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Llywodraeth Cymru
Welsh Government

The M4 Motorway (Junction 23 (East of Magor) to West of Junction 29 (Castleton) and Connecting Roads) and The M48 Motorway (Junction 23 (East of Magor) Connecting Road) Scheme 201-

The M4 Motorway (Junction 23 (East of Magor) to West of Junction 29 (Castleton) and Connecting Roads) and The M48 Motorway (Junction 23 (East of Magor) Connecting Road) (Amendment) Scheme 201-

The London to Fishguard Trunk Road (East of Magor to Castleton) Order 201-

The M4 Motorway (West of Magor to East of Castleton) and the A48(M) Motorway (West of Castleton to St Mellons)(Variation of Various Schemes) Scheme 201-

The M4 Motorway (Junction 23 (East of Magor) to West of Junction 29 (Castleton) and Connecting Roads) and the M48 Motorway (Junction 23 (East of Magor) Connecting Road) and The London to Fishguard Trunk Road (east of Magor to Castleton) (Side Roads) Order 201-

The Welsh Ministers (The M4 Motorway (Junction 23 (East of Magor) to West of Junction 29 (Castleton) and Connecting Roads) and the M48 Motorway (Junction 23 (East of Magor) Connecting Road) and the London to Fishguard Trunk Road (East of Magor to Castleton)) Compulsory Purchase Order 201-

The M4 Motorway (Junction 23 (East Of Magor) to West of Junction 29 (Castleton) and Connecting Roads) and The M48 Motorway (Junction 23 (East Of Magor) Connecting Road) (Supplementary) Scheme 201-

The Welsh Ministers (The M4 Motorway (Junction 23 (East Of Magor) to West of Junction 29 (Castleton) and Connecting Roads) and The M48 Motorway (Junction 23 (East Of Magor) Connecting Road) and The London to Fishguard Trunk Road (East of Magor to Castleton)) Supplementary Compulsory Purchase Order 201-

Proof of Evidence

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Welsh Government, Land Contamination

Document Number: WG 1.11.1

M4 CORRIDOR AROUND NEWPORT**Proof of Evidence – Contamination****Contents**

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1. Author

- 1.1 My name is Andy Clifton and I am employed by RPS Planning and Development, a division of RPS Group plc as an Operational Director.
- 1.2 My academic qualifications include a BSc Honours Degree in Geology and a MSc Degree in Engineering Geology. I am a Chartered Engineer, Chartered Scientist and Chartered Environmentalist. I am a Member of the Institute of Materials, Minerals and Mining, a Member of the Institution of Environmental Sciences, a Member of the British Geotechnical Association and a fellow of the Geological Society. I also hold 'Advisor' status on the UK Register of Ground Engineering Professionals and I am a Contaminated Land: Application In Real Environments (CL:AIRE) Qualified Person.
- 1.3 As a Member of the Institutions described above I must abide by their Codes of Professional Conduct, which set out the standards, ethics and professional behaviour expected of Members.
- 1.4 I have over twenty years' experience in the construction and development industry, primarily as a land contamination specialist. I have undertaken numerous ground characterisation and remediation projects to support a wide variety of development proposals ranging from new nuclear power stations to housing developments to major new transport infrastructure.
- 1.5 In 1999 I co-authored a paper on contaminated land risk assessments [A. Clifton, M. Boyd, S. Rhodes. Assessing the Risks. *Land Contamination and Reclamation*, Volume 7, Number One, pp 27-32. (January 1999)].
- 1.6 I have worked on and led various land contamination assessment projects and have developed and implemented land remediation and waste management strategies on a variety of different kinds of brownfield and operational industrial sites. These have included: infilled quarries; laboratory sites; power stations; waste management facilities; and former landfill sites. In addition to the assessment and management of land contamination to help facilitate new development, I have experience of managing land contamination associated with obtaining and surrendering environmental permits.

- 1.7 During my career I have contributed to Environmental Impact Assessments (EIAs) associated with the consenting of development and infrastructure projects. My input has been particularly in regard to construction and operational impacts from and to ground conditions including land contamination, materials and waste management.
- 1.8 I was the contamination lead specialist during the consenting process and subsequent enabling works at Atomic Weapons Establishment (AWE) Burghfield where I was responsible for the Ground Conditions chapter in the Environmental Statement (ES) and the design, implementation and verification of the remediation of a former site tip containing various contaminants including asbestos. My work enabled all of the land contamination planning conditions to be discharged and the development has been completed.
- 1.9 I contributed to the Development Consent Order application for the Hinkley Point C nuclear power station including the conventional waste management chapter for the ES and agreeing a Statement of Common Ground with the Environment Agency (EA) and local councils. This included incorporating the management of contaminated materials into an integrated waste management strategy.
- 1.10 After designing and implementing a land contamination investigation and assessment, I agreed a remediation strategy with the EA for Fawley Power Station that would be acceptable to enable the full surrender of the site's environmental permit.

Personal Role on the Scheme.

- 1.11 I first became involved in the M4 Corridor Around Newport (M4CaN) Scheme (the Scheme) in 2013 to support the Costain Vinci Joint Venture's (CVJV) tender to undertake the Scheme, having previously carried out land contamination assessments in Newport Docks. Since my initial involvement and as a member of the CVJV's design team, I have led the assessment of land contamination and developed the land contamination management strategy including the outline remediation strategy. I was responsible for the

production of Chapter 11 Soils and Geology of the March 2016 ES (Document 2.3.2) including associated appendices and annexes and updates contained within the September 2016 ES Supplement (Document 2.4.4) and December 2016 ES Supplement (Document 2.4.14). During the course of the project I have met with relevant Statutory Consultees (Natural Resources Wales (NRW), Newport City Council (NCC) and Monmouthshire County Council (MCC)) to present land contamination risk assessments and remediation proposals. I also facilitated with them the agreement of the Land Contamination Management Strategy (Appendix SR11.3 of the December 2016 ES Supplement (Document 2.4.14)).

1.12 I am part of the project team responsible for the delivery of the Scheme and I am acting as an expert witness at this inquiry. The evidence which I have prepared and provide in this Proof of Evidence is true and has been prepared and is given in accordance with the guidance of my professional institution. I confirm that the opinions expressed are my true and professional opinions.

2. Scope of Proof of Evidence

- 2.1 This Proof of Evidence addresses land contamination relating to the proposed M4 Corridor around Newport.
- 2.2 In Section 3, I describe the relevant policies and guidance applicable to the management of land contamination associated with new developments. I also discuss the methods adopted to assess the baseline conditions and identify potential impacts.
- 2.3 In Section 4, I describe the current baseline position with regard to ground conditions and land contamination in the vicinity of the Scheme. This will include information on the establishment of this baseline position.
- 2.4 In Section 5, I describe the proposed land contamination remediation and mitigation of potential effects.
- 2.5 In Section 6, I respond to issues and objections raised by regulatory, organisations and an individual with regard to land contamination matters.
- 2.6 In Section 7, I set out my conclusions.
- 2.7 My evidence is therefore presented in the following structure:
 1. Author
 2. Scope of Proof of Evidence
 3. Methodology, Policy and Guidance
 4. Establishment of Baseline Conditions and Land Contamination Risk Assessment
 5. Land Contamination Remediation and Mitigation
 6. Responses to Objections
 7. Summary and Conclusions
 8. Appendices

2.8 It is not my intention to reproduce large sections of text from the March 2016 ES Chapter and its Appendices (Document 2.3.2), but simply to cross refer to, or highlight key procedural and technical matters that are pertinent to the assessment of the Scheme. Consequently, in this evidence I will refer to supporting material contained within the March 2016 ES (Document 2.3.2) the September 2016 ES Supplement (Document 2.4.4) and the December 2016 ES Supplement (Document 2.4.14) where relevant.

Links to Other Evidence

2.9 The effects of land contamination on water quality are considered within my evidence. However, further detail on the potential impact of the Scheme on water quality is provided in the Drainage and Water Environment Statement of Evidence by Mr Richard Graham (WG 1.15.1). Mr Barry Woodman's evidence (WG 1.6.1) provides detail of how the remediation of contaminated soils is incorporated into the Scheme's construction. Dr Peter Ireland's evidence (WG 1.7.1) discusses the Register of Environmental Commitments which I also refer to within my evidence.

3. Methodology, Policy and Guidance

Introduction

- 3.1 This section sets out relevant government policy, designations and UK guidance on land contamination.

Land Contamination

- 3.2 In Wales, Part IIA of the Environmental Protection Act (EPA) 1990 (Doc 12.1.1), as introduced by Section 57 of the Environment Act 1995, is implemented by the Contaminated Land (Wales) Regulations 2006 as amended¹ (Doc 12.1.7) Under Part IIA of the EPA, sites are 'determined' as 'contaminated land' by the Local Authority if they are causing, or if there is a significant possibility of causing, significant harm to human health or significant pollution of controlled waters. Controlled waters are defined by the Water Act 2003 (Doc 12.1.5) as including both surface waters and groundwater within an aquifer. In general terms, the legislation advocates the use of a risk assessment approach to assessing contamination and remedial requirements. The contaminated land regime under EPA Part IIA is focussed on the identification and subsequent management of contaminated sites based on existing use. In the case of a change in use contamination is managed under the planning regime.

