	Large or Very large
Very high	Neutral	Slight	Moderate or large	Large or Very large	Very large

Limitations of the Assessment

12.3.27 The following limitations and assumptions have been noted.

- The construction and operation of the Scheme would be carried out in accordance with normal good working practice implemented on such projects. A Pre-Construction Environmental Management Plan (Pre-CEMP) sets out the environmental measures that would be adopted during the construction phase. This is provided in Appendix 3.2 and would form the basis of the full CEMP prior to construction commencing.
- Details of the approach to construction would be as set out in Chapter 3 (Scheme Construction) and Appendix 3.1.
- The final quantities of materials to be used for construction of the Scheme, the sources from where they would be obtained and their mode of transport will be further reviewed during detailed design to ensure overall best value.

12.4 Baseline Environment

Ground Conditions

12.4.1 Details relating to the geology and soils within the study area are presented in Chapter 11 of this ES. A brief summary of key aspects is provided below.

Bedrock Geology

12.4.2 The bedrock geology typically comprises the following.

- The St Maughan's Group (typically Mudstones) of Devonian Age in the western part of the study area around Castleton and Coedkernew.
- The Mercia Mudstone Group of Triassic Age across the Gwent Levels.
- Various bedrock (Carboniferous Limestone, Tintern Sandstone Formation of Carboniferous and Devonian Age, and Marginal Facies of the Mercia Mudstone Group of Triassic Age) in the eastern part of the study area around Magor.

Superficial Deposits

12.4.3 The superficial deposits typically comprise the following.

- Made Ground in the area of Newport Docks (associated with Docks Way Landfill, Stephenson Street Industrial Estate and Solutia chemical works) and to the south of Llanwern Steelworks (associated with sludge lagoons).
- Glacial Till (typically gravelly clay) in the area of the proposed Castleton Interchange.
- Alluvium (typically silty clay) and River Terrace Deposits (sand and gravel) around Coedkernew and Magor.
- Tidal Flat Deposits (typically soft clays) underlain by Glaciofluvial Deposits (typically gravel) across the Gwent Levels.

12.4.4 There are no Regionally Important Geodiversity Sites (RIGS) or other designated sites within the study area.

Areas Potentially Affected by Land Contamination

12.4.5 It is noted that the new section of motorway is located within the vicinity of 27 potentially contaminated sites, including landfills, Newport Docks, Llanwern Steelworks sludge lagoons and other industrial/commercial land uses.

Mineral Resources

12.4.6 The Mineral Resource Map for South East Wales (British Geological Survey, 2010b) indicates that whilst mineral resources are largely absent, the following resources are indicated to be present along the alignment of the new section of motorway.

- Outcrops of Limestone, Sandstone and River Terrace Deposits (sand and gravel) within the vicinity of the Magor junction of the existing M4.
- An area of River Terrace Deposits (sand and gravel) and Alluvium in the western part of the study area at Coedkernew.

12.4.7 There are no active mineral sites/working quarries along the alignment of the new section of motorway or within the immediate surrounding area. However, Machen limestone quarry is located approximately 6 km to the north west of the Castleton junction of the existing M4. Additionally, Ifton limestone quarry lies dormant and is located approximately 4.5 km to the north east of the Magor junction of the existing M4.

12.4.8 The ‘former Gwent’ Aggregates Safeguarding Study (Cuesta Consulting Limited, 2009) indicates that Ifton quarry has 11 million tonnes of existing permitted reserves in addition to the estimated 30 million tonnes of proven reserves. Machen quarry is understood to have 20 million tonnes of reserves and supplies aggregate by road throughout the local area, as well as supplying more distant markets by rail.

12.4.9 For the ‘former Gwent’ authorities of Newport, Torfaen, Blaenau Gwent and Monmouthshire, the average annual aggregate production was 0.44 million tonnes for the years 2003-5 and it is estimated that their shared reserves are 18.4 million tonnes (Monmouthshire County Council, 2014).

12.4.10 The Aggregates Safeguarding Map for South East Wales (British Geological Survey, 2012b) indicates that whilst mineral resources recommended for safeguarding from future development are largely absent, the following resources are indicated to be present along the alignment of the new section of motorway. These resources are recognised within the Newport LDP (Newport City Council, 2015) and Monmouthshire LDP (Monmouthshire County Council, 2014).

- Outcrops of Limestone and River Terrace Deposits (sand and gravel) - Category 1 resources and outcrops of Sandstone - Category 2 resources present within the vicinity of the existing Magor junction of the M4.
- An area of River Terrace Deposits (sand and gravel) - Category 1 resource present at Coedkernew.

Waste Management Facilities

12.4.11 The baseline conditions have been established through desktop research including interrogation of the EA online Waste Data Interrogator (EA 2016).

12.4.12 A review of waste management facilities located in South East Wales that receive construction and demolition (C&D) wastes has been undertaken. Table 12.5 below, whilst not exhaustive, identifies the 20 facilities which received over 1,000 tonnes of C&D waste in 2012.

12.4.13 C&D wastes are defined as Chapter 17 wastes in the European Waste Catalogue (EWC). These include:

- insulation materials and asbestos-containing construction materials;
- gypsum-based construction material;
- other construction and demolition wastes;
- soil (including excavated soil from contaminated sites) - stones and dredging spoil;
- concrete - bricks - tiles and ceramics;
- metals (including their alloys);
- wood - glass and plastic; and,
- bituminous mixtures - coal tar and tarred products.

Table 12.5: Sites Accepting over 1,000 tonnes C&D Waste in 2012

Site Name	Facility type	Location	Tonnes C&D managed
Neal Soil Supplies Ltd	Treatment	Cardiff	241,585
Whitehall Landfill	Landfill	Cardiff	107,423
Former Panteg Steelworks	Use of Waste	Torfaen	80,327
Docksway Landfill - Area 2	Landfill	Newport	53,956
Longships Road	Treatment	Cardiff	38,456
Lamby Way Landfill Site	Landfill	Cardiff	29,912
Bryn Pica Landfill Site	Landfill	Rhondda, Cynon, Taff	26,941
Hendy Recycling	Treatment	Rhondda, Cynon, Taff	23,114
Vianshill Farm	Use of Waste	The Vale of Glamorgan	20,194
Lysaght Village Newport	On/In Land	Newport	18,386
Tyla Coch (Redhill) Quarry	Use of Waste	Rhondda, Cynon, Taff	16,180
Trecatti Landfill Site	Landfill	Merthyr Tydfil	14,375
The Old Brickworks	Treatment	Torfaen	12,402
Bryn Pica Waste Operations	Treatment	Rhondda, Cynon, Taff	11,373
Bryn Quarry Ltd	On/In Land	Caerphilly	8,500
Fred Lloyd & Sons Ltd	MRS	Torfaen	7,066
Hendy Quarry Landfill	Landfill	Rhondda, Cynon, Taff	2,857
Chapel Bridge Yard	MRS	Caerphilly	2,740
Pacific Plant Ltd	Use of Waste	Caerphilly	2,479
Colin Richardson Recycling Centre	Treatment	Newport	1,065

12.4.14 The facilities which accepted the largest quantities of waste are Neal Soil Supplies Ltd, which is a treatment facility located at Rumney (Cardiff) that processed over 240,000 tonnes in 2012, and Whitehall Landfill located in Wenvoe, Cardiff which processed over 107,000 tonnes in 2012.

