

High Speed 2 - 1MC06 - Stage One C2 - MWCC - North Portal of Chiltern Tunnels to Brackley

Twyford Embankment Landscape Earthworks Conceptual Site Model

1MC06-CEK-EV-NOT-CS06_CL10-000005

Rev	Date	Author	Checked by	Approved by	Revision Details	EKFB Reviewer
C01	11/09/2025	J.Spalding	A.Watts	J.Cassidy	Updated for EA Comments	Zara Rostance
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Stakeholder review required (SRR)	Purpose of SRR
County / District / London Borough Council	Acceptance
LOV	Approval
LUL	No Objection
NRL	Consent
TFL	
Utilities Company	
Other (please specify)	



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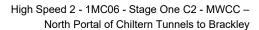
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Environment Agency Queries and Response

The following comments have been raised by the Environment Agency Environmental Permitting Office) on the 19/08/2025 for the Twyford Embankment DfR submission (reference EPR/EP3426SB/A001) which utilises information presented within the Twyford Embankment Landscape Earthworks Conceptual Site Model Report (prepared by ASC), revision C01.

EA queries (italics) and ASC responses are listed below in the order presented and this CSM report has been updated in the corresponding sections. From the 15 comments raised by the EA on the DfR submission, comments 1-5 are relevant to this CSM report and are discussed below.

 Conceptual Model Cross-Sections – Amend the conceptual site model cross-sections to present (a) the receptors, (b) the geological, hydrogeological or hydrological setting of the site, and (c) any engineering/mitigation measures potentially required under The Environmental Permitting (England and Wales) Regulations 2016 (EPR2016). Reason: The current conceptual model cross-sections are based solely on the engineering details required.

An asset-specific Conceptