

Contract No. 1MC13

Pool Wood Embankment: Ground Gas Risk Assessment – Sub Lot 5 South

Document Number: 1MC09-BBV_MSD-EV-RIA-NS04_NL10-100006

Current Revision	Author	Reviewed By	Approved By	Date Approved	Reason for Review
P01	David Dray	Tim Hodges	Remant Doorgakant	15/11/2024	S3 – For Review and Comments

Stakeholder Review Required (SRR)

- ☐ Yes – Please Specify Below
- ☒ No

Click or tap here to enter text.

Purpose of SRR

- ☐ Comment
- ☐ Information
- ☐ Approval

HS2 Signature Required

- ☐ Yes – Please Specify Below
- ☒ No

Click or tap here to enter text.

Handling Instructions: Produced by BBV for project use only

Without prejudice to the express terms and conditions of the Contract, this document is issued for the party which commissioned it and for specific purposes connected with the captioned project only. Subject to the conditions of the Contract, the Employer may provide this document to third parties for the purpose of the project.

The issuing Consultant expressly excludes tortious liability for third parties, the issuance of this document to third party/ies and reliance on it shall not create any contractual nor tortious obligation between the third party/ies and the Consultant. The Consultant accepts no responsibility for the consequences of this document being relied upon by any other party than the Employer or other party/ies the Employer issued the document to in accordance with the Contract or any party/ies to whom the Consultant has provided a collateral warranty under the contract, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to the Consultant by other parties.

Any person using or relying on the document for such other purpose agrees, and will by such use or reliance be taken to confirm his agreement to indemnify the issuing Consultant for all loss or damage resulting therefrom. the issuing Consultant accepts no responsibility or liability for this document to any party other than the Employer, the person by whom it was commissioned or the beneficiary of any collateral warranty provided by the Consultant.

© Copyright Controller HMSO 2017. This material is published for High Speed Two (HS2) Limited with the permission of the Controller of Her Majesty's Stationery Office".

"The authors of this report are employed by Balfour Beatty Vinci JV. The work reported herein was carried out under a deed placed on 01/08/2017 by High Speed Two (HS2) Limited and should not be relied upon as authoritative by any third party.

This report shall not be copied or reproduced in whole or in part except with the express consent of High Speed Two (HS2) Limited.

Review Required

Team	Yes/No	Name	Position	Date
Quality				
Health & Safety				
Environment & Sustainability				
Other teams if required				

Revision History

Previous Revision	Author	Reviewed By	Approved By	Date Approved	Reason for Review
P01	David Dray	Tim Hodges	Remant Doorgakant	15/11/2024	S3 – For Review and Comments

Revision Summary

Paragraph Modified	Details of Modification

Contents

1	INTRODUCTION	5
1.1	Purpose of the report	5
1.2	Background	5
1.3	Report Context	9
1.4	Reference Documents	9
2	SITE SETTING	10
2.1	Site location and description	10
2.2	Geology	10
2.3	Published hydrogeology	11
3	SITE CONCEPTUAL MODEL REVIEW	12
3.1	Overview	12
3.2	Source	12
3.3	Pathways	13
3.4	Receptors	14
3.5	Risk assessment	14
4	CONCLUSIONS	15
4.1	Gas management requirements	15
APPENDIX A	QUALITATIVE RISK ASSESSMENT DEFINITIONS	16
APPENDIX B	REFERENCES	20

1 Introduction

An 850m long landscape bund will be formed alongside the 1,414m long Pool Wood Embankment that will be constructed as part of the HS2 rail link from London to Birmingham. Of the landscaped bund, 475m will comprise material placed under a permit for waste recovery. The material, placed under this permit, will be derived from the excavation of the Middle Bickenhill landfill, which comprised inert, industrial, commercial, household, and special wastes.

This document provides a qualitative assessment of the risks posed by the gas generated through the biodegradation of the organic materials derived from the former landfill to human health and surrounding properties.

This assessment identifies that the design of the landscape bund, the age of the wastes and the remediation practices that will be put in place during the excavation, material management and waste recovery plan, mean that the risk from landfill gas arising and impacting on human health and property should be very low.