Planning Policy Wales

- 3.3 The current national guidance on planning and pollution control, including development on potentially contaminated land, is outlined in Chapter 13: Minimising and Managing Environmental Risks and Pollution of Planning Policy Wales (PPW Edition 9) (Document 5.1.12). Land contamination is a material planning consideration. PPW (paragraph 13.5.1) advises that 'the planning system should guide development to lessen the risk from natural or human-made hazards, including risk from land instability and land contamination. The aim is not to prevent the development of such land, though in some cases that may be the appropriate response. Rather it is to ensure

¹ Contaminated Land (Wales) Regulations 2012

that development is suitable and that the physical constraints on the land, including the anticipated impacts of climate change, are taken into account at all stages of the planning process. However, responsibility for determining the extent and effects of instability or other risk remains that of the developer.'

- 3.4 In paragraph 13.7.1 PPW goes on to state that 'planning decisions need to take into account:
- a. The potential hazard that contamination presents to the development itself, its occupants and the local environment.
 - b. The results of a specialist investigation and assessment by the developer to determine the contamination of the ground and to identify any remedial measures required to deal with any contamination.'
- 3.5 PPW sets out the inter-relationship between the contaminated land regime under the provisions of Part IIA of the EPA and the planning regime. In paragraph 13.7.4 PPW sets out that a development will not lead to the site being designated as contaminated land under Part IIA of the EPA and the onus is on the developer to ensure this. The local planning authority's role is to ensure that the land is suitable for its proposed use.
- 3.6 Newport City Council's Local Development Plan (Document 5.3.1) includes objectives that are in part related to land contamination (Objective 6 – Conservation of the Natural Environment and Objective 9 – Health and Well Being). General Development Principle GP7 relates to Environmental Protection and Public Health and states that '*development will not be permitted which would cause or result in unacceptable harm to health because of land contamination, dust, instability or subsidence, air, heat, noise or light pollution, flooding, water pollution, or any other identified risk to environment, local amenity or public health and safety.*'
- 3.7 The Part IIA contaminated land regime and local and national planning policy all require a risk based approach to managing land contamination. The presence of contamination alone does not necessarily require remediation. For a risk to exist a viable pathway must exist between any contaminant and a

relevant receptor (i.e. there must be a contaminant linkage). Only contamination considered to be causing an unacceptable risk should be remediated.

Land Contamination Guidance

- 3.8 The Development of Land Affected by Contamination: A Guide for Developers (Document 12.2.10) has been produced for the benefit of developers who may be involved in the assessment and management of land contamination in Wales under the planning regime. The guide sets out a land contamination management procedure which is consistent with the CLR11 Model Procedures for the Management of Land Contamination (Document 12.2.3), the latter being the land contamination industry accepted good practice guidance document in the UK.
- 3.9 As the Scheme is for a new highway under the Highways Act 1980 (Document 3.1.5) and is subject to the need for an EIA, the assessment was carried out in line with the Design Manual for Roads and Bridges (DMRB) guidance including the methodology described in DMRB 11.3.11 Geology and Soils (Document 6.1.8). In addition the Scheme was designed following DMRB 4.1.2 HD22/08 Managing Geotechnical Risk (Document 6.1.8) which in turn refers to further guidance on addressing potential land contamination (DMRB 4.1.7 HA 73/95. Site Investigation for Highway Works on Contaminated Land (Document 6.1.8)).
- 3.10 The HA 73/95 guidance requires adequate ground investigation is undertaken to characterise the ground conditions at the Scheme. A number of ground investigations have been undertaken along the route of the proposed new section of motorway (see Table A below) and the approach taken for the Scheme in my opinion meets the guidance in HA73/95. However, since the HA 73/95 guidance was published in 1995 new legislation has come into force (including the Contaminated Land (Wales) Regulations 2006 as amended² (Doc 12.1.7) and further guidance on the assessment and management of land contamination is now available (including CLR11). This has been

² Contaminated Land (Wales) Regulations 2012

recognised by Highways England (formerly the Highways Agency) in a consultation document (Document 12.3.6) and further DMRB guidance is planned but not yet available. As such, the approach taken to assess land contamination has adopted more recent guidance which is centred on CLR11 (Doc 12.2.3). This guidance is advocated by NRW, MCC and NCC and is also cited within the Welsh Local Government Association Document Development of Land Affected by Contamination: A Guide for Developers (Document 12.2.10). The adopted approach taken to the assessment of land contamination has considered the effects of land contamination on the Scheme during construction and operation. The approach taken was also agreed with NRW, MCC and NCC (December 2016 ES Supplement Appendix SR11.3 (Doc 2.4.14)).

- 3.11 The CLR11 (Document 12.2.3) guidance sets out a phased approach to land contamination management starting with a preliminary risk assessment, then further investigation and assessment where potential unacceptable risks may exist. This is followed by a remedial options appraisal, remediation design and then implementation where risks are considered unacceptable. Finally, verification of remediation is undertaken to demonstrate that the remediation was effective.
- 3.12 A preliminary risk assessment and generic risk assessment is set out in the 2014 Preliminary Sources Study Report (PSSR) (Document 12.3.3). This was refined further as the Scheme was developed and data from the 2015 Supplementary Ground Investigation became available and is reported in the Land Contamination Assessment Report (Appendix 11.1 of the March 2016 ES (Doc 2.3.2)). Following the completion of the 2016 Additional Ground Investigation, the Land Contamination Assessment Report was updated further (Appendix R11.1 of the September 2016 ES Supplement (Doc 2.4.4)) as the understanding of the extent and nature of land contamination that could be encountered improved.
- 3.13 Thus in my opinion the EIA undertaken for the Scheme and reported in the March 2016 ES (Document 2.3.2) and the September 2016 ES Supplement (Document 2.4.4) has followed an appropriate approach in line with current

guidance with respect to the identification and characterisation of land contamination and the need for remediation.

4. Establishment of Baseline Conditions and Land Contamination Risk Assessment

Introduction

- 4.1 The detailed assessment of the effects of the Scheme on geology and soils including land contamination is presented in Chapter 11 of the March 2016 ES (Document 2.3.2) and the September 2016 ES Supplement (Document 2.4.4). The assessment was carried out in line with all appropriate guidance, most specifically the methodology described in DMRB 11.3.11 (Document 6.1.8) and CLR11 (Document 12.2.3).
- 4.2 Consultation has been undertaken with a number of appropriate regulatory organisations with responsibilities for the regulation of land contamination throughout the process of collating baseline information and leading to the final Scheme design. Principally this has comprised consultation with NRW, MCC and NCC.
- 4.3 Prior to the commencement of work on the collection and collation of baseline data, a Scoping Report regarding the EIA was issued to statutory consultees (Appendix 5.1 of the March 2016 ES) Document 2.3.2)). Where comments were received from any consultee with regard to the Scoping Report, the scope and methodology of the subsequent assessment was adjusted where necessary to accommodate the consultee's comments.
- 4.4 The focus of the consultation was primarily on land contamination management rather than the protection of sensitive geological sites as no sensitive or designated geological sites would be affected by the Scheme. The consultations included discussions on guidance, policy and standards to be adopted to assess potential risks to controlled waters and human health from land contamination as well as discussions regarding the various potentially contaminated sites that would be affected by the Scheme. The consultations with NRW also included presenting proposals for the remediation and Scheme design within the TATA Steel Llanwern Steelworks site and discussions on the

management of existing environmental permits that would be affected by the Scheme including those held by TATA Steel and Solutia.

- 4.5 The approach to the assessment and remediation of land potentially affected by land contamination was agreed by MCC, NCC and NRW. The key principles agreed and to be adopted for the Scheme are set out in a Land Contamination Management Strategy (Appendix SR11.3 of the December 2016 ES Supplement (Document 2.4.14)).
- 4.6 Five previous ground investigations have been undertaken within the permanent and temporary land take of the Scheme (see Table A) and these are shown on Figures 3a-3p of this evidence.