- 12.4.15** Mixed residual wastes also require disposal at nearby facilities. An assessment was undertaken to identify the facilities that are shown to accept this waste type. Table 12.6, below, identifies eight facilities in South East Wales which received over 1,000 tonnes of mixed residual waste in 2012. All of the facilities accepted between 24,000 and 64,000 tonnes. Mixed residual waste has been defined as EWC code 20 03 01.

Table 12.6: Sites accepting over 1,000 tonnes mixed residual waste in 2012

Site Name	Facility Type	Location	Tonnes Mixed residual waste managed (Tonnes)
Silent Valley Cwm Treatment Plant	Treatment	Blaenau Gwent	24,555
Lamby Way Landfill Site	Landfill	Cardiff	57,639
Trecatti Landfill Site	Landfill	Merthyr Tydfil	42,656
Docksway Landfill - Area 2	Landfill	Newport	31,350
Bryn Pica Waste Operations	Treatment	Rhondda, Cynon, Taff	29,737
Bryn Pica Landfill Site	Landfill	Rhondda, Cynon, Taff	63,079
Veolia Es Cleanaway (uk) Limited	Treatment	Rhondda, Cynon, Taff	27,538
Site Serv Ltd	Treatment	The Vale of Glamorgan	32,767

- 12.4.16** At present, the most significant operational disposal site within the vicinity of the proposed new section of motorway is Docks Way Landfill, which is located in close proximity to Newport Docks. The landfill site is authorised for disposal of non-hazardous and inert waste. The closest disposal for hazardous waste is located in Swindon.

Future Baseline Conditions

- 12.4.17** Consideration has been given to the potential for changes in the baseline conditions in the medium to long term as a result of climate change. The Climate Change Risk Assessment for Wales (Welsh Government and Defra, 2012) has been reviewed, together with other climate change prediction tools. With respect to material resources, the Climate Change Risk Assessment for Wales identifies that climatic factors have the potential to disrupt UK business supply chains by affecting availability of natural resources and raw materials, or by causing distribution delays because of disruption to transport.
- 12.4.18** To adapt to climate change, the Newport LDP (Newport City Council, 2015) states that '*In order to ensure that finite resources are being used in a sustainable manner, developments should where possible use secondary and recycled aggregates as part of the construction process. Wherever possible this should be done without taking materials off site. This would complement the Plan's Strategic Policies on Waste Management and Minerals (SP20 and SP21 respectively)*'.

12.5 Mitigation Measures Forming Part of the Scheme Design

- 12.5.1** Construction of the Scheme would take account of normal good practice measures to reduce resource use and the generation of waste. In addition, a number of measures have been identified during the EIA process and these are described in Section 12.9 below.

12.6 Assessment of Potential Land Take Effects

New Section of Motorway

- 12.6.1** The land take required for the construction of the new section of motorway would hinder the future extraction of existing mineral deposits present within the footprint of the new section of motorway.
- 12.6.2** There are no Regionally Important Geodiversity Sites at, or within the vicinity of, the new section of motorway and mineral resources are typically absent. However, minor reserves of superficial deposits and bedrock geology, which should be safeguarded, are present at Magor and Coedkernew (BGS, 2012a and 2012b).
- 12.6.3** Given the minimal quantity of materials present within these reserves their sensitivity is considered to be low.
- 12.6.4** The magnitude of impact from the reduced accessibility to these mineral resources from construction of the new section of motorway is considered to be moderate adverse. The significance of the environmental effect is therefore considered to be slight adverse.

Complementary Measures

- 12.6.5** The Complementary Measures, including reclassification of the existing M4, are described in Chapter 2 (Scheme Description). These measures would not require any additional land take over and above those discussed in the sections above for the proposed new section of motorway. Therefore no significant effects on materials would be likely to occur.

12.7 Assessment of Potential Construction Effects

Proposed New Section of Motorway

- 12.7.1** The earthworks to be undertaken to enable construction of the new section of the motorway would involve cutting into existing topography at Castleton and Magor and the construction of a low lying embankment across the Caldicot Levels and Wentlooge Levels (collectively known as Gwent Levels). Embankments are required to accommodate infrastructure (junctions, slip roads etc.) that are elevated above the main carriageway.
- 12.7.2** In addition to the road pavement construction, a number of structures are proposed to be constructed including the following.
- Overbridges and underbridges to accommodate existing infrastructure.

- Culverts and reen bridges.
- River Usk Crossing (including a cable-stayed bridge).
- River Ebbw Underbridge.

12.7.3 Details relating to individual structures are provided in Chapters 2 and 3 of this ES.

Types and Quantities of Materials Required for Construction

12.7.4 The types and quantities of materials required for construction of the proposed new section of motorway have been separated into those required for earthworks to enable embankment construction (primarily site won materials) and those required for construction of the road pavement and other structures (primarily imported materials).

Earthworks

12.7.5 The provisional estimated bulk earthwork volumes for the new section of motorway are provided in Table 12.7 below.

Table 12.7: Earthworks Volumes

Type of Material	Approximate Quantity Required (m ³)	Approximate Quantity Site Won (m ³)	Approximate Quantity Imported (m ³)
Earthworks			
General Fill for embankment construction and landscaping	6,500,000	5,400,000	1,100,000
Topsoil	411,000	411,000	0

12.7.6 Ground conditions across the Gwent Levels comprise soft, organic-rich silt and clay soils and a very high groundwater table. Construction of embankments over such soft soils can lead to considerable settlement over a long period of time, leading to potential instability of the embankment. To speed up the process of settlement and to ensure a consistent rate of settlement is achieved, vertical band drains would be installed prior to the construction of the embankments. The band drains would allow water within the soil (i.e. pore water) to drain more quickly and reduce the build up of pore water pressure. In combination with the installation of the band drains, additional material (up to 1 metre) would be added to the embankment in a process called ‘surcharging’, whereby the additional load would achieve settlement in a shorter period. The surcharge material would be removed after approximately 12 months once consolidation of the embankment has been achieved. All surcharge materials are expected to be managed within the proposed land take and are included in the volumes within Table 12.7 above.

Construction Materials

12.7.7 The provisional estimated volumes of construction materials required for the new section of motorway are provided in Table 12.8, below. Estimates of quantities that can be site won and additional quantities that would require importing are provided.

Table 12.8: Estimated Construction Materials Volumes

Type of Material	Approximate Quantity Required (m ³)	Approximate Quantity Site Won (m ³)	Approximate Quantity Imported (m ³)
Road Pavement Construction			
Capping	76,000	38,000	38,000
Sub-base	248,000	0	248,000
Base	172,000	0	172,000
Binder	47,000	0	47,000
Surface	34,000	0	34,000
Structures			
Structural Steelwork	36,000 (Tonnes)	0	36,000 (Tonnes)
Reinforcement	3100 (Tonnes)	0	3100 (Tonnes)
Concrete	202,000	0	202,000
Drainage			
Pipe Bedding	55,000	0	55,000
Concrete	3,600	0	3,600

Cut and Fill Balance**12.7.8**

A variety of materials are required to enable construction of the propose new section of motorway. The strategy for the construction phase is to reuse as much of the material won (excavated) during construction as possible. This would maximise the sustainability of the Scheme by minimising both the amount of material that would otherwise be transported for disposal and the amount of imported primary raw materials, thereby preserving mineral resources.

Material Sources**12.7.9**

Where practicable, site won materials would be reused for the earthworks. However, as identified in Table 12.9 below, certain materials required for construction would need to be imported and would be preferentially sourced from local suppliers.

Table 12.9: Material Sources

Material Requirement	Material Source	Transportation Method (where sourced off site)
Road Pavement Construction		
Capping	Site won (borrow areas from Magor), sourced from a local supplier (Ifton and Machen quarries)	Ifton Quarry: DumpTruck/Road Wagon using dedicated haul road
Sub-base	Site won, Sourced from a local supplier (Ifton and Machen quarries)	Machen Quarry: Road Wagon using local road network
Base	Sourced from a local supplier (Ifton and Machen quarries)	Ifton Quarry: DumpTruck/Road Wagon using dedicated haul road
Binder	Sourced from a local supplier (Ifton and Machen quarries)	Machen Quarry: Road Wagon using local road network
Surface	Sourced from a local supplier (Ifton and Machen quarries)	Machen Quarry: Road Wagon using local road network

Material Requirement	Material Source	Transportation Method (where sourced off site)
Earthworks		
Drainage Materials	Sourced off site from a local supplier (Ifton and Machen quarries)	Ifton Quarry: DumpTruck/Road Wagon using dedicated haul road Machen Quarry: Road Wagon using local road network
General Fill	Site won and sourced from a local supplier (Ifton and Machen quarries)	
Landscaping Material	Site won	Site won
Topsoil	Topsoil strip would be reused on site	Site won
Structures		
Structural Steelwork	Sourced from a local supplier where possible.	Articulated Road Wagon
Reinforcement	Sourced from a local supplier (either Newport or Neath)	Articulated Road Wagon
Pile cages	Manufactured off site	Articulated Road Wagon
Concrete	Mobile concrete batching plants established on site (either side of the River Usk) supported by existing Hanson ready-mix plants at Cardiff and Newport docks	6m ³ or 8m ³ concrete wagon using either the local road network or the dedicated site haul route.
Bridge Beams	Manufactured off site (northern England)	Articulated Road Wagon. Materials to be initially held at the abnormal loads holding area and called in as required.
Drainage		
Pipe Bedding	Sourced from a local supplier (Ifton and Machen quarries)	Ifton Quarry: DumpTruck/Road Wagon using dedicated haul road Machen Quarry: Road Wagon using local road network
Concrete	Mobile concrete batching plants established on site (either side of the River Usk) supported by existing Hanson ready-mix plants at Cardiff and Newport docks	6m ³ or 8m ³ concrete wagon using either the local road network or the dedicated site haul route.

12.7.10 Details of the various sources of materials and their use are provided below and are split into two groups, site won materials and off-site materials.

Site Won Materials

12.7.11 As set out above, the strategy for the new section of motorway is to reuse as much site won material as possible.

12.7.12 The reuse of site won materials would be undertaken in accordance with the approach set out in the Definition of Waste: Development Industry Code of Practice (CL:AIRE, 2011). This would require the preparation of a Materials Management Plan (MMP), which would control and document the reuse of materials. An Outline Materials Management Plan is provided as part of Appendix 3.2 of this ES. The reuse of site won materials would be subject to

their compliance with relevant specifications and assessment criteria to ensure engineering suitability and protection of environmental receptors. The assessment criteria will be agreed with NRW and Newport and Monmouthshire local planning authorities prior to construction and details will be provided within the MMP. Where materials are unable to meet the assessment criteria they would either be treated to make them suitable for use (see treatment and processing of materials section below) or disposed of off-site as waste (see management of waste section below). The quantities of materials requiring offsite disposal would be minimised by adopting this approach for site won soils.

- 12.7.13** The following provides details relating to the principal sources of site won materials.

Demolition Materials

- 12.7.14** Several existing structures would require demolition to accommodate the construction of the new section of motorway. Materials that may be won during the demolition and site clearance works, and which may potentially be reused, are set out below.

- Bituminous pavement material.
- Aggregate sub-base.
- Fill and landscaping material.
- Reinforced concrete and concrete.
- Masonry and brickwork.
- Reinforcement and structural steelwork.

- 12.7.15** Where necessary, demolition materials proposed for reuse would be appropriately processed to meet specification requirements (see treatment and processing of materials section below).

Soils and Rock

- 12.7.16** For construction of the motorway embankment it is proposed to reuse as much as possible of the excavated soil and rock generated from cutting activities to be undertaken at the Castleton and Magor Interchanges. Assessment of the available ground investigation information indicates that the majority of these materials would be suitable for reuse (following processing to required specifications) as general embankment fill.