1.1 Purpose of the report

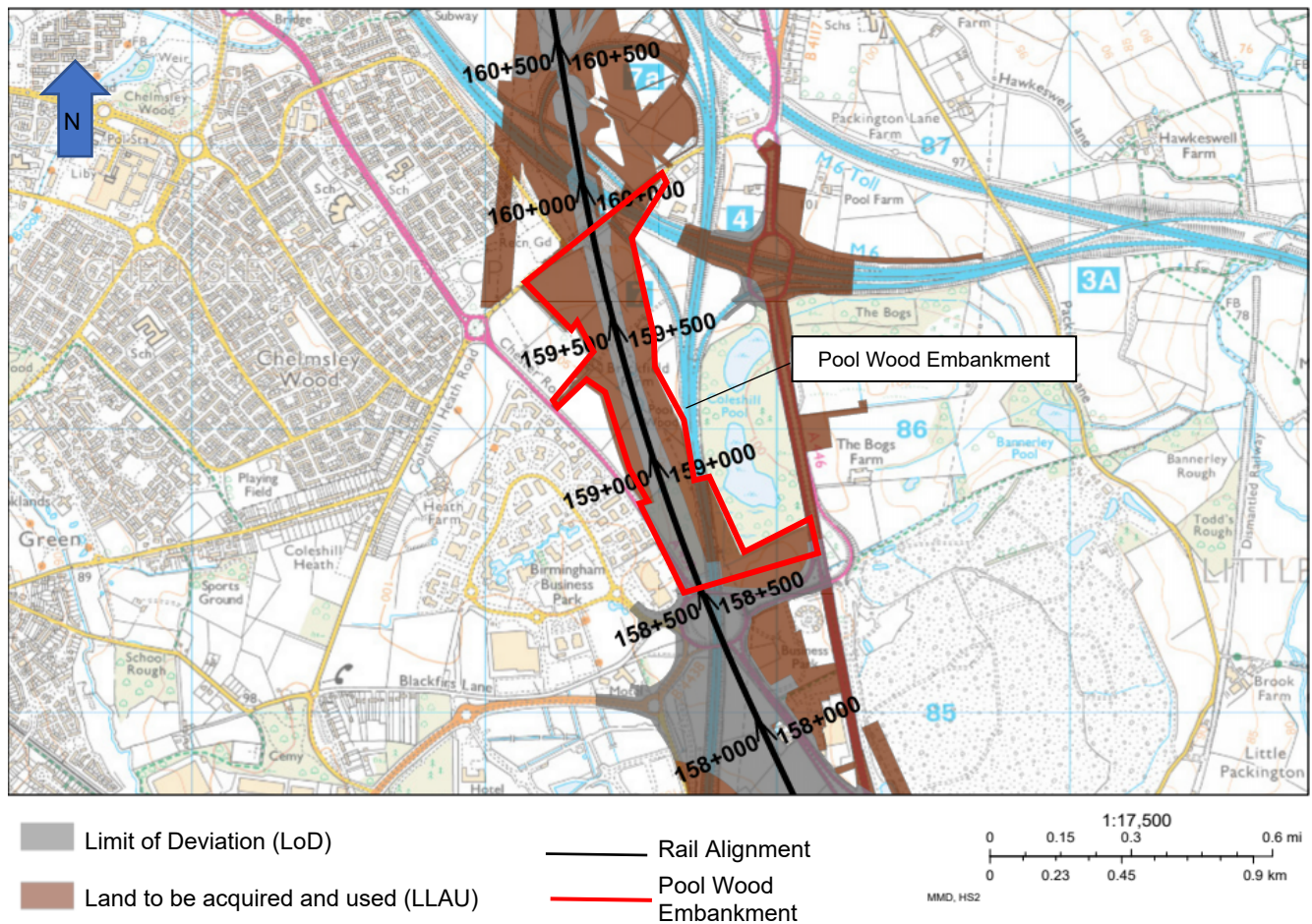
The DJV has been appointed to undertake a gas risk assessment relating to the import and placement of potentially gas-producing waste materials for reuse in the construction of a landscape bund which is part of Pool Wood Embankment, to the immediate west of HS2.

1.2 Background

Pool Wood Embankment is located ~10km to the south-east of Birmingham City Centre and just south-east of the town of Chelmsley Wood. The embankment is approximately 1.5km long and mostly crosses an area of existing farmland and woodland. In the north at chainage 159+805 of the HS2 scheme, a new underbridge will be constructed where the embankment meets Coleshill Heath Road. Where the embankment ends in the south, the HS2 alignment intersects the M42, to the south of Junction 7. A box structure will be constructed to take the HS2 alignment from the embankment and over the M42 carriageway. The box structure ties in with Packington Embankment in the south.