Table A - Summary of Previous Ground Investigations

Ground Investigation	General Scope of Works
Norwest Holst Soil Engineering Ltd, 1998	87 cable percussive boreholes (30 extended using rotary drilling) 50 rotary cored boreholes 15 rotary open hole boreholes 11 trial pits In situ testing Geotechnical and chemical lab analysis
Exploration Associates, 2000	33 window sample boreholes 11 trial pits In situ testing Geotechnical and chemical lab analysis
Norwest Holst Soil Engineering Ltd, 2008	53 cable percussive boreholes 33 rotary cored boreholes 51 window sample boreholes 56 trial pits In situ testing Geotechnical and chemical lab analysis
Geotechnical Engineering Ltd, 2015 (2015 Supplementary Ground Investigation)	138 boreholes 45 trial pits In situ testing Geotechnical and chemical lab analysis Gas and groundwater monitoring
RPS, 2016 (2016 Additional Ground Investigation)	35 cable percussive boreholes 9 rotary boreholes 28 cable percussive boreholes with rotary follow on 32 window sample boreholes 42 trial pits In situ testing Geotechnical and chemical lab analysis Gas and groundwater monitoring

- 4.7 The 2015 Supplementary Ground Investigation was undertaken on behalf of Welsh Government along the preferred route. Since the publication of the March 2016 ES (Document 2.3.2) an additional stage of ground investigation has been completed. This 2016 Additional Ground Investigation was undertaken in order to provide further data on ground conditions in areas where limited or no ground investigation data was previously available, and to provide data to support further geotechnical design of the Scheme. It was also undertaken to provide further data on some of the previously identified, known and potentially contaminated sites to verify the risk levels identified in the March 2016 ES (Document 2.3.2) and to support the development of the remediation design.
- 4.8 The 2014 PSSR (Document 12.3.3) and the more recent ground investigations and assessments have identified the general ground conditions along the Scheme. The ground investigations have provided data on the geotechnical engineering properties of soils and rocks, the hydrogeological characteristics of soils and rocks as well as a good understanding of the extent of land contamination likely to be affected by the Scheme.
- 4.9 The general geological sequence along the Scheme is set out in Table B below.

Table B - Geological Sequence

Geological Period	Supergroup	Group	Subgroup / Formation
Quaternary	-	-	Glacial Till (GT)
			Alluvium (ALV)
			Head (HD)
			River Terrace Deposits (RTD)
			Tidal Flat Deposits (TFD)
			Glaciofluvial Deposits (GFD)
Triassic	-	Mercia Mudstone Group (MMG)	
		-	Mercia Mudstone (marginal facies)
Carboniferous	Carboniferous Limestone	Pembroke Limestone Group	Gulley Oolite Formation (GOF)
			Blackrock Limestone subgroup (BLF)
		Avon Group (AVG)	
Devonian	Old Red Sandstone (ORS)	Upper ORS	Tintern Sandstone (TSF)
			Quartz Conglomerate (QZ)
		Lower ORS	Brownstone Formation (BWF)
			St Maughans Formation (SMF)
Silurian			Raglan Mudstone Formation (RMF)

4.10 The assessments have also identified 27 specific potentially contaminated sites that are affected by the Scheme and these are set out below in Table C and are shown on Figures 1a-1d of this evidence.

Table C - Potential Land Contamination Sources Impacted by the Scheme

Potential Land Contamination Source Area	Description
CL-1 Castleton Interchange Spoil Heaps	Anecdotal evidence suggests that the spoil heaps were formed from excavation of surplus suitable fill and unsuitable marshy material and top soil during A48 (M) construction, in the late 1970s and from excavation spoil of an attenuation pond in 2009.
CL-2 Former Construction Storage Compound	Used as a storage compound for machinery and materials for M4/A48 (M), and later M4, construction and maintenance work.
CL-3 Pound Hill	A backfilled pit.
CL-4 Cefn Llogel Farm	A historical landfill which reportedly accepted inert waste.
CL-5 Church Road	An area of infilling and historic fly tipping.
CL-6 Radiator Manufacturers and Adjacent Land	Large areas of disturbed ground with ponds, some of which have been backfilled and former industrial site uses.
CL-8 Former Railway Bridge	Made Ground associated with embankments approach of former railway bridge.
CL-9 Green Lane Landfill	Licensed inert landfill with prior use for refuse

Potential Land Contamination Source Area	Description
	tipping.
CL-10 Made Ground	Area with anecdotal evidence of Made Ground identified during 2014 walk over survey.
CL-13 Docks Way Landfill	Area 1 - historic landfill (now restored) accepting inert, household, commercial and industrial waste. Area 2 - active landfill receiving domestic refuse and industrial/commercial waste.
CL-14 Newport Docks	Industrialised area with many industrial and commercial uses. Also includes infilled historic River Ebbw channel. Possible refuse waste extending from Docks Way landfill onto the proposed Southern Distributor Road spur road.
CL-15 Stephenson Street Industrial Estate	Industrial area and docks with discrete features including former refuse tip and backfilled ponds.
CL-16 Infilled River Ebbw	Infilled River Ebbw channel. This area has been included as part of the CL-14 assessment
CL-17 Solutia Chemical Works	Chemical works including historical manufacturing processes associated with polychlorinated biphenyls (PCB). Particular site features comprising PCB cell (buried PCB impacted soil and wastes), Solutia landfill (inert and industrial waste) and Phase III Monsanto landfill (inert waste).
CL-18 River Usk Pier Location	Mudflats of the River Usk (potentially contaminated river sediment).
CL-20 Mir Steel Works and Associated Waste Disposal Site	Steelworks, lagoons and waste disposal area (Slobland Landfill). This area has been included as part of the CL-15 assessment.
CL-22 Former Llanwern Research Laboratories	Former research laboratories and benzene pipeline.
CL-26 TATA Steel Llanwern Steelworks site including reedbeds, metal recovery area and lagoons	Reedbeds, metal recovery area and 4 no. lagoons associated with adjacent steelworks.
CL-27 Elver Pill Reen and Green Moor Landfill	Historic landfill, known infilling in the vicinity of Elver Pill Reen, suspected three discrete locations of buried steelworks waste (Green Moor Landfill).
CL-29 Spoil Heaps and Old Quarry, Llanwern Approach Road	Spoil mounds.
CL-30 Green Moor Quarry Landfill	Historical backfilling of quarry indicated as a refuse tip.
CL-32 Magor Depot (Wilcrick Depot)	Trunk Road Agency depot.
CL-33 B4245 Quarry	Partially backfilled quarry with unknown material.
CL-35 Magor Services	Service station including petrol filling station, car/HGV parking.
CL-38 Knollbury Cesspits	Three cesspits associated with campsite.
CL-39 The Elms Road Old Quarry and Lime Kiln	Partially backfilled quarry with unknown material.
CL-41 Severn Junction Tunnel Yard	Former railway land.

4.11 A Land Contamination Assessment Report has been prepared which details the approach, findings and recommendations resulting from the assessment of land contamination at the Scheme (Appendix R11.1 of the September 2016

ES Supplement (Document 2.2.4)). Each of the 27 potentially contaminated sites has been subject to an individual assessment of potential risks to human health and controlled waters and a report has been prepared for each site (March 2016 ES Appendix 11.1, Annex D (Document 2.3.2)). Sites CL-2, CL-3, CL-4, CL-6, CL-8, CL-10, CL-13, CL-14 (includes CL-16), CL-15 (includes CL-20), CL-17, CL-18, CL-26, CL-27, CL-30 and CL-33 were subject to additional ground investigation and the reports were updated and published within the September 2016 ES Supplement Appendix R11.1, Annex D (Document 2.4.4)).

Human Health Risk Assessment

- 4.12 Human health risks from potential contamination affecting construction workers and members of the general public adjacent to the Scheme have been qualitatively assessed. To meet requirements of current health and safety legislation, including the Construction Design Management Regulations 2015, the contractor would adopt safe working procedures and controls to protect construction workers and the general public. For the majority of the 27 identified potentially contaminated sites, normal safe working procedures and industry good practice that would be adopted on a typical construction-site on brownfield land would be adequate to mitigate risks. This would include site inductions and tool box talks to ground-workers, provision of personal protective equipment, procedures for dealing with previously unidentified and unexpected contamination, dust control measures and vehicle wheel washes.
- 4.13 Notwithstanding these general measures, the following 13 potentially contaminated sites would need additional site controls and procedures during construction to mitigate risks to construction workers:
- a. CL-13 Docks Way Landfill
 - b. CL-14 Newport Docks (including CL-16 Infilled River Ebbw)
 - c. CL-15 Stephenson St Industrial Estate (including CL-20 Mir Steel Works and Waste Disposal Site)

- d. CL-17 Solutia Chemical Works
- e. CL-18 River Usk Pier Location
- f. CL-22 Former Llanwern Research Laboratories
- g. CL-26 Llanwern Steelworks including Lagoons
- h. CL-27 Elver Pill Reen and Green Moor Landfill
- i. CL-32 Magor Depot
- j. CL-35 Magor Services
- k. CL-39 The Elms Road Old Quarry and Lime Kiln

4.14 Risks associated with hazardous ground gas that could be encountered during construction that also require risk control measures to be in place are discussed in paragraphs 4.29-4.31 of this evidence.

4.15 The long term (chronic) risks to human health have been assessed. This was carried out using modern guidance including the use of Generic Assessment Criteria (GAC) derived using the Environment Agency's Contaminated Land Exposure Assessment (CLEA) Framework model³ whereby measured soil contaminant concentrations can be compared. The CLEA model includes consideration of inhalation, ingestion and dermal contact exposure pathways from contamination in soils. Suitable for Use Levels (S4ULs) published by CIEH / LQM (Document 12.3.5) using the most relevant potential contaminant exposure scenario models have been taken as the primary source of GAC used in the assessment. The most stringent GAC from either public open space (park) or commercial end use exposure scenarios were adopted. The use of S4ULs was agreed with MCC and NCC as stated within the Land Contamination Management Strategy (Appendix SR11.3 of the December 2016 ES Supplement (Document 12.4.14)).