- 12.7.17** The suitability for reuse of site won materials within the embankment would be critical requiring strict control and management. Measures to manage this are identified within the Pre-CEMP (Appendix 3.2) and would form the basis for the full CEMP, which would be developed prior to construction commencing.

- 12.7.18** To mitigate the depletion of mineral resources, appropriate processing of site won soils and rock would be undertaken to maximise the amount of material that may be reused and minimise the amount of waste. The reuse of site won soils and rock would prevent the need for the import of primary raw materials, thereby preserving the off-site mineral resources.

Borrow Areas

- 12.7.19** Borrow areas have been identified at locations within the vicinity of the new section of motorway, details of which are provided below and in Chapter 3.
- 12.7.20** Approximately 600,000 m³ of Class 2 material (in accordance with the Specification For Highways Works Volume 1) would be obtained from Berryhill Farm, Castleton, which would be used for the embankment construction for the Castleton Interchange Overbridge Link B and for the embankment core across the Gwent Levels once the ground treatment measures have been installed (see Appendix 3.1).
- 12.7.21** Further borrow areas have been identified within the Magor to Undy section. Material from the borrow areas is required to provide the required embankment core and surcharge material early in the construction programme for all embankment areas across the Caldicot Levels in lieu of cut material that cannot be released due to the construction sequence.
- 12.7.22** All borrow areas would be backfilled to a re-profiled level similar to the pre-construction ground profiles with material sourced from the embankment surcharging soils and other suitable site won soils.

Topsoil

- 12.7.23** Topsoil would be generated at the Castleton and Magor Interchanges. This material would be placed in bunds close to where it is excavated. Further topsoil would be excavated relating to the borrow pit areas. This too would be stockpiled ready for reuse to reinstate the borrow pit areas. Temporary land take has been identified for topsoil storage within the proposed land take boundary. These areas of temporary land take would be returned to the landowner on completion of the construction phase.

Contaminated Soils

- 12.7.24** There are a number of sites where contaminated soils are/or could be present, including the sludge lagoons at the Llanwern Steelworks. The reuse of contaminated soils has the potential to adversely impact upon receptors. Details of the known and potential areas of contamination and an assessment of effects in relation to the use of such materials are provided in Chapter 11 (Geology and Soils) and Chapter 16 (Road Drainage and water) of this ES. The management of potentially contaminated soils is further addressed in the Outline Remedial Strategy (Appendix 11.2) that will form the basis of the final Remediation Strategy to be developed prior to the commencement of construction.
- 12.7.25** In summary, the most sensitive receptors in relation to contamination are considered to be controlled waters (surface waters and groundwater) in the context of designated sites (such as the Gwent Levels Sites of Special Scientific Interest) and people in the context of construction workers and adjacent land users.
- 12.7.26** To mitigate the risk to receptors from the reuse of site won materials, only soils that comply with relevant assessment criteria would be deemed suitable for reuse. Where necessary, contaminated soils would be treated to render suitable for use (see treatment and processing section below). Details of the assessment criteria are provided within the Outline Remediation Strategy (Appendix 11.2).

Off-site Materials

Ifton and Machen Quarries (Locally Sourced Quarried Materials)

- 12.7.27** It is anticipated that Ifton and Machen limestone quarries would be used to source specified granular fill material for use as drainage blankets and starter layers for embankment construction and capping and sub-base materials for road pavement construction. Other local quarries, including Tytherington (south Gloucestershire), Penderyn and Craig-yr-Hesg, may also be used.
- 12.7.28** Up to approximately 3 million tonnes of material would be required from these sources, which have permitted reserves of 11 million tonnes (Ifton) (Cuesta Consulting Ltd 2009) and 20 million tonnes (Machen).

Effects on Material Sources

- 12.7.29** The main effects in relation to material sources are considered to be in relation to the use of site won soils and rock, the reuse of contaminated soils and the use of locally sourced quarried materials.
- 12.7.30** Based on the low levels of mineral resources within the land take, the sensitivity overall of these resources is considered to be low.
- 12.7.31** Given the quantity of site won soils and rock to be excavated and used as part of the construction phase, the magnitude of impact from the depletion of mineral resources is considered to be moderate adverse. The significance of environmental effect from the reuse of site won mineral resources is therefore considered to be slight adverse.
- 12.7.32** In terms of contaminated soils, the sensitivity of receptors varies according to the receptor type, as set out in Chapter 11. The sensitivity depends on, amongst other factors, the classification of the receiving aquifer or watercourse. As such, the risk presented to receptors from the reuse of contaminated soils is influenced by the location where the materials shall be reused. For the purposes of assessing the environmental effect from the reuse of contaminated soils, a conservative approach has been adopted with the sensitivity of the receptors judged to be high. Given the anticipated quantity of contaminated soils present within the footprint of the new section of motorway that may potentially be reused, the magnitude of the impact is considered to be major adverse. The significance of effect arising from the reuse of contaminated soils is therefore considered to be large adverse.
- 12.7.33** Where imported primary raw materials are required for earthworks and other construction purposes there would be a negative impact upon mineral resources as a result of their depletion. The overall sensitivity of the mineral resources at Ifton and Machen quarries is considered to be medium.
- 12.7.34** Given the anticipated volumes of material required from these quarries (up to 3 million tonnes) compared to their existing permitted reserves, the magnitude of impact upon the quarries is considered to be moderate. The significance of environmental effect from the use of locally sourced quarried material is therefore considered to be moderate.

Movement of Materials during Construction

- 12.7.35** Due to the levels of congestion on the existing M4 around Newport and the surrounding local road network, the strategy for transport of materials is to avoid the use of these roads wherever possible. On occasions when their use is unavoidable, for example at the start of construction until access points have been established, their use would be limited to off peak usage with hours of working agreed with local planning authorities.
- 12.7.36** The motorway tie-in sequences at Castleton and Magor have been developed to significantly remove the need for construction traffic reliance upon the existing local road network. Works access would be established on the motorway sections at Castleton and Magor.
- 12.7.37** A number of haul routes would be constructed, which would be used for the following purposes.
- The movement of earthworks materials for embankment construction.
 - Delivering materials and plant for constructing structures and culverts.
- 12.7.38** The haul roads would typically be incorporated within the permanent earthworks embankment footprint. Across the Gwent Levels, the haul road would also serve as the working platform for the ground treatment measures.
- 12.7.39** It is expected that a dedicated haul road would be constructed across fields from the eastern end of the new section of motorway direct to Ifton quarry. Materials sourced from Machen quarry would be delivered using the existing road network. The possibility also exists for the delivery of materials from Machen quarry to Newport Docks using rail. However, logistics may preclude this form of transport.
- 12.7.40** The number of Heavy Goods Vehicle (HGV) and Light Duty Vehicle (LDV) movements on the local road network, and resulting additional traffic required to import the materials associated with the new section of motorway will depend on final routing agreements for construction traffic.
- 12.7.41** The movement of materials to and from the new section of motorway would impact upon the local road network, the sensitivity of which is considered to be high. Given the potential disruption to traffic that may occur the impact is considered to be major adverse. The significance of effect from the transportation of materials is therefore assessed as large adverse.
- 12.7.42** To mitigate the impact upon the local road network, where materials are required to be imported, local suppliers, where possible, would be used to minimise transportation distances. Additionally, deliveries would be planned to avoid peak traffic. Alternative forms of transport for the import of materials, namely by rail and sea (making use of Newport Docks), would also be reviewed and implemented where feasible to support construction.