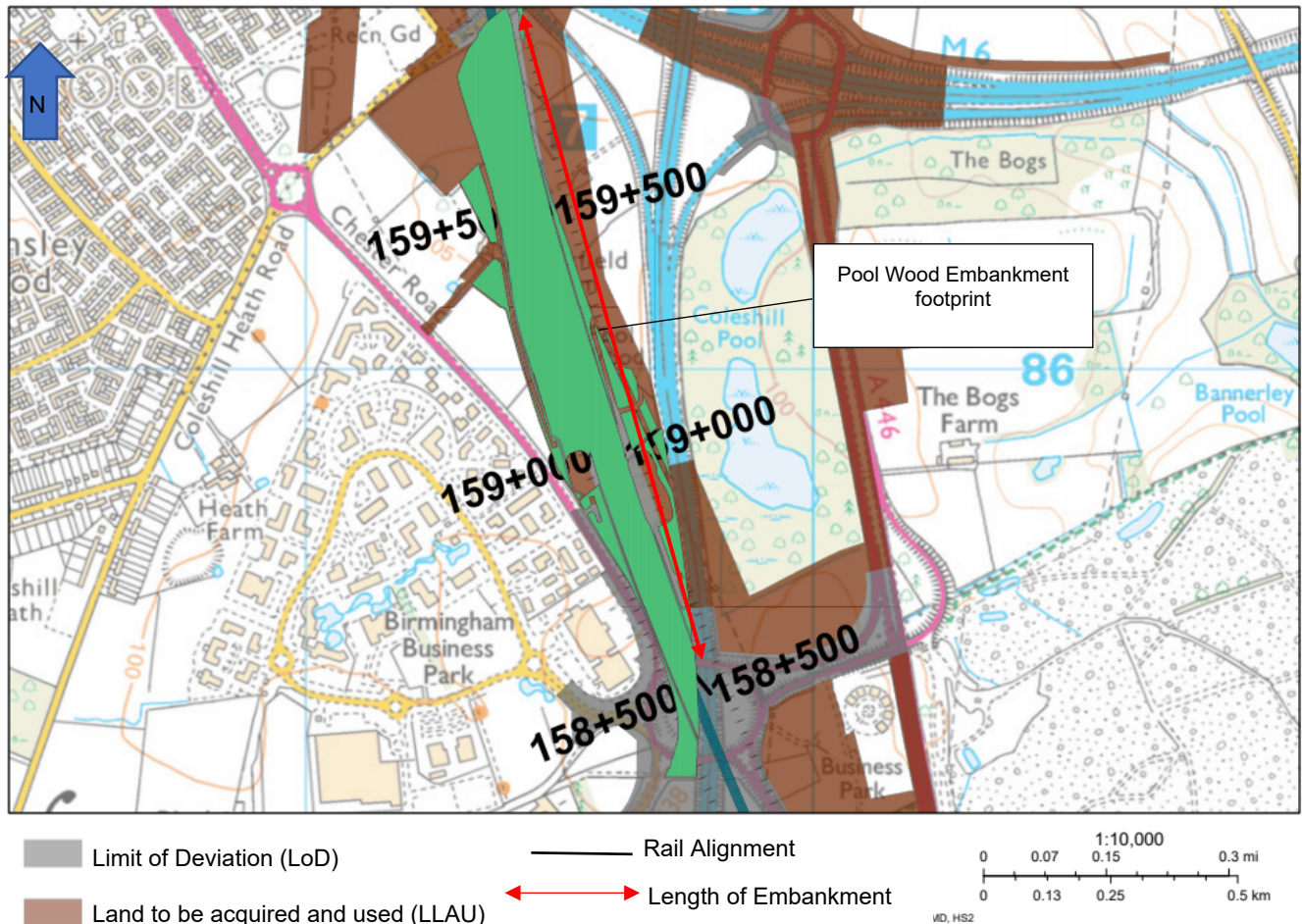
The location of Pool Wood Embankment and the extent considered in this report is shown on Figure 1, which comprises the land within the Limit of Deviation (LoD) and the Land to be Acquired and Used (LLAU). Figure 2 shows the footprint of the embankment (highlighted in green) and Figure 3 shows an aerial image of the area. The section of the landscape bund (hereafter referred to as the Site) subject to the placement of material sourced from Middle Bickenhill landfill is shown in Figure 4 and Figure 5.

Figure 1: Extent of Pool Wood Embankment



Source: HS2 Phase 1 MWCC web interface MOATA

Figure 2: Pool Wood Embankment (embankment footprint shown in green)



Source: HS2 Phase 1 MWCC web interface MOATA

Figure 3: Aerial imagery (2012) of Pool Wood Embankment extent



3/10/2021

— Alignment chainage markers 04-11-2020

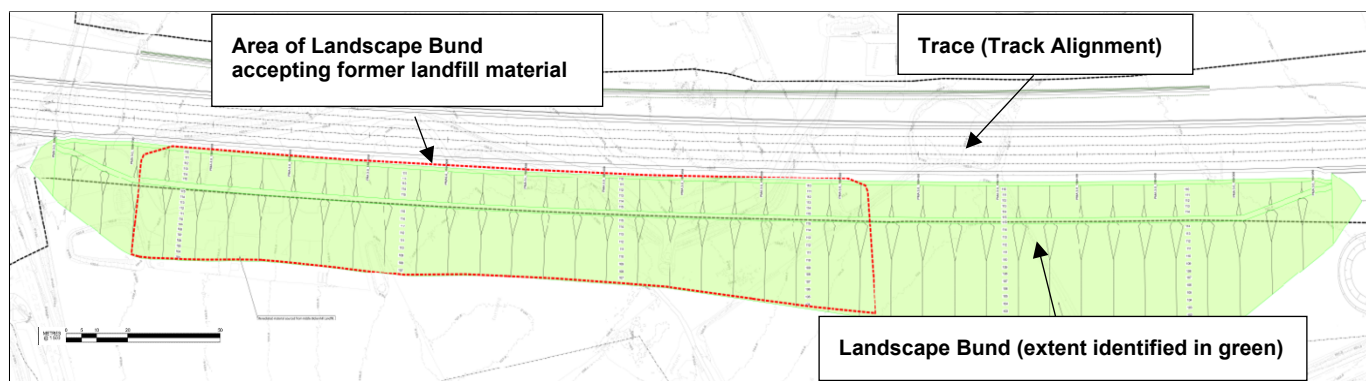
— Rail Alignment 2D

Source: HS2 Phase 1 MWCC web interface MOATA

The LoD specify the limits where the scheduled works may be constructed, and LLAU, is the area that outlines the additional limits for other works (e.g., ancillary works such as the provision of environmental mitigation), as well as the limits of land required in connection with the construction and future maintenance of the project.