³ Environment Agency. [CLEA Software \(Version 1.05 Handbook\)](#) Better Regulation Science Programme. Science report: SC050021/SR4. Sept 2009.

- 4.16 The Contaminated Land Statutory Guidance (Document 12.2.23) states that the use of assessment criteria alone should not be the only reason to decide whether remedial action is needed. The decision on remediation needs to consider other factors such as the depth of the contamination and the type and nature of the future ground surface above the contamination. This point has been taken into account during the assessment as contaminated soils that would be left within the permanent works will be covered by the motorway embankment which itself would have hardstanding and clean topsoil for landscaping. This would prevent future motorway users being exposed to contaminated soils and similarly potentially contaminated dusts would not be generated mitigating risks to adjacent land.
- 4.17 The comparison of chemical test results of soil samples collected during ground investigations to the GAC has identified that only a limited number of soil samples exceeded the screening criteria. This strongly indicates that large areas of gross contamination that could cause unacceptable risks to human health are not present, even within known areas where potentially contaminating activities have or may have occurred. When account is taken of the Scheme's design and that potentially contaminated soils will be covered by hardstanding and landscaped area, the long term risks to human health are low to very low along the full length of the proposed new section of motorway during its operation.
- 4.18 A potential risk to future maintenance workers being exposed to polychlorinated biphenyls (PCB) contaminated soils was identified at CL-17. In this area a potential risk was identified where maintenance workers could come into contact with contaminated soils remaining in situ outside the pier footprints or embankment footprint required for the Scheme. Remediation would therefore be required to mitigate this risk and this would take the form of the placement of a clean layer of soil of appropriate thickness across the affected areas.
- 4.19 Localised occurrences of asbestos contaminated soils have been identified in discrete areas in a small number of the potentially contaminated sites including CL-17 and there is a risk that asbestos may be encountered in the areas of

historical uncontrolled tipping associated with Docks Way Landfill (CL-13) along the proposed Docks Way Link. Control measures would be needed in these areas to mitigate risks from asbestos both during construction and during operation of the Scheme. As with many construction projects involving brownfield sites, there is a risk that asbestos contaminated soils may be unexpectedly encountered and as such procedures and control measures would need to be implemented during construction to mitigate this risk. I discuss this further in paragraphs 4.39, 5.9 and 5.24 of this evidence.

Controlled Waters

- 4.20 To assess risks to controlled waters a screening assessment that compares measured water quality results collected from previous groundwater and surface water sampling activities to appropriate water quality assessment criteria was undertaken. Two sources of statutory and non-statutory water quality assessment criteria were used:
- a) Environmental Quality Standards (EQS) defined for the protection of the ecology of water environments.
 - b) Drinking Water Standards (DWS) defined on the basis of water to be used for human consumption.
- 4.21 Trigger levels developed by the former Countryside Council for Wales (CCW) to determine when further investigation or remedial action is required on the basis of a potential impact to water quality in the Gwent Levels were also adopted during the assessments.
- 4.22 For each of the 27 potentially contaminated sites, in order to identify potential risks to controlled waters, groundwater and soil leaching test results were compared to the assessment criteria. In addition a conceptual site model was developed for each site. These identify potential controlled water receptors and also potential pathways via which contaminants could impact controlled waters based on the Scheme design. An assessment was also made of the baseline surface water and groundwater conditions along the route of the proposed new section of motorway so that an evaluation of the likelihood of

deterioration in the existing baseline water quality could be made. This was important as instances of some contaminant concentrations already exceeding EQS and DWS were identified in surface water and groundwater samples both within potentially contaminated sites and also well beyond potentially contaminated sites. This indicated that there is a background level of some contaminants such as arsenic, boron, copper, nickel and selenium. The baseline water condition is set out within the Baseline Water Environment Report (Appendix 16.2 of the March 2016 ES (Document 2.3.2)).

4.23 The key controlled waters receptors assessed were:

- a. Rivers and streams including the River Usk and River Ebbw.
- b. Land drainage including the reens and ditches of the Gwent Levels.
- c. Aquifers designated by NRW.
- d. Known surface water and groundwater abstractions including private supplies.

4.24 For each potentially contaminated site a number of potential pathways were assessed including:

- a. Contaminated surface water run-off into land drainage surface waters.
- b. Downward vertical migration of contaminated leachate and/or contaminated perched water within the Made Ground into the main groundwater bodies.
- c. Downward vertical migration of contaminated leachate and/or contaminated perched water within the Made Ground into the main groundwater bodies and subsequent lateral migration to surface waters.
- d. Creation of new pathways for shallow contamination to migrate along piles and foundations from the Made Ground, through the Tidal Flat Deposits and into Glaciofluvial Deposits and/or Mercia Mudstone.

- 4.25 Other pathways were initially assessed but have subsequently been discounted as additional ground investigation data became available during the Scheme development. The following pathways have been discounted and are not considered significant:
- a. Upward migration of saline aquifer water into surface waters via band drains during construction. This is because the volumes of pore water operated by band drains during surcharges moving upwards would be low as pore waters are likely to migrate downwards. Furthermore any pore waters that do migrate vertically would be directed into the wider construction water drainage control system and would not be directly discharged to surface waters.
 - b. Downward migration via band drains of contaminants in perched groundwater and leachable contaminants in contaminated soils. This is because the increased concentration of contaminants migrating downwards in band drains causing an appreciable deterioration of groundwater quality in the aquifer would be negligible, the duration of the surcharging activities that the band drains are to be installed for is short term and the volume of pore water would be low. Furthermore, the aquifer quality beneath the Tidal Flat Deposits where band drains are proposed is considered poor, is not an important potable water resource and is not in hydraulic continuity with the surface water drainage within the Wentlooge and Gwent Levels.
- 4.26 During construction the greatest potential risk to controlled waters without mitigation is considered to be from uncontrolled contaminated run-off entering sensitive surface waters, including the Gwent Levels SSSI particularly from the CL-26 (TATA Steel Llanwern Steelworks area) but also at CL-13, CL-17, CL-22, CL-27 and CL-35.
- 4.27 There are also potential risks during construction at 11 potentially contaminated sites (CL-13, CL-17, CL-18, CL-22, CL-26, CL27, CL-32, CL-33, CL-35, CL-39 and CL-41). from contaminants leaching from soils and perched groundwater either migrating downwards into underlying aquifers or entering

surface waters. Further piling and foundation works risk assessments would need to be undertaken to determine the level and types of control needed. No known private abstractions have been identified to be at risk from the 27 potentially contaminated sites.

- 4.28 During operation of the Scheme the assessments indicate that the risk to controlled waters will be low for 21 of the 27 sites with the 6 remaining sites (CL-17, CL-22, CL-33, CL-35, CL-39 and CL-41 being considered either moderate or moderate to low risk. Nonetheless for these 6 sites remedial action would be required to mitigate potential risks.

Hazardous Ground Gases

- 4.29 An assessment of risks during construction and operation of the Scheme from potentially hazardous ground gases has been undertaken. The assessment has used UK guidance including CIRIA C665: Assessing Risks Posed by Hazardous Ground Gases to Buildings, 2007 (Document 12.2.4) and has considered an evaluation of hazardous ground gases at each of the 27 potentially contaminated sites as well as an assessment of hazardous ground gases being generated by natural soils such as the organic soils of the Tidal Flat Deposits throughout the Scheme.

- 4.30 The assessment has identified that gas control measures and safe working procedures would be required during construction ground works within the Tidal Flat Deposits, particularly associated with piling and band drain installation, in order to protect construction workers. Additional detailed assessments to enable specific safe methods of working would be needed within CL-26 due to the potential for hydrogen sulphide and carbon monoxide to be encountered during excavations within the lagoons. Additional controls and safe working construction methods would be needed in other potentially contaminated sites including CL-13, CL-14, CL-35 and CL-39 due to the potential presence of landfill gases being generated from historical tipping activities. In CL-15, CL-17, CL-26 and CL-32 potential hydrocarbon contamination may necessitate additional safety controls to protect construction workers from exposure to volatile organic compounds.

4.31 The gas risk assessment has also identified the need for gas controls to be incorporated into the design of the new section of motorway to mitigate the potential increase in risk of ground gases migrating off-site and impacting adjacent properties. The mitigation will be provided in the finalised Remediation Strategy Report.