Storage of Materials during Construction

- 12.7.43** There would be one main compound established for the construction phase at the rear of Imperial Park, Newport. The main compound would provide office and welfare accommodation for staff and operatives, overnight plant storage and small tool and material storage. The main compound would also provide areas

for traffic management and house a pre-cast pile manufacturing facility with its own dedicated concrete batching plant.

- 12.7.44** In addition, ‘section’ offices would be provided at either side of the River Usk Crossing and at the Castleton and Magor Interchanges. The River Usk Crossing section offices would provide pre-cast yards and concrete batching plants.
- 12.7.45** Satellite compounds would be established at structure locations (for example, at North Row). These areas would be used to store plant, equipment and materials, as well as providing mixed storage areas for subcontractors and traffic management. The compounds would also be used for preassembly of reinforcement and construction of formwork.
- 12.7.46** Fuel would be stored at several compounds including the main compound, and the section offices, in dedicated bunded areas. Fuel would not be stored in compounds located within the Gwent Levels Sites of Special Scientific Interest (SSSIs) to reduce the risk of damaging the sensitive environment.
- 12.7.47** Topsoil, subsoil and unsuitable materials would be appropriately stockpiled. The topsoil and subsoil stores would be up to 3 metres (topsoil) and 5 metres (subsoil) in height. The height of the unsuitable material stores would be up to 7 metres. Topsoil would not be stripped from the proposed soil storage areas, with a geotextile placed on the existing ground surface.
- 12.7.48** Items such as large drainage pipes and precast culvert sections would be stored close to where they are to be installed and bulk materials, such as granular fill, would be placed within its permanent position as soon as it is delivered.
- 12.7.49** Material storage of high value items would be kept within secure areas at the main or section compounds. Where possible, pre-fabrication of reinforcing steel (rebar) would be carried out in the main or section compounds and transported to the place of installation.
- 12.7.50** Excavated contaminated soils have the potential to cross contaminate clean materials if they are not appropriately characterised and where there is poor stockpile management. Additionally, excavated materials present a risk to environmental receptors if they are inadequately stored whilst awaiting treatment.
- 12.7.51** As detailed above, the sensitivity of environmental receptors to contamination from existing materials is judged to be high along much of the proposed new section of motorway. Given the anticipated quantity of contaminated soils to be excavated and managed the magnitude of the impact is considered to be major. As set out above with regard to the reuse of contaminated soils, the significance of effect in relation to the potential spreading of contamination from inadequate stockpile management and storage is therefore considered to be large.
- 12.7.52** To mitigate the risks, works would be undertaken in accordance with the Pre-CEMP (Appendix 3.2), Outline Remedial Strategy (Appendix 11.2) and Outline Material Management Plan (document provided as part of Appendix 3.2). These outline documents would form the basis of the final plans to be agreed prior to the commencement of construction.

Treatment and Processing of Materials

12.7.53 Where site won materials are deemed unsuitable for reuse due to the presence of contamination and/or inadequate engineering properties, then appropriate treatment and/or processing would be undertaken to enable incorporation within the new construction process, where practicable. Details of the treatment and processing of materials is provided below.

Treatment

12.7.54 It has been estimated that in order to accommodate the proposed new section of motorway, approximately 770,000 m³ of site won contaminated soil would require treatment to enable its reuse. The Llanwern sludge lagoon materials contain various levels of contaminants and by-products generated from the steel manufacture process including heavy metals. It is proposed that the lagoon materials would be treated using stabilisation and solidification technology. An appraisal of remedial options is made in the Outline Remedial Strategy (Appendix 11.2). Feasibility trials would be undertaken to establish the most appropriate binder compounds for use in the stabilisation/solidification technique .

12.7.55 The stabilised materials would undergo an extensive assessment to ensure they exhibit appropriate properties to ensure engineering suitability and protection of environmental receptors. A Scheme specific temporary, mobile treatment facility would be set up and located within close proximity to the sludge lagoons in order to accommodate the volume of spoil envisaged.

12.7.56 It is envisaged that the treated material would be incorporated within the embankment for the new section of the motorway.

12.7.57 The treatment of contaminated soil to enable its reuse rather than its off-site disposal as waste has a number of positive impacts which include the following.

- Minimising the amount of material requiring off-site disposal, thereby preserving the capacity of local disposal facilities.
- Minimising the amount of off-site primary raw materials required as replacement material, thereby preserving mineral reserves (most notably at Machen and Ifton quarries).
- Minimising the movement of materials to and from the Scheme, thereby minimising the impact upon the local road network.

12.7.58 The significance of environmental effects upon identified receptors from the following activities has been considered elsewhere within this chapter.

- The use of contaminated soil without treatment.
- The disposal of contaminated soil as waste rather than treatment and reuse.
- The use of off-site raw materials rather than site won materials.

12.7.59 The treatment and reuse of existing contaminated soils would reduce the long term risk presented to environmental receptors and therefore, in terms of areas of existing contamination, can be considered to represent a beneficial impact. This is considered in Chapter 11 of this ES: Geology and Soils.

Processing

- 12.7.60** To enable the reuse of excavated soils and rock it would be necessary to process the materials to meet necessary engineering specifications. The following processing may be required.
- Segregation of excavated materials into different classifications for reuse. Some materials would be suitable for reuse within embankments, whilst some would be unsuitable, (e.g. due to high moisture content or organic matter content) and would be used for areas of essential mitigation/landscape planting.
 - Crushing and processing of excavated rock would be required to satisfy grading requirements for reuse. The processing of materials would generate a certain degree of noise and airborne dust, the impacts of which are discussed in Chapters 13 and 7, respectively, of this ES.
- 12.7.61** Dedicated processing areas would be established near to the Castleton and Magor Interchanges i.e. in the locations where materials would be generated through necessary cutting activities to accommodate the new section of the motorway. Processed materials would also be stored in these locations for later use in the construction programme as required.
- 12.7.62** The processing of excavated materials into materials suitable for reuse would minimise the amount of material that requires off-site disposal as waste and minimise the amount of primary raw materials requiring import, thereby preserving mineral resources.

Management of Waste

- 12.7.63** Hypothetically, excavated materials that do not meet reuse assessment criteria and/or engineering specifications may be classified as unsuitable for use and require off-site disposal as waste.
- 12.7.64** It has been estimated that approximately 770,000 m³ of site won contaminated materials from Llanwern Steelworks sludge lagoons would require treatment to render it suitable for use. If this material was to be disposed of instead, significant strain would be put on local waste disposal facilities. The closest disposal facility to the Scheme is Docks Way Landfill, which is located in close proximity to Newport Docks and is authorised for disposal of non-hazardous and inert waste. This is currently the only operational disposal facility within the vicinity of the Scheme. The closest disposal facility to the Scheme for hazardous waste is located in Swindon.
- 12.7.65** The Environmental Permit for Docks Way (Area 2) Landfill (Permit number DP3733BK) states that the total quantity of waste that may be deposited in the landfill shall not exceed 1,190,000 tonnes. Additionally, the quantity of waste that is deposited each year shall not exceed 90,000 tonnes (non-hazardous) and 13,500 tonnes (inert).
- 12.7.66** The volume of contaminated soil that is anticipated to be generated (770,000 m³), and which theoretically would require disposal should treatment not be undertaken, would exceed the annual capacity of Docks Way Landfill. Therefore, should disposal of this volume of material be required then the magnitude of the impact upon disposal facilities is considered to be major adverse. Given that the

disposal facility is the only one operational in Newport and is regionally important, its environmental value/sensitivity is considered to be medium. The significance of effect is therefore considered to be large adverse.

Summary of Environmental Effects - Construction Phase

- 12.7.67** Table 12.10 below provides a summary of the likely significance of environmental effects (without mitigation) from the use of material resources, and the generation and management of waste, resulting from the construction of the new section of motorway.

Table 12.10: Summary of Environmental Effects (without mitigation)

Impact	Sensitivity	Magnitude of Impact	Significance of Effect
Depletion of mineral resources: Use of site won rock during construction	Low	Moderate	Slight adverse
Reuse of site won contaminated soils: Storage and potential for cross-contamination	High	Major	Large adverse
Impact on mineral resources at Ifton and Machen quarries	Medium	Moderate	Moderate adverse
Impact on local road network (movement of materials)	High	Major	Large adverse
Reduced capacity of waste disposal facilities (if reuse not possible)	Medium	Major	Large adverse

Complementary Measures

- 12.7.68** The Complementary Measures proposed are described in Chapter 2 (Scheme Description). These measures would not require any additional land take and is not likely to require significant levels of materials use or waste generation during construction (over and above that described above for the new section of motorway). Therefore no significant effects on materials would be likely to occur.

12.8 Assessment of Potential Operational Effects

Proposed New Section of Motorway

- 12.8.1** There would not be a significant requirement for the importation or disposal of materials during the operation of the new section of motorway. However, materials would be required for routine maintenance operations, such as the disposal of damaged safety fences, resurfacing and landscaping materials and some disposal of materials would occur during this phase.
- 12.8.2** The sensitivity of the disposal facilities, including Docks Way Landfill, is considered to be medium. Given the small, and infrequent, volumes of materials required for the operational phase and the small requirements for disposal the magnitude of the impact is considered to be negligible. The significance of effect is therefore considered to be slight adverse.

12.8.3 Any landscape or routine infrastructure maintenance would employ the waste hierarchy of reduction, reuse and recycling of waste prior to disposal. Following these procedures would minimise the impact upon receptors.

12.8.4 Surface water monitoring is proposed for 5 years following construction in order to confirm no unacceptable impacts are realised.

Complementary Measures

12.8.5 The Complementary Measures proposed are described in Chapter 2 (Scheme Description). These measures would not require any additional land take and is not likely to require significant levels of materials use or waste generation during operation (over and above that described above for the new section of motorway). Therefore no significant effects on materials would be likely to occur.

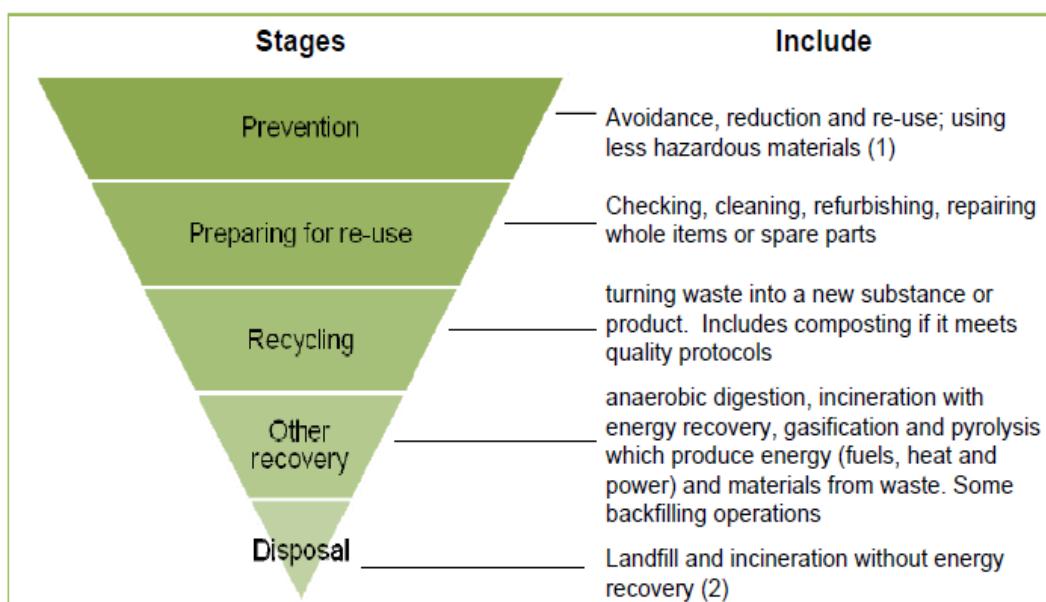
12.9 Mitigation and Monitoring

Construction Phase

12.9.1 Construction practice has been discussed as part of the preceding sections. The following provides further information relating to proposed mitigation measures.

12.9.2 The following mitigation measures would be implemented to reduce the impact upon identified receptors from the use of material resources and the generation and management of waste during construction.

12.9.3 To mitigate the amount of excavated material that is classified as waste and requires off-site disposal, the waste hierarchy defined in the Waste Framework Directive (Directive 2008/98/EC) would be adopted for the Scheme. The hierarchy would be applied as a priority order in waste prevention and management legislation and policy.



12.9.4 The hierarchy indicates that where waste is unavoidable, products and materials can, subject to regulatory controls, be reused again for the same or a different purpose. Otherwise, resources should be recovered from waste through

recycling or in the generation of energy. Only where none of the above offer an appropriate solution should materials be disposed of as waste.

- 12.9.5** Adopting the waste hierarchy would significantly reduce the amount of material requiring off-site disposal, and it is considered that the quantity of material requiring disposal as part of the construction phase with the measures in place would be negligible.
- 12.9.6** The Materials Management Plan for the Scheme will demonstrate that site won materials would be managed and reused in accordance with Definition of Waste: Development Industry Code of Practice (CL:AIRE, 2011) and therefore is not be classified as 'waste'. Materials to be covered by the Materials Management Plan will be identified within the Site Waste Management Plan. An Outline Materials Management Plan is provided as part of Appendix 3.2 of this ES.
- 12.9.7** The reuse of site won materials would be subject to compliance with relevant specifications and assessment criteria to ensure engineering suitability and protection of environmental receptors. The assessment criteria would be agreed with NRW and Newport and Monmouthshire local planning authorities and compliance would mitigate the risk presented to environmental receptors.
- 12.9.8** Where necessary, materials initially unsuitable for reuse (due to non-compliance with relevant specifications and/or assessment criteria) would be treated and/or processed onsite to render them suitable for use. Treatment would include stabilisation/solidification of contaminated soils, whilst processing would include the screening and crushing of materials to achieve the required grading requirements.
- 12.9.9** Where treatment is not practical and the material is unacceptable for embankment construction, it may be used in areas of landscape mitigation where appropriate.
- 12.9.10** The reuse of site won materials, as opposed to the import of replacement primary raw materials, mitigates the depletion of mineral resources and reduces the impact upon the local transport network caused by additional vehicular movements. Additionally, minimising the amount of material that requires off-site disposal as waste reduces the impacts upon disposal facilities.
- 12.9.11** The reuse of materials would be undertaken in accordance with the Materials Management Plan. The Plan would include details of the assessment criteria for material reuse and details of the proposed locations where materials shall be reused. An Outline Materials Management Plan is provided as part of Appendix 3.2 of this ES. This will form the basis of the final Materials Management Plan to be developed prior to construction.
- 12.9.12** Where materials are required for import from off-site sources, local suppliers, where possible, would be preferentially selected to reduce the impact upon the local transport network. Materials anticipated for import include materials for road pavement construction, aggregates, reinforcing and structural steelwork and concrete.
- 12.9.13** A watching brief would be maintained during site works to identify any as yet unidentified/unexpected areas of contamination and prevent any potential spreading of contaminated materials during the works. Appropriate plans and method statements to stockpile separately and manage any contamination

identified, and to prevent spreading of such contamination would be prepared within the remediation strategy for the Scheme and documents supporting the Materials Management Plan. An Outline Remedial Strategy is provided at Appendix 11.2 of this ES.

- 12.9.14** Good construction practices would be adopted as per the relevant Pollution Prevention Guidelines (EA, NIEA & SEPA, 1999, 2005, 2011, 2012 and 2013), including all necessary precautions to prevent any deterioration of the environment e.g. due to fuel leaks from plant.

Operational Phase

- 12.9.15** The potential impacts of waste materials resulting from the operational activities of the Scheme would be minimised by appropriate management to include regular collection of any road debris and the appropriate disposal of materials generated through landscape maintenance.

12.10 Assessment of Land Take Effects

Proposed New Section of Motorway

- 12.10.1** It has been identified that as a result of construction of the proposed new section of motorway the future extraction of existing mineral deposits within the footprint would be precluded.
- 12.10.2** The effects post mitigation would remain as outlined in Section 12.6 (slight adverse significance).

Complementary Measures

- 12.10.3** The Complementary Measures proposed are described in Chapter 2 (Scheme Description). These measures would not require any additional land take over and above those discussed in the sections above for the new section of motorway. Therefore no significant effects on materials would be likely to occur.

12.11 Assessment of Construction Effects

Proposed New Section of Motorway

- 12.11.1** It is considered that, by application of standard good construction practice, which was taken into account in the assessments presented in Sections 12.6 to 12.8, and implementation of the mitigation measures described in Section 12.9, the potential effects identified in Section 12.7 would be reduced.
- 12.11.2** This would involve use of guidance such as the Environment Agency's Pollution Prevention Guidelines (PPG) (in particular PPG1, PPG5, PPG6, PPG21) as sources of good practice. These guidance documents include recommendations regarding use of fuel spill kits and safe storage requirements. The application of appropriate working methods developed using these guidance documents would mitigate against potential human health and controlled water contaminant linkages being created during construction.
- 12.11.3** Good working practices would be applied, e.g. damping down of dust during dry conditions to prevent exposure to workers and off-site dispersion.

- 12.11.4** Pollution risks from the storage of fuel for plant and machinery as well as leaks and spillages would be addressed with the adoption of appropriate method statements and working practices.
- 12.11.5** As summarised in Table 12.11 below, the remaining adverse effects during the construction phase, following mitigation, are generally considered to be slight adverse. In the case of the reuse of site won previously contaminated soils, the treatment process would provide betterment of the existing soil quality and result in a beneficial impact upon environmental receptors. One temporary moderate adverse effect relating to transport of materials has been identified.