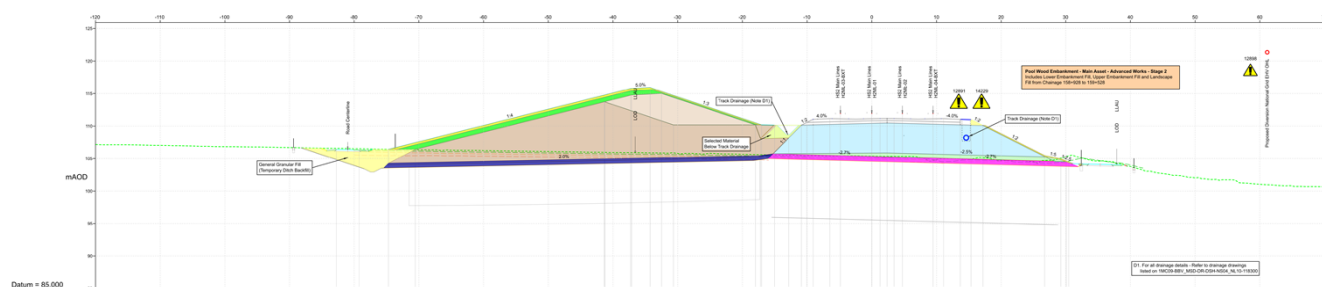
For the purposes of this report, contamination sources associated with material placement in the area to be permitted and receive landfill material will be considered.

Figure 4: Location of Site Boundary



Source: extract from HS2 drawing entitled "Pool Wood Embankment, Approximate Extent of Permitted Boundary", January 2024 (1MC09-BBV_MSD-CV-DPP-NS04_NL10-219402)

Figure 5: Cross-Section through Pool Wood Embankment Chainage 159 +500



Source: Balfour Beatty VINCI – drawing 1MC09-BBV_MSD-CV-DSE-NS04_NL10-218329 Rev P02 24/03/23

1.3 Report Context

This report is a qualitative gas risk assessment, based on a source, pathway, receptor approach. This report covers the gas risks resulting from the placement of material to form the section of the landscape bund to receive material from the landfill.

1.4 Reference Documents

Document Title	Document Number
WP 053(A) – BIS - Enabling Works - North Contract - Remediation Strategy Report - 29 October 2019 ⁱ .	1EW04-LMJ-EV-REP-NS07-053013 C02
Foundation Works Risk Assessment: Pool Wood Embankment - 24 August 2021 ⁱⁱ .	1MC09-BBV_MSD-EV-REP-NS04_NL10-100049 C01
Pool Wood Embankment Land Quality Management Report - 29 March 2022 ⁱⁱⁱ .	1MC09-BBV_MSD-EV-REP-NS04_NL10-100167 C01,

2 SITE SETTING

2.1 Site location and description

The total length of Pool Wood Embankment will be approximately 1,414m. The length of the landscape bund is approximately 850m and runs from Ch. 158+920 to 159+775 on the west side of the Pool Wood Embankment trace. The red line boundary of the waste recovery permit within the landscape bund is 475m running from Ch 159+225 to Ch 159+700.

The height of the embankment associated with the trace varies along its length up to a maximum height from ground level to the top of the protection layer of approximately 11m (without considering the landscape bund). The width for the mainline embankment track bed is approximately 31m. The asset has a maximum side slope of 1:2. The maximum height of the site (and wider landscape bund) is 14m above existing ground elevations. The internal slope of the site and (and wider landscape bund) is 1:3 and the external slope is 1:4.

Historically, the site mostly comprised farmland. Aerial photos show that there is some construction taking place near the north of the site, adjacent to Coleshill Heath Road. This is likely to be associated with temporary works for HS2.

2.2 Geology

The published geology shows the following:

British Geological Society records were reviewed to assess geology at and near the site. Made Ground is recorded on or immediately to the east of the Site at approximate Ch 159+280 to 159+680.

Glaciolacustrine deposits (comprising of clay and silt) are present below the entire site, which are in turn underlain by Glaciofluvial deposits (comprising sand and gravel). Alluvial deposits (comprising clay, silt sand and gravel) are recorded approximately 300m to the east of the Site.

The site is underlain by up to approximately 10.0m of Glaciolacustrine Deposits and then 2.0 to 5.0m of Glaciofluvial Deposits.

The superficial deposits are underlain by the bedrock geology of the Mercia Mudstone Group, described as structureless with blocky weathering mudstone and siltstone.