Summary of Risks from Land Contamination

- 4.32 The table in Appendix 1 of this evidence which is taken from Annex E of Appendix R11.1 of the September 2016 ES Supplement (Document 2.4.4) and sets out the overall risk levels associated with the expected levels of contamination likely to be encountered within each of the 27 potentially contaminated sites.
- 4.33 Although potentially polluting historical activities may have taken place for many of the potentially contaminated sites, including CL-1, CL-2 and CL-38, only limited or no contamination has been identified. Thus the corresponding risks to human health and controlled waters at these sites are considered very low or low during the construction and operation of the Scheme.
- 4.34 For other sites, including CL-6, CL-14, CL-15, and CL-18, although elevated levels of soil and groundwater contamination have been identified the risks to human health and controlled waters are considered low when the Scheme is in operation. This is due to the limited ability (i.e. likelihood) for contaminants to reach, in sufficient quantity, and adversely affect a viable receptor, that is there is no, or only limited potential contaminant linkage. An example of this is CL-14 where although contaminants in soils may exist the motorway embankment would form a barrier between potential contaminants and future users of the Scheme during its operation.
- 4.35 For other known contaminated sites, namely CL-13, CL-17, and CL-26, remediation and or controls are required to mitigate risks from contamination.
- 4.36 In summary, although potentially polluting historical activities may have taken place, the investigations and risk assessments have identified risks to human health and the environment are low to very low at 12 of the potentially

contaminated sites (CL-1, CL-2, CL-3, CL-4, CL-5, CL-6, CL-8, CL-9, CL-10, CL-29, CL-30 and CL-38). For the other 15 known potentially contaminated sites, namely CL-13, CL-14, CL-15, CL-16, CL-17, CL-18, CL-20, CL-22, CL-26, CL-27, CL-32, CL-33, CL-35, CL39 and CL-41, remediation and or controls are required to mitigate risks from contamination.

4.37 Consideration was also given to ground gas, soils and water contamination sample data outside of the 27 potential contaminated sites. The risks to controlled waters and human health are considered low as would be expected due to the lack of obvious contamination sources.

4.38 A remediation strategy is being developed as set out in the Outline Remediation Strategy Report (Appendix R11.2 of the September 2016 ES Supplement (Document 2.4.4)) to manage land contamination risks, including ground gas, as identified in the Land Contamination Assessment Report. This is discussed in Section 5 of this evidence.

4.39 In addition, and as with any construction project where brownfield land is present, there is a chance that previously unidentified and unknown contamination, including asbestos contaminated materials and ground gas, may be encountered unexpectedly. To mitigate this risk contingency plans and controls would be put in place during construction. Similarly, the handling and management of potentially contaminated soils generated from excavations such as cuttings or foundations would also require careful management. These issues are both addressed within the Outline Remediation Strategy Report (Appendix R11.2 of the September 2016 ES Supplement, (Document 2.4.4)) and discussed within Section 5 of this evidence. The project team is committed to the production and implementation of the final Remediation Strategy Report (see Commitment No. 71 in the Register of Environmental Commitments, Appendix SR18.1 of the December 2016 ES Supplement (Document 2.4.14)).

5. Land Contamination Remediation and Mitigation

Introduction

- 5.1 An outline remediation strategy has been prepared and is set out in the Outline Remediation Strategy Report (Appendix R11.2 of the September 2016 ES Supplement (Document 2.4.4)). The need to mitigate risks from land contamination has been considered throughout the design of the Scheme. Understanding the need for remediation of unacceptable risks and the management of known and potentially contaminated soils and waters increased following ground investigations in 2015 and 2016.
- 5.2 The primary purpose of the remediation strategy is to mitigate potential risks to human health and the environment from land contamination as a result of the construction and operation of the published Scheme. The Outline Remediation Strategy Report that has been produced (Appendix R11.2 of the September 2016 ES Supplement (Document 2.4.4)) would continue to be developed prior to the commencement of construction and this considers mitigation of land contamination risks during both construction and operation of the Scheme.
- 5.3 A sustainable approach to the management of land contamination during the construction of the Scheme has been adopted wherein unnecessary remediation and off-site disposal of contaminated soils is to be avoided. Further, the Scheme is being designed such that *'the benefit of undertaking remediation is greater than its impact and that the optimum remediation solution is selected through the use of balanced decision-making process'* (Document 12.2.24).
- 5.4 During the design of the Scheme, the approach to the remediation strategy has been discussed with MCC, NCC and NRW and the remediation strategy will be developed further during the detailed design of the Scheme. It will then be discussed with NRW, MCC and NCC prior to construction commencing to seek their approval. The implementation of the Remediation Strategy Report by the Contractor during construction is addressed in Commitments 71, 146

and 147 of the Environmental Commitments Register (Appendix SR18.1 of the December 2016 ES Supplement (Document 2.4.14)).

Motorway Embankment Design

- 5.5 In order to construct the motorway embankment a considerable volume of general fill is required. In order to help mitigate against the need to import primary or secondary aggregates from off-site sources, and the associated traffic impacts, the reuse of soils and rock on-site has been a key consideration during Scheme development. The motorway embankment has been designed such that contaminated soils excavated during construction (for instance in areas of cutting through a potentially contaminated site) may be reused as general fill within the embankment subject to compliance with suitability for reuse criteria. The reuse of contaminated soils within the Scheme would also reduce the environmental impact of removing contaminated soils for off-site disposal to landfill and traffic impacts of waste disposal lorry movements. The suitability for reuse criteria would ensure that the reused contaminated soils are both geotechnically suitable and do not cause an unacceptable risk to the environment or human health once placed within the embankment. Some contaminated soils would require treatment prior to reuse (such as the lagoon silts and slag at the TATA Steel Llanwern Steelworks site (CL-26)). It should be noted that use of steelworks slag in construction in the UK is common and a Quality Protocol (Document 12.2.25) published by the Environment Agency supports its use. Based on available ground investigation data collected and the risk assessments undertaken the vast majority of contaminated soils are considered to be suitable for reuse within the Scheme and very little contaminated material would have to be disposed of off-site. This is consistent with Scheme's objectives of minimising waste generation and minimising the reliance of materials being brought onto site through reuse of suitable materials.
- 5.6 The motorway embankment would be covered in the hardstanding of the motorway pavement which would also include a highway drainage system. The flanks of the embankment would have clean, uncontaminated soils placed for landscaping. The configuration of the motorway embankment is shown in

Appendix 11.2, Figures 4a-4d of the March 2016 ES (Document 2.3.2). Thus the likelihood of soil contamination within the embankment causing unacceptable risk to the controlled waters or human health are considered low because:

- a. The ability for rainwater to infiltrate into the embankment core and leach contaminants would be extremely limited due to the low permeability of construction materials placed above the general fill and also that rainwater would be managed within the highway drainage system.
 - b. The risks to human health would be mitigated by the presence of an appropriate thickness of clean soils and the motorway pavement preventing exposure of contaminated soils.
- 5.7 The suitability for reuse criteria would be discussed with MCC, NCC and NRW to seek their agreement prior to construction as part of the remediation strategy and associated material management plan.

Outline Remediation Strategy Report

- 5.8 The Outline Remediation Strategy (Appendix R11.2 of the September 2016 ES Supplement (Document 2.4.4)) has been prepared drawing upon UK guidance including CLR11 (Document 12.2.3) and the WLGA guidance (Document 12.2.10). The Outline Remediation Strategy includes a remediation options appraisal that considers different remediation objectives, remediation techniques and remediation criteria and evaluates feasible remediation options for the Scheme.
- 5.9 The Outline Remediation Strategy Report also sets out an outline remediation implementation plan that includes procedures for excavation of materials, handling arrangements, dealing with unexpected contamination including asbestos contaminated soils and monitoring. Figures 3a-d of this evidence show a summary of the remediation strategy. An outline remediation verification plan is also set out within the Outline Remediation Strategy which describes requirements to ensure that adequate records and information

would be gathered during construction to provide ‘lines of evidence’ to demonstrate the remediation was successful.

- 5.10 The Outline Remediation Strategy Report also sets out the need for surface water and groundwater assurance monitoring during and after construction and also procedures to manage, handle and store contaminated materials to mitigate risks of pollution during construction. Surface water and groundwater protection controls would be set out in the Construction Environmental Management Plan (CEMP) as discussed in para 5.17 below. The final Remediation Strategy Report would also include details of any gas protection measures needed to mitigate the potential risk of gas migration toward adjacent properties where such risks have been identified along with details of gas monitoring requirements during and after construction.
- 5.11 The final Remediation Strategy Report would also set out the controls and management arrangements associated with the treatment of waste materials such that they may be fully recovered and be reused within the Scheme.
- 5.12 The commitment to produce a Remediation Strategy Report is listed within the Register of Environmental Commitments (Appendix SR18.1 of the December 2016 ES Supplement (Doc 2.4.14) – see Commitments No. 71 and 89).

Outline Material Management Plan

- 5.13 The general design principal of retention and reuse of contaminated materials within the Scheme is proposed provided that such materials are geotechnically suitable and, once placed, do not result in unacceptable risks to human health or controlled waters.
- 5.14 The Outline Remediation Strategy Report provides preliminary details of how the management of soils excavated on-site will be managed and documented, including a Material Management Flow Chart (Annex A in Appendix R11.2, of the September 2016 ES (Document 2.4.4)). An Outline Material Management Plan (Annex H in Appendix 3.2 of the March 2016 ES (Document 2.3.2)) has also been prepared in accordance with the CL:AIRE Definition of Waste Code of Practice (Document 12.2.8) which would be updated and submitted to NRW

prior to construction. This demonstrates in further detail how contaminated materials would be managed and tracked during the works to ensure compliance with the remediation strategy and that only suitable materials that do not cause an unacceptable risk to the environmental or human health would be used.

5.15 Following construction no contaminated soils will be left exposed at the ground surface within the permanent works.

5.16 The Outline Materials Management Plan would be finalised and will be part of the CEMP (see Commitments Nos. 71 and 75) in the Register of Environmental Commitments (Appendix SR18.1 of the December 2016 ES Supplement (Doc 2.4.14)).

Construction Environmental Management Plan

5.17 The CEMP will set out environmental control measures that would be put in place by the contractor during construction. The Pre-Construction Environmental Management Plan (Pre-CEMP) published as Appendix 3.2 of the March 2016 ES (Document 2.3.2) would be updated during detailed design and agreement sought with NRW prior to construction. The CEMP would include the finalised Remediation Strategy Report and Materials Management Plan as well as the Groundwater and Surface Water Protection Plans. These documents will include procedures to manage potentially contaminated materials and waters such that significant impacts to the environment are mitigated. The provision of the CEMP is identified as Commitment No.96 in the Register of Environmental Commitments (Appendix SR18.1 of the December 2016 ES Supplement (Document 2.4.14)).

Specific Remediation Requirements

5.18 The following sections discuss specific remediation and controls required to manage risks at the key contaminated sites. The Outline Remediation Strategy Report (Appendix R11.2 of the September 2016 ES Supplement (Document 2.4.4)) sets out these requirements and further detail would be provided as the

remediation strategy is developed to seek agreement with NRW, MCC and NCC.

5.19 Section 7.3 of the Buildability Report (Appendix 3.1 of the March 2016 ES (Doc 2.3.2)) also provides an outline of the methods to be used during construction to manage land contamination and the remediation of known and potentially contaminated sites. It also states that controls would be put in place to prevent the spread of contamination (para 7.3.18) and piling risk assessments (para 7.3.41 and 11.3.7) will be undertaken to ensure piling activities do not cause pollution. Commitment No.46 of the Register of Environmental Commitments (Appendix SR18.1 of the December 2016 ES Supplement (Document 2.4.14) also states that control measures would be put into place to mitigate the spread of dusts and soils, which would also reduce the potential risk from the spread of potentially contaminated soils and dusts.

Solutia Chemical Works

5.20 The design of the Scheme has avoided the need to disturb the PCB waste disposal 'cell' at Solutia Chemical Works. This has been achieved by the new section of motorway bridging over the PCB cell. This design would allow Solutia to continue with the existing management and maintenance arrangements. During construction groundwater monitoring would be undertaken (see para 5.36 below) to provide assurance that the PCB cell's integrity has not been compromised.

5.21 The presence of shallow contaminants in soils including PCBs and asbestos causing a risk to human health would be mitigated largely through the placement of a clean capping material of appropriate thickness across the affected areas. The placement of a clean cap would protect construction workers and the general public during construction and also future site users. Additional safety controls would be needed for ground workers prior to the placement of the clean capping material.

Docks Way Landfill

- 5.22 The design of the Scheme has avoided the need to disturb engineered parts of Docks Way Landfill. It has also been designed to minimise the amount of excavation within areas where waste may have been historically tipped in order to reduce potential arisings unsuitable for reuse being generated.
- 5.23 Further detailed gas risk assessments possibly supported by further ground investigation and monitoring are to be undertaken to determine the need for and extent of gas protective measures to be incorporated into the Scheme along the proposed Docks Way Link where it passes through areas of historical waste tipping.
- 5.24 Although asbestos has not been encountered in previous ground investigations in this area, based on historical records there is a reasonable possibility that asbestos contaminated soils may be encountered in areas where historical tipping took place. As such, safety controls and procedures would be developed and agreement sought from NRW, MCC, NCC and, if required, the Health and Safety Executive prior to construction. Management of the unforeseen presence of asbestos would form a part of the Scheme's Remediation Strategy Report as part of the 'discovery strategy' and this is set out in Commitment Nos. 89 and 147 in the Register of Environmental Commitments (Appendix SR18.1 of the December 2016 ES Supplement (Document 2.4.14)).

Tata – Reedbeds and Lagoons

- 5.25 The proposed new section of motorway, Glan Llyn link road and new motorway maintenance depot (Glan Llyn Depot) cross part of TATA Steel's Llanwern Steelworks. There are generally three areas of land that would require potentially contaminated materials to be appropriately managed, these being:
- a. Former metal recovery area
 - b. Lagoons 12, 25, 26, 27SE and 27SW

- c. Reedbeds Nos. 1 and 2

5.26 Hydrocarbon contamination has been identified in the former metal recovery area and further remediation design would be undertaken to mitigate potential risks to construction workers, future depot site workers and controlled waters.

5.27 The affected areas of the lagoons will require:

- a. Excavation and reinstatement of the lagoons and existing drainage systems to the north of the new proposed section of motorway. This is shown on Figure 2 of my evidence as is taken from Annex D (D16 Vol. 1) in Appendix R11.1 of the September 2016 ES Supplement (Document 2.4.4)).
- b. Coarse slag would be reused to reform the lagoon bunds.
- c. Surplus coarse slag and silt would be reused within the motorway embankment subject to meeting suitability for reuse criteria.

5.28 Paragraphs 7.3.31 to 7.3.32 in the Buildability Report (Appendix 3.1 of the March 2016 ES (Document 2.3.2)) provide an overview of the treatment methods to be adopted to enable the reuse of the lagoon materials.

5.29 Treatment of lagoon materials is expected to be needed prior to reuse within the motorway embankment. An appropriately experienced specialist remediation subcontractor would undertake the treatment of materials on TATA Steel land to the north of the new section of motorway. The treatment of materials from lagoons would fall under the Environmental Permitting (England & Wales) Regulations 2010 (as amended) (Doc 12.1.9) regulated by NRW. Depending upon the duration of the treatment activities a Mobile Plant Licence or a Waste Bespoke Operation Permit would be required by the contractor to be obtained from NRW prior to commencement. Approximately 591,000 m³ of lagoon silts and slag at TATA Steel Llanwern Steel works site (CL-26) would require treatment prior to reuse and the lagoon silts would be cement stabilised (Mr Barry Woodman's evidence WG 1.6.1).

- 5.30 The process and documentation of treatment of materials would need to demonstrate to NRW that those materials are fully recovered so that they can be designated as no longer needing regulation as waste. This will be set out in the final Remediation Strategy Report and agreement sought from NRW as set out in Commitments No. 71 and No. 89 in the Register of Environmental Commitments (Appendix SR18.1 of the December 2016 ES Supplement (Document 2.4.14)).
- 5.31 The reedbeds would be reconfigured and any contaminated soil arisings would be reused, possibly following treatment, within the motorway embankment.
- 5.32 Further investigation and assessment of hazardous ground gases would be required to determine the full extent and nature of risks associated with hydrogen sulphide and carbon monoxide within the lagoons area. The primary risk requiring mitigation is the protection of ground workers during excavations in the lagoons area during construction. The assessments would also determine the level of protection needed.

Existing Environmental Permit Variations and Surrender

- 5.33 The proposed new section of motorway would impact on six existing environmental permits held by various industrial site operators. An Environmental Permitting Strategy Report (Appendix 11.5 of the March 2016 ES, (Document 2.3.2)) has been prepared and also discussed with NRW. It sets out the general approach to be adopted and supporting information that would be required to surrender and vary the existing permits to accommodate the Scheme. The permit holders would be responsible for any permit variation or surrender application to NRW but some documentation would be provided by the project team to support the application process.

Surface Water, Groundwater and Gas Protection

- 5.34 The Contractor would design a suitable surface water and groundwater protection plan and seek its agreement with NRW prior to construction. The plan would have to include measures to control the risk of contaminants in any run-off entering controlled waters without prior treatment and with appropriate

discharge consents already in place. In order to control surface water run-off from construction areas entering sensitive surface waters features such as the reens and ditches within the Gwent Levels, a temporary run-off containment bund would be constructed on each side of the alignment as described in the Outline Ground and Surface Water Management Plan (March 2016 ES, Appendix 3.2, Annex G (Document 2.3.2)) and also in paragraph 16.9.2 in Chapter 16 of the March 2016 ES. The bunds would form lateral lagoons that would be designed to contain and collect construction surface water prior to its treatment and release under a NRW agreed discharge consent in accordance with the Environmental Permitting (England and Wales) Regulations (as amended) (Document 12.1.9). The containment bund would also mitigate the potential risk of any contaminated construction surface run-off waters entering adjacent surface water courses without prior treatment.

Remediation Verification Report

5.35 Following the guidance set out in CLR11 (Document 12.2.3) and also the guidance within Verification of Remediation of Land Contamination⁴ (Document 12.2.26), following completion of all remediation and earthworks, a Remediation Verification Report would be prepared to provide evidence that the remediation was implemented successfully. The Remediation Verification Report would include the lines of evidence set out within the final Remediation Strategy Report and would be provided to MCC, NCC and NRW to seek approval. The requirements for the Remediation Verification Report are set out in the Outline Remediation Strategy (Appendix R11.2 of the September 2016 ES Supplement (Document 2.4.4) and the commitment to produce a Remediation Verification Report is No. 146 in the Register of Environmental Commitments (Appendix SR18.1 of the December 2016 ES Supplement (Document 2.4.14)).

⁴ Environment Agency. Verification of Remediation of Land Contamination. 2010. Report: SC030114/R1.

Gas, Groundwater and Surface Water Assurance Monitoring

5.36 In order to provide assurance that the construction including remediation works does not cause a significant impact to surface water or groundwater quality or increase the risk of migrating ground gas, monitoring would be undertaken during and after construction for 5 years during the aftercare period (paragraph 11.9.32 of the March 2016 ES(Document 2.3.2)). This would allow comparison with the pre-construction baseline conditions. The monitoring strategy would be set out in the final Remediation Strategy Report and agreement for it will be sought from NRW, NCC and MCC. This commitment to undertake groundwater and surface water monitoring is Ref. No. 145 in the Register of Environmental Commitments (Appendix SR18.1 of the December 2016 ES Supplement (Document 2.4.14)).

6. Responses to Objections

Response to Natural Resources Wales (NRW) Letters dated 4th May 2016 (OBJ0268) and 18th October 2016.

- 6.1 Following the publication of the 2016 March ES (Document 2.3.2), NRW provided a formal response (OBJ0268). Since the response was received discussions with NRW have been on going including a meeting held on 20th July 2016. NRW also issued a letter dated 18th October following publication of the September 2016 ES Supplement (Doc 2.4.4).
- 6.2 In NRW's response to the 2016 March ES (Document 2.3.2), they did not raise any fundamental challenges or failings to the approach, findings of the assessments nor proposed mitigation measures set out in the ES relating to land contamination. Indeed NRW stated in several instances that they were satisfied with the proposals and welcome the approach taken including that the remediation proposals would require NRW's agreement. Notwithstanding this, NRW raised a number of specific details each of which I set out below along with a response.

Chapter 11 Geology and Soils

- 6.3 *'Table 11.9 With respect to CL-26, we'd query whether in addition there is a risk associated with the presence of potentially explosive gases.'*
- 6.4 Response: Since the March 2016 ES (Document 2.3.2) was issued further ground investigation including monitoring and assessment of ground gas in CL26 has been undertaken. This risk has been discussed in paragraphs 4.29 and 5.32 of my evidence.

Appendix 11.1 Land Contamination Assessment Report

- 6.5 *'4.4.9 In relation to the statement "However it is notable that groundwater areas of the new section of the motorway is naturally saline and thus unsuitable as a potable water supply". We recommend that this be clarified with references/ justification, as we would query whether this is the case for the entire proposed stretch of motorway.'*

6.6 Response: The salinity of the groundwater is discussed in the March 2016 ES (Document 2.3.2) in several places including paragraph 16.4.67 and paragraph 5.7.1 of Appendix 16.2. The March 2016 ES comments that the shallow and deep groundwater near the River Usk and River Ebbw is more saline (brackish) in nature and the groundwater within the Tidal Flat Deposits and underlying Glaciofluvial Deposits within the Caldicot Levels is also brackish. There are also no known documented groundwater abstractions used for potable supply in the Gwent Levels in proximity to the Scheme (March 2016 ES, paragraph 16.4.62. In summary, although the statement in paragraph 4.4.9 of Appendix 11.1 of the March 2016 ES is incorrect, the assessments undertaken, impacts identified and mitigation proposed are still appropriate.

Appendix 11.2 - Outline Remediation Strategy

6.7 *'3.4.16 We note and welcome the principle to manage ground and surface water discharge during the construction phase by means of a Surface Water and Ground Water Management Plan. We recommend that this principle be captured in the Statement of Commitments, including that the Plan would need to be developed and approved to the satisfaction of NRW and implemented in full accordance with the approved Plan. We also advise that it would also be necessary to obtain NRW consents/ permits to implement much of this work.'*

6.8 Response: It is clear in the documentation submitted in support of the Draft Orders that NRW agreement to a variety of documents and consents will be required to be sought prior to construction (Commitment numbers 71, 89 and 145.in the Register of Environmental Commitments in Appendix SR18.1 of the December 2016 ES Supplement).

6.9 *'5.5.2 With reference to the reuse of the Tata Llanwern lagoon material within the proposed motorway embankment, we refer you to our earlier position (outlined in an email dated 29/2/16 titled "M4 Corridor around Newport - NRW Response to Waste Query relating to Tata Slurry Lagoons - 29 February 2016") that the material is not considered a made ground or soil in accordance with the Contaminated land: Application in Real Environments (CL:AIRE)*

Definition of Waste Code of Practice (DoWCoP) and therefore should not be re-used under that scheme. We require additional information (as requested in the email) in order to demonstrate compliance with Article 6 of the Waste Framework Directive 2008/98/EC with respect to end-of-waste status.'

6.10 Response: Since the NRW letter of 4th May 2016 was received further discussions with NRW have taken place regarding the management of lagoon materials at the TATA Steel Llanwern Steelworks site (CL-26). The Outline Remediation Strategy has been updated to reflect the discussions (paragraph 5.5.2 in Appendix R11.2 of the September 2016 ES Supplement (Document 2.4.4)) which acknowledges that '*lagoon materials may require treatment prior to reuse and demonstration of full recovery to achieve end of waste*'. The need for agreeing and complying with end of waste criteria is also set out elsewhere in the Outline Remediation Strategy including paragraphs 5.2.1, 5.5.5, 7.1.1, 7.1.3 and Annex A.

Appendix 11.3 - Land Contamination Management Strategy

6.11 '*We note and welcome that our comments made on earlier drafts have influenced this current iteration. Therefore our only remaining comment is to note that 2.1.3 refers to the re-use of suitable materials should be in accordance with CL:AIRE Definition of Waste Development Industry Code of Practice (v2 011) (DoWCoP).*

6.12 '*Whilst this is acceptable in most circumstances, please refer to our comment made in relation to 5.5.2 of Appendix 11.2, Outline Remediation Strategy - in the case of the Llanwern lagoon material NRW is not of the view that this constitutes a suitable source under the CL:AIRE DoWCoP. As outlined in our email of 29 February, we are awaiting receipt of specific detail before we can advise further.'*

6.13 Response: NRW's position has been accommodated as per paragraph 5.30 of this evidence. Furthermore following discussions since the letter of 5th May 2016 NRW has agreed the Land Contamination Mitigation Strategy in their email of 3rd November 2016 (see Appendix 2 of this evidence) following a

modification to paragraph 2.1.3 of that document regarding the management of waste materials. The Land Contamination Management Strategy that NRW have agreed to has been published as Appendix SR11.3 of the December 2016 ES Supplement (Doc 2.4.14)).

6.14 Section 3.7.1 of NRW's letter dated 18th October 2016 stated that *'From the results of ground investigations published to date, and provided the principles of the outline remediation strategy are carried through to the development of a detailed remediation strategy which is agreed with NRW and fully implemented in accordance with the agreed strategy, NRW considers that adverse effects on controlled waters could be avoided. We recommend that this be addressed within the Register of Commitments.'*

6.15 Response: As described in paragraph 4.3.8 of this evidence, the further development of the Outline Remediation Strategy along with seeking of its approval is set out within the Register of Environmental Commitments (Appendix SR18.1 of the December 2016 ES Supplement (Document 2.4.14)).

Objection relating to the use of the possible toxic infill material from the old Llanwern Steelworks (OBJ0276)

6.16 Concern was raised in OBJ0276 regarding the reuse of materials from the TATA Steel Llanwern Steelworks within the Scheme and the subsequent risk of pollution occurring.

6.17 Response: The design of the Scheme has been subject to an assessment of land contamination and also a remediation strategy has been developed to deal with known and potentially contaminated material following current UK guidance. This is described within Chapter 11 of the March 2016 ES (Document 2.3.2 and supporting information was provided in ES Appendix 11.1 (Land Contamination Assessment Report) and ES Appendix 11.2 (Outline Remediation Strategy Report). Following completion of the 2016 Ground Investigation the Land Contamination Assessment Report and Outline Remediation Strategy Report was updated and published in the September 2016 ES Supplement as Appendix R11.1 and R11.2 respectively (Doc 2.4.4).

The design of the embankment has been undertaken using the sustainable principle of retention and reuse of contaminated materials within the Scheme, provided that such materials do not result in unacceptable risks to human health or controlled waters. Materials from the lagoons at the TATA Steel Llanwern Steelworks site would be treated on-site by a specialist remediation contractor such that any materials placed within the motorway embankment would comply with suitability criteria (Sections 11.5.3, 11.5.4, 11.9.22 and 11.9.23 of the March 2016 ES describe this). The potential risks of contaminants leaching from materials placed within the embankment have been assessed as low and this is described throughout Chapter 16 of the March ES including Sections 16.7.10-20 and Tables 16.22 to 16.24 and Tables 16.25 to 16.26.