Table 12.11: Magnitude of Impact and Significance of Effect during Construction Following Mitigation

Impact	Mitigation	Magnitude of impact	Significance of effect
Depletion of mineral resources: Use of site won rock during construction	Appropriate processing to minimise waste	Minor	Slight adverse
Reuse of site won contaminated soils: Storage and potential for cross-contamination	Use of good practice in storage of construction materials. Watching brief during site works to identify any hotspots of contamination. Appropriate plans and method statements to stockpile and manage separately any contamination identified to prevent spreading. Note that treatment of existing areas of contamination also has the potential for an improvement to existing conditions for contaminated sites. Further details are provided in Chapter 11.	Negligible	Slight adverse/beneficial
Impact on mineral resources at Ifton and Machen quarries	The reuse of site won materials rather than the import of primary raw materials.	Minor	Slight adverse
Impact on local road network (movement of materials)	Minimise the amount of material requiring import (i.e. maximise the amount of material reuse) Undertake detailed assessment of traffic flows/traffic impact assessment	Moderate	Moderate adverse
Reduced capacity of waste disposal facilities (if reuse not possible)	Minimise the amount of site won materials requiring off- site disposal as waste (i.e. adopting the waste hierarchy defined in the Waste Framework Directive)	Negligible	Slight adverse

Complementary Measures

- 12.11.6** The Complementary Measures proposed are described in Chapter 2 (Scheme Description). These measures would not require any additional land take and is not likely to require significant levels of materials use or waste generation during construction (over and above that described above for the new section of motorway). Therefore no significant effects on materials would be likely to occur.

12.12 Assessment of Operational Effects

Proposed New Section of Motorway

- 12.12.1** There would not be a significant requirement for the importation or disposal of materials during the operation of the new section of motorway. However, materials arising from routine maintenance operations, such as the disposal of damaged safety fences, resurfacing and landscaping materials would occur during this phase.
- 12.12.2** By employing the waste hierarchy of reduction, reuse and recycling of waste prior to disposal waste disposal would be minimised thereby reducing potential impacts. The effects would remain as described in Section 12.8 above.

Complementary Measures

- 12.12.3** The Complementary Measures proposed are described in Chapter 2 (Scheme Description). These measures would not require any additional land take and is not likely to require significant levels of materials use or waste generation during operation (over and above that described above for the new section of motorway). Therefore no significant effects on materials would be likely to occur.

12.13 Assessment of Cumulative Effects

- 12.13.1** The assessment of cumulative effects upon material resources from construction of the new section of motorway and other proposed (but not yet built) developments is presented in Chapter 17 (Assessment of Cumulative Effects and Inter-relationships).

12.14 Inter-related Effects

- 12.14.1** The use of material resources for construction of the Scheme together with the management of waste may also give rise to other impacts, including detrimental impacts on air quality, water quality, nature conservation, landscape and noise. The impacts upon these receptors, as a result of the Scheme's construction, are considered within the relevant sections of the ES: Air Quality (Chapter 7), Water Quality (Chapter 16), Nature Conservation (Chapter 18), Landscape (Chapter 9) and Noise (Chapter 13). Further details of inter-related effects are considered in Chapter 17.

12.15 Summary of Effects

- 12.15.1** The likely significance of environmental effects from the use of material resources, and the generation and management of waste, resulting from the construction and operation of the Scheme are summarised in Table 12.12 below.
- 12.15.2** The strategy for construction is to reuse as much of the material won (excavated) during construction as possible. This would maximise the sustainability of the Scheme by minimising both the amount of material that would otherwise be transported for disposal and the amount of imported primary raw materials, thereby preserving mineral resources.
- 12.15.3** The resultant effect on mineral sterilisation and depletion of resources is assessed as slight adverse.
- 12.15.4** The reuse of site won materials would be undertaken in accordance with the approach set out in the Definition of Waste: Development Industry Code of Practice (CL:AIRE, 2011). This would require the preparation of a Materials Management Plan that would control and document the reuse of materials. The reuse of site won materials would furthermore be subject to their compliance with relevant assessment criteria to ensure suitability and protection of environmental receptors. These requirements are provided in an Outline Remedial Strategy (Appendix 11.2). An Outline Materials Management Plan is provided as part of Appendix 3.2 of this ES.
- 12.15.5** Where materials are initially unable to meet the assessment criteria they would either be treated to make them suitable for use or, as a last resort, disposed of off-site as waste. Effective treatment would offset the need for imported material resources and minimise the requirements for disposal.
- 12.15.6** During the construction phase, standard best construction practice would be adopted. A Construction Environmental Management Plan (CEMP) will set out the controls for material storage. A Pre-CEMP is provided at Appendix 3.2 of this ES.
- 12.15.7** This approach for managing materials is consistent with the waste hierarchy defined in the Waste Framework Directive (Directive 2008/98/EC). Adopting the waste hierarchy would significantly reduce the amount of material requiring off-site disposal and hence minimise potential impacts relating to movement of materials both on to and off the site.
- 12.15.8** The assessment demonstrates that the significance of adverse environmental effects with mitigation in place is generally slight. However, during construction the importation of materials and associated traffic movements could potentially result in short term, localised, moderate adverse effects particularly relating to increased heavy goods vehicle movements. Detailed traffic management would be required to mitigate the movement of materials during construction.
- 12.15.9** During the operational phase there would be no significant effects anticipated associated with material resources.

Table 12.12: Summary of Likely Environmental Effects on Material Resource

Impact/ Activity	Sensitivity of receptor	Description of impact	Short/ medium/ long term	Magnitude of Impact (prior to mitigation)	Significance of effect (prior to mitigation)	Magnitude of impact (with mitigation)	Significance of effect (with mitigation)	Significant / Not significant
Land Take								
Permanent land take	Low	Sterilisation of mineral resources beneath footprint of Scheme	Long term	Moderate	Slight adverse	Moderate	Slight adverse	Not Significant
Construction								
Use of site won rock	Low	Depletion of mineral resources	Long term	Moderate	Slight adverse	Minor	Slight adverse	Not Significant
Use of site won contaminated soils	High	Storage and potential for cross-contamination	Short to medium term	Major	Large adverse	Negligible	Slight adverse/beneficial	Not Significant
Use of imported materials	Medium	Impact on mineral resources at Ifton and Machen quarries	Long term	Moderate	Moderate adverse	Minor	Slight adverse	Not Significant
Movement of materials	High	Impact on local road network	Short to medium term	Major	Large adverse	Moderate	Moderate adverse	Significant
Disposal of materials	Medium	Reduced capacity of waste disposal facilities	Long term	Major	Large adverse	Negligible	Slight adverse	Not Significant
Operation								
Use and disposal of materials	Medium	Disposal of waste materials during operation	Long term	Negligible	Slight adverse	Negligible	Slight adverse	Not Significant