The underlying bedrock is interpreted as Grade I / II Mercia Mudstone. There is an upper weathered horizon of Grade IV/V mudstone that is approximately 2.0m thick. There are limited groundwater strikes recorded at the site. Information indicates that groundwater lies at around 92mAOD in the mudstone and at the boundary between the Glaciolacustrine and Glaciofluvial Deposits (~96.0 and 102.0mAOD).

Table 1 provides a summary of the geology recorded during ground investigations at and near Pool Wood Embankment.

Table 1: Geology

Strata	Distribution	Typical depth range (m bgl)	Description
Topsoil	Located across the Site	0 to 0.50	Mixture of granular and cohesive. Mostly recorded as agriculturally reworked deposits. Generally described as clay or sand.
Made Ground	3 of 3 window samples 6 of 11 cable percussion boreholes 1 of 13 rotary drilled boreholes 1 of 10 trial pits (encountered at the southern and northern boundary and the centre of the Site)	0 to 5.65	Mixture of granular and cohesive materials. Mostly described as sand and gravel and clay. Gravel includes ash, flint, brick, concrete, glass, and charcoal
Glaciolacustrine Deposits	5 of 11 cable percussion boreholes 3 of 13 rotary drilled boreholes (encountered in the centre and northern part of the Site)	0.50 to 11.1	Mostly cohesive described as sandy silty or sandy clay.
Glaciofluvial Deposits	Encountered across the Site in all boreholes	3.2 to 12.60	Mixture of granular and cohesive. Granular materials mostly described as fine to coarse sand and cohesive as sandy clay.
Weathered Mercia Mudstone Group (Grade III/IV)	Encountered across the Site in all boreholes	0.80 to 15.00	Very high strength reddish orange, brown silty CLAY
Unweathered Mercia Mudstone Group (Grade I/II)	Encountered across the Site in all boreholes	8.61 to 35.60 (depth not proven)	Very weak, medium to thickly bedded, reddish brown MUDSTONE. Bedding is horizontal, undulating, smooth and clean

2.3 Published hydrogeology

The published geological units identified at the Site and surrounding area have the following aquifer characteristics, as determined by the Environment Agency (EA):

- Glaciofluvial and Alluvial deposits – Secondary A aquifers, which contain permeable layers capable of supporting water supplies at a local scale, and in some cases forming an important source of base flow to rivers.
- Glaciolacustrine deposits – Non-productive.
- Mercia Mudstone Group – Secondary B aquifer, which contain predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons, and weathering.

3 SITE CONCEPTUAL MODEL REVIEW

3.1 Overview

For the purposes of this study, contamination and environmental considerations are studied by developing a conceptual model of the Site that describes the environmental features of the Site together with the expected interaction of potential contamination sources and the wider environment. There are three components to any site conceptual model, as summarised below:

- Source – Potentially gas generating components of the material placed
- Pathways – Routes linking the source with the receptors
- Receptors – Aspects (human health and property) that could be impacted by the presence of gas

Risks are defined qualitatively using the probability x consequence ratings summarised in Appendix A

3.2 Source

The material that is to be used in the construction of the Site will arise from the Middle Bickenhill landfill. It is expected that up to 90% of ~178,800m³ to be excavated from the landfill (up to ~161,920m³) will be used at the Site.

The Middle Bickenhill landfill was operational between 1962 and 1985. It accepted inert, industrial, commercial, household, and special wastes.

A ground investigation was undertaken, which showed the widespread presence of asbestos in fill materials (16 out of 50 samples analysed). In addition, there were locally elevated hydrocarbons, polyaromatic hydrocarbons (PAHs) and metals recorded in fill in excess of the Generic Assessment Criteria (GAC) for parks / open spaces.

According to the BIS Remediation Strategyⁱ there were elevated ground gas concentrations recorded with peaks of 26% v/v carbon dioxide and 56% v/v methane within Middle Bickenhill Landfill. Depleted oxygen was also recorded (down to 0.1% v/v). Maximum peak flow rates of 12.7 l/hr and 10.2 l/hr were recorded from a specific location; however, steady flow rates from this location were much lower at between 0.0 and 0.1 l/hr. Steady state flow rates recorded from all wells installed in the fill material ranged from 0 to 2.1 l/hr. The raw data supplied for the site casts some doubt on the detailed conclusions with the highest flow rates occurring at the end of monitoring periods or during single spot monitoring events. However, the general trends across the site are consistent with peak flow rates from other holes not exceeding 6.3 l/hr and typically <2.5 l/hr across the landfill.

Water was observed in seven of the 24 exploratory holes where Made Ground was encountered. These water strikes were located either near the base of the landfill in granular soils (and so potentially in continuity with groundwater) or at shallower depths and recorded as “seepages” only. Both inorganic and organic contaminants were recorded in shallow groundwater exceeding the Environmental Quality Standards and Drinking Water Standards (including total petroleum hydrocarbons, boron, hexavalent chromium, zinc, cyanide, ammoniacal nitrogen, PAHs and phenol). A subsequent Detailed Quantitative Risk Assessment (DQRA)^{iv} was undertaken in advance of the Remediation Strategy to assess the risks from these contaminants in the Secondary A Aquifer to the eastern (down gradient) HS2 site boundary (LOD). Exceedance of the derived site-specific assessment criteria (SSAC) were recorded for inorganic

and organic contaminants (including boron, zinc, hexavalent chromium, ammoniacal nitrogen and phenol).

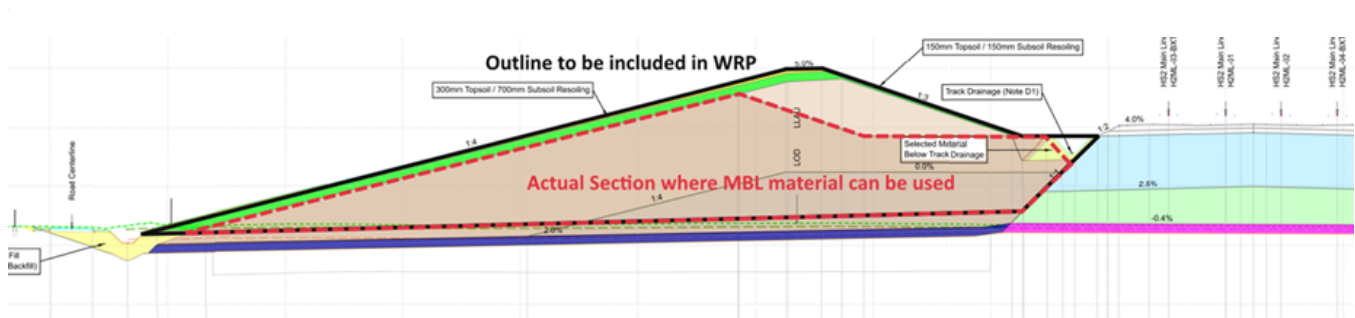
Japanese Knotweed is present across a wide area of the landfill.

A Remediation Implementation Plan is being developed that will ensure that the wastes with the greatest concentration of potentially polluting organic wastes are removed for incineration, together with measures to manage the Japanese Knotweed. It is expected that the remediation strategy will be based on screening to remove oversize materials (for future crushing) and to improve the quality of the fill for reuse and compaction. This operation will be undertaken in accordance with an Asbestos Management Plan. Following screening, the material will be subject to chemical and geotechnical testing to determine the materials suitability for use. The remaining material following recovery operation is largely expected to comprise crushed / suitable fills meeting a landscape specification.

3.3 Pathways

Figure 6 shows that the material sourced from the Middle Bickenhill Landfill will form a central core of the bund and will be covered by a one metre thick soil cover layer.

Figure 6: Cross-section through the Pool Embankment landscape bund



There are two principal pathways whereby gas resulting from the degradation of organic matter has the potential to affect on-site and off-site receptors. These include:

- Fugitive emissions of gas from the surface of the deposited material into the atmosphere where they will be diluted and dispersed; and
- Lateral migration of gas through the subsurface soils.

Human exposure to landfill gas emissions in the atmosphere may arise via a number of pathways as follows:

- Direct inhalation of airborne contaminants and particles, including airborne contaminants that may arise from lateral migration of landfill gas;
- Deposition of contaminants onto soils, vegetation and surfaces and subsequent ingestion of soils, vegetation and deposited dust;
- Dermal contact with contaminated soils and dust; and
- Contamination of vegetation via deposition and uptake through leaves and roots.

A further, and typically negligible pathway is human exposure to contaminants that are present in the gas. This can occur from the ingestion of other food products such as locally grown dairy products and meat (exposure occurs by the animal ingesting contaminated soils and vegetation). However, this is not applicable as HS2 will retain ownership and the bund will be used for landscaping. It will not be transferred over for agricultural uses and public access will be prohibited.

Lateral gas migration is unlikely, as firstly the materials used in the construction of the Site will form an above-ground feature, but also as shown in Figure 6 will be underlain with a 350mm thick drainage blanket that will form a preferential pathway for any gas generation. The permeability of the drainage layer will be significantly greater than the underlying Glaciolacustrine Deposits. These deposits have a relatively low hydraulic conductivity varying between 1.8×10^{-9} m/s to 3.6×10^{-6} m/s.

Atmospheric pollution is possible, as the placed material will not be covered by an impermeable barrier. Therefore, the main migration pathway for gas will be the emission to atmosphere through the surface of the deposited materials.

Other trace gases, such as hydrogen sulphide and other odorous gases could be generated.

3.4 Receptors

There are several properties within 250 metres of the Site. The closest properties are part of the Waterside Centre Business Park to the south and west of the embankment.

The closest residential properties are those on Bluebell Drive, which are approximately 320m to the northwest of the Site. There are no properties within a relevant distance to the east of the Site, as it is bordered by the M42 and beyond, the A446 roads.

The global environment (atmosphere) could also be considered to be a potential receptor for gases generated through organic material degradation.