- 6.18 Considerable volumes of materials would be required to construct the new section of motorway. By reusing and, where necessary treating, contaminated material on-site, the Scheme has been designed to avoid the need to dispose of large quantities of contaminated materials off-site and import considerable volumes of clean materials on-site which is less sustainable and more expensive. A Land Contamination Management Strategy (ES Appendix 11.3) that sets out the principles of how contaminated materials would be managed and regulated has been agreed with NRW and the relevant Local Authorities. The final remediation scheme will also be submitted to NRW and the Local Authorities to seek their agreement prior to construction commencing.

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- 6.19 NCC's April 2016 response to the published Draft Orders do not raise any objections nor concerns with the proposed approach to the management of land contamination. Indeed NCC stated *'Overall, the scheme is likely to be beneficial in tackling some areas of historic contamination within Newport. If done correctly this would meet the Well-being of Future Generations (Wales) Act 2015 goals and the Environmental Protection 1990'*.

- 6.20 However, NCC do set out a number of requirements and further considerations that would need to be addressed prior to and during construction of the Scheme. The salient points are discussed below.
- 6.21 Potential Generation of Part IIA Contaminated Land Sites
- 6.22 NCC raised a concern that construction activities and the Scheme's operation could result in sites that could be determined as Contaminated Land under EPA Part IIA.
- 6.23 Response: The Remediation Strategy is designed to meet the PPW (Document 5.1.12) requirement that following development land should not fall within the definition of contaminated land under EPA Part IIA. The remediation strategy approach is to mitigate the risk of new contamination linkages being created as set out in paragraph 3.2.2 of the Outline Remediation Strategy (Appendix R11.2 of the September 2016 ES Supplement (Document 2.4.4)).

Soil Contamination Management

- 6.24 NCC raised two points regarding contaminated soil management:
- 6.25 (1) NCC stated that '*a highly detailed soils management plan should be in place throughout the Scheme ensuring that no new areas of contamination are generated during the construction phase of the project.*'
- 6.26 (2) NCC raised a further point stating that any materials that are deemed a waste do not cause a risk to human health/the environment.
- 6.27 In response to each point:
- 6.28 (1) The Outline Remediation Strategy Report would be developed further during detailed design. The final remediation strategy would be agreed with NCC and will include an update of the Outline Material Management Plan (March 2016 ES, Appendix 3.2, Annex H (Document 2.3.2)). My comments in paragraph 5.14 of this evidence also relate to this issue.
- 6.29 (2) Control measures to be put in place during construction to mitigate risks from contaminated materials are set out in the Outline Remediation Strategy

Report (Appendix R11.2 of the September 2016 ES Supplement (Document 2.4.4)) and as mentioned previously the document would be updated and agreed with NCC.

Ground Gas Management

6.30 NCC raised four points regarding ground gas:

6.31 (1) NCC stated that *'The gas risk has been fully determined'*.

6.32 (2) NCC recommended that *'progressive gas risk assessment is undertaken throughout the construction phase of the Scheme and should continue for a period after its completion.'*

6.33 (3) *'All potential receptors that may be at risk from gas generation should be investigated and risk assessed and this should include the reuse of gas generating materials.'*

6.34 (4) *'There is a small potential for gas migration to be a risk to human health/property that may result in a Part IIA site, even after the construction has finished'*.

6.35 Responding to each point in turn:

6.36 (1) NCC recognises that the ground gas regime is understood.

6.37 (2) and (3) This point is addressed in para 6.9.1 of the Outline Remediation Strategy Report (Appendix R11.2 of the September 2016 ES Supplement (Document 2.4.4)) wherein more detailed gas risk assessments would be undertaken to identify detail of gas control measures including mitigation of ground gas that could be encountered during construction. The gas protection measures and monitoring requirements would be agreed with NCC.

6.38 (4) See comments under paragraph 6.22 of this evidence.

Risk to the Water Environment

6.39 NCC pointed out that *'There is a potential risk of liquid contaminants such as hydrocarbons migrating off site if disturbed, be it during remediation or unforeseen contamination. The outline remediation strategy does encompass this scenario. However, assurances should be sort ensuring any migration of liquid contamination off site by the activities of the M4 construction programme is dealt with at the time, so not cause any potential Part IIA site, now or within a reasonable time frame after its completion.'*

6.40 Response: My response in para 6.22 of this evidence also addresses this concern.

Unexploded Ordnance (UXO) Risk

6.41 Due to the potential for UXO to be encountered during construction NCC recommended *'a full emergency procedure is developed and tested involving all relevant stake holders and emergency services. Additionally all workers should have training on the procedure and their individual duties made clear'*.

6.42 Response: As set out on the plan in Appendix 11.4 of the March 2016 ES (Document 2.3.2) potential areas where there is a risk of UXO being encountered during construction have been identified. In paragraph 11.9.28 the March 2016 ES states that *'a UXO Mitigation Strategy would be developed using guidance within Unexploded Ordnance: A guide for the Construction Industry (CIRIA, 2009), to mitigate risks from unidentified unexploded ordnance. The UXO Mitigation Strategy would draw upon information from within the Explosive Ordnance Threat Assessment Report (Bactec, 2014).'* The UXO mitigation strategy would be developed and agreed with relevant stakeholders by the contractor prior to construction and would form part of the CEMP (see paragraph 11.9.29 of the March 2016 ES).

Response to Gwent Wildlife Trust (OBJ0270) letter dated 4th May 2016

6.43 The Gwent Wildlife Trust letter states that the area proposed for replacement of saltmarsh appears to have been previously used for industry and does not appear to have been investigated for potential contamination.

6.44 Response: This area has been subject to an assessment of land contamination following current UK guidance and this is set out in the March 2016 ES (Doc 2.3.2) Appendix 11.1 within Land Contamination Assessment Report Annex D CL15, Stephenson Street Industrial Estate Areas as revised within September 2016 ES Supplement Appendix R11.1. Figure 1 in the report shows that the area may have been subject to potential contaminative uses which may in turn have led to some level of contamination of the area. Section 10.2.2 of the March 2016 ES specifically states that sampling will be undertaken in the area to refine the risk assessment and enable the remediation strategy (set out in Appendix R11.3 of the September 2016 ES Supplement) to be finalised, and approval sought with NRW and Newport City Council, and then implemented during construction of the Scheme. It may be that the sampling demonstrates that no remediation is necessary.

7. Summary and Conclusion

- 7.1 My Proof of Evidence demonstrates that the risks from land contamination during construction and operation of the Scheme have been well investigated and appropriately assessed. Twenty-seven potentially contaminated sites have been identified and each has been investigated and subjected to a robust risk assessment in line with current guidance as well as local and national planning policy. The assessments have considered risks from contaminants in soils and water and also ground gas affecting human health and the environment.
- 7.2 Whilst some risks to human health and the environment have been identified an outline remediation strategy has been prepared to demonstrate how risks will be controlled and mitigated. The outline remediation strategy has been developed using current UK guidance and will be further developed during the detailed design phase of the Scheme to seek agreement with NRW, MCC and NCC prior to construction commencing.
- 7.3 The remediation strategy has adopted a sustainable approach to maximising the reuse of materials within the Scheme reducing materials import and avoiding the need to remove contaminated materials off-site by road for disposal into landfill.
- 7.4 During construction all remedial works would be undertaken in line with the agreed remediation strategy. Following completion of all remediation and earthworks, a remediation verification report would be prepared to provide evidence that the remediation was implemented successfully. Assurance groundwater and surface water monitoring would be undertaken to verify that significant impacts leading to deterioration of existing water quality have not occurred during and for 5 years after construction.
- 7.5 The Scheme would result in beneficial environmental improvement as the risks to human health from exposure to potentially contaminated soils will be reduced. The approach to land contamination assessment and proposed remediation strategy has been presented to the key Regulators and NRW, MCC and NCC have all agreed to the approach to the management of land

contamination proposed. Furthermore NCC has commented that the Scheme is likely to be beneficial in tackling some areas of historic contamination within Newport. NRW have also agreed that provided the principles of the Outline Remediation Strategy Report are carried through to its implementation, any adverse effects on controlled waters could be avoided and the reuse of lagoon materials from the TATA Steel Llanwern Steelworks site within the construction of the new section of motorway is the most sustainable option.

- 7.6 My Proof of Evidence includes all facts which I regard as being relevant to the opinions which I have expressed and the Inquiry's attention has been drawn to any matter which would affect the validity of that opinion. I believe the facts which I have stated in this Proof of Evidence are true and that the opinions expressed are correct. I understand my duty to the Inquiry to assist it with matters within my expertise and I believe that I have complied with that duty.
- 7.7 This evidence represents my true and professional opinion and is given in accordance with the Code of Professional Conduct of the various institutes of which I am a member.

8. Appendices and Figures (Separate Document – WG 1.11.3)

8.1 The following Figures and Appendices which I refer to in my Proof of Evidence are presented in WG 1.11.3:

Figures 1a-d	Sites with Potential Land Contamination Source Areas
Figures 3a-p	Ground Investigation Locations
Figures 3a-d	Outline Remediation Strategy
Figure 2	Conceptual Site Model for CL-26 (Lagoons)
Appendix 1	Summary Risk Matrix of Potentially Contaminated Sites
Appendix 2	Email dated 3/11/16 from NRW