3.5 Risk assessment

For there to be a major risk to the potentially sensitive receptors each part of the source, pathway, receptor approach has to be in place. In reality, the risk to sensitive receptors through lateral migration is very low because the material is placed above ground and any potential lateral movement would be collected in the granular base layer, which connects to a drainage layer along the western extremity of the Site (and wider landscape bund).

The only potential impacts are, therefore, through global atmospheric pollution and odour from trace elements. In reality, measures will be taken to limit the extent of atmospheric emissions and odour impacts through the use of the waste recovery plan. The material imported will be screened to remove oversized materials and “black bag waste” and other visible degradable inclusions such as timber, and will restrict the organic nature of the material placed. In addition, the waste is relatively old as the Middle Bickenhill landfill last received waste in 1985. Therefore, much of the biodegradation of the waste matter will already have occurred. It is possible that movement of this material may encourage some aerobic degradation to occur, but this should be short-lived and would not result in the more harmful organic compounds being developed.

Overall, the impact to the environment resulting from gas generated from the biodegradation of the waste should be very low.

4 CONCLUSIONS

4.1 Gas management requirements

Gas management requirements will essentially be covered during the construction. Measures will be taken to screen the most potentially contaminating materials from the source for disposal off-site. In addition, the material will be placed on a granular drainage blanket and be filled above ground level, thus removing the potential for lateral migration of gases.

The gas generation resulting from the material placed is unlikely to cause significant impacts and the risks to human health and property post development are considered to be very low. Assuming that good practices are adopted, and risk assessments and method statements are followed, the risk to construction workers should also be very low. It is, therefore, proposed that no further gas protection measures are required.

Appendix A Qualitative Risk Assessment Definitions

The qualitative risk summaries for non-controlled waters are derived from the Environmental Statement Volume 5, Technical Appendices, Scope and methodology Report Addendum (CT-001-000/2), Annex F, (HS2, 2013)

Table A.1: Classification of probability

Classification	Definition of the Probability of Harm/Pollution Occurring
High Likelihood	The contaminant linkage exists and it is very likely to occur in the short term, and/or will almost inevitably be realised in the long term, and/or there is current evidence of it being realised.
Likely	The source, pathway and receptor exist for the contaminant linkage and it is probable that this linkage will occur. Circumstances are such that realisation of the linkage is not inevitable, but possible in the short term and likely over the long term.
Low Likelihood	The source, pathway and receptor exist and it is possible that it could occur. Circumstances are such that realisation of the linkage is by no means certain in the long term and less likely in the short term.
Unlikely	The source, pathway and receptor exist for the contaminant linkage but it is improbable that it will be realised even in the long term.

Table A.2: Classification of consequence (non-controlled water receptors)

Classification	Definition of Consequence
Human Health Receptors – Site End Users	
Severe	Acute damage to human health based on the potential effects on the critical human health receptor.
Medium	Chronic damage to human health based on the potential effects on the critical human health receptor.
Minor	Minimal short- term effects on human health based on the potential effects on the critical human health receptor.
Negligible	No appreciable impact on human health based on the potential effects on the critical human health receptor.
Ecosystem Receptors	
Severe	For sites with designations as follows – Site of Special Scientific Interest, National Nature Reserve, Special Protection Area (and potential sites), Special Area of Conservation (and candidate sites) or Ramsar. Irreversible adverse change in the functioning of the ecological system or any species of special interest that forms part of that system.
Medium	For sites with designations as follows – Site of Special Scientific Interest, National Nature Reserve, Special Protection Area (and potential sites), Special Area of Conservation (and candidate sites) or Ramsar. Substantial adverse change in the functioning of the ecological system or any species of special interest that forms part of that system.
Minor	Harm to ecosystems of a low sensitivity such as sites of local importance. No appreciable harm to ecosystems with statutory designations.
Negligible	Limited harm to ecosystems of low sensitivity such as sites of local importance.
Property Receptors – Buildings, Foundations and Services including the operational HS2 scheme	
Severe	Collapse of a building or structure including the services infrastructure from explosion due to ground gasses.
Medium	Significant damage to a building or structure including the services infrastructure impairing their function.
Minor	Damage to buildings/structures and foundations but not resulting in them being unsafe for occupation. Damage to services but not sufficient to impair their function.
Negligible	No appreciable damage to buildings/structures, foundations and services.
Property Receptors – Grade 1 Agricultural land	
Severe	Substantial loss in the value of crops or domestically-grown produce resulting from disease, death or other physical damage. Death to livestock, domesticated animals or wild animals subject to shooting or fishing rights.
Medium	Substantial diminution in yield of crops or domestically-grown produce resulting from disease, death or other physical damage. Serious disease or other serious physical damage to livestock, domesticated animals or wild animals subject to shooting or fishing rights.
Minor	Harm to crops but not resulting in a substantial loss in value or diminution in yield. Limited harm in terms
Classification	
	of disease or other physical damage to livestock, domesticated animals or wild animals subject to shooting or fishing rights.
Negligible	No appreciable harm, or harm to a low sensitivity receptor.

The qualitative risk summaries for controlled waters are derived from HS2 Technical Standard – groundwater protection Document number HS2-HS2-EV-STD-000-000010.

Table A.3: Classification of Probability (Controlled Waters)

Classification	Definition
High likelihood	There is a linkage and an event that either appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptor of harm or pollution.
Likely	There is a linkage and all the elements are present and in the right place, which means that it is probably that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low likelihood	There is a linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Unlikely	There is a linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

Table A.4: Classification of Consequence (Controlled Waters)

Classification	Criteria	Example
Major	Adverse: Loss of an attribute and /or quality and integrity of an attribute	Adverse: Increased flood risk to essential infrastructure, highly or more vulnerable developments; loss of a fishery; decrease in surface water ecological or chemical WFD status or groundwater qualitative or quantitative WFD status
	Beneficial: Creation of new attribute or major improvement in quality of an attribute	Beneficial: Creation of flood plain and decrease in flood risk; increase in productivity or size of fishery; increase in surface water ecological or chemical WFD status; increase in groundwater qualitative or quantitative WFD status.
Moderate	Adverse: Loss of part of an attribute or decrease in integrity of an attribute	Adverse: Increased flood risk to less vulnerable developments; Partial loss of fishery; measurable decrease in surface water ecological or chemical quality or reversible change in the yield or quality of an aquifer, affecting existing users, but not changing any WFD status
	Beneficial: Moderate improvement in quality of an attribute	Beneficial: Measurable increase in surface water quality or in the yield or quality of aquifer benefiting existing users but not changing any WFD status
Minor	Adverse: Some measurable change to the integrity of an attribute	Adverse: Increased flood risk to water compatible development or impact which does not affect existing or any possible future developments; measurable decrease in surface water ecological or chemical quality; decrease in yield or quality of aquifer not affecting existing users or changing any WFD status
	Beneficial: Measurable increase, or reduced risk of negative effect to an attribute	Beneficial: Measurable increase in surface water ecological or chemical quality; increase in yield or quality of aquifer not affecting existing users or changing any WFD status

Negligible	No change to integrity of attribute	Negligible change to flood risk; discharges to watercourse or changes to an aquifer which lead to no change in the attribute's integrity
------------	-------------------------------------	--

Table A.5: Comparison of Magnitude of Effect (Consequence) Against Probability

	Consequence			
Probability	Major	Moderate /Medium	Minor	Negligible
High likelihood	Very high risk	High risk	Moderate risk	Moderate/low risk
Likely	High risk	Moderate risk	Moderate/low risk	Low risk
Low likelihood	Moderate risk	Moderate/low risk	Low risk	Very low risk
Unlikely	Moderate/low risk	Low risk	Very low risk	Very low risk

Table A.6: Estimation of Risk (All receptors)

Risk	Definition
6 (Very High risk)	There is a high probability that a contaminant linkage could exist between a source and a designated receptor resulting in detriment to the receptor. Investigation and remediation will be required prior to (or as part of) construction. During construction further mitigation and monitoring measures (in accordance with the draft Code of Construction Practice (CoCP)) are likely to be required. Such sites are considered significant.
5 (High Risk)	It is likely that a contaminant linkage exists with potentially a severe affect on designated receptors. Investigation and remediation is very likely to be required. Such sites are considered significant.
4 (Moderate risk)	It is possible that an effect could arise to a designated receptor through a contaminant linkage. However, the effect is most likely to be moderate to minor. Further investigative work is likely to be required to clarify the risk. Some remediation works may be required. Such sites may be considered significant.
3 (Moderate / Low Risk)	It is possible that a contaminant linkage could exist, but if it does, any effects would normally be minor. Further investigative work (which is likely to be limited) to clarify the risk may be required. Any subsequent remediation works are likely to be relatively limited.
2 (Low risk)	It is a low possibility that a contaminant linkage could exist. However, should there be a linkage the effect to the receptor (with regards to controlled waters) would normally be minor or negligible and the effect on human health would be negligible. No investigation or remedial works are likely to be required.
1 (Very Low risk)	It is unlikely that a contaminant linkage could exist between a source and a designated receptor.

Appendix B References

- i Laing Murphey (2019): WP 053(A) – *BIS - Enabling Works - North Contract - Remediation Strategy Report* - Document no.: 1EW04-LMJ-EV-REP-NS07-053013 C02, 29 October 2019
- ii Mott MacDonald / Systra (2021): *Foundation Works Risk Assessment: Pool Wood Embankment* - Document Number: 1MC09-BBV_MSD-EV-REP-NS04_NL10-100049 C01, 24 August 2021
- iii Mott MacDonald / Systra (2022): *Pool Wood Embankment Land Quality Management Report* - Document Number: 1MC09-BBV_MSD-EV-REP-NS04_NL10-100167 C01, 29 March 2022
- iv Laing Murphey (2019): WP 053(A) – *BIS - Enabling Works - North Contract – Land Quality Assessment Report* – Document number 1EW04-LMJ-EV-REP-NS07-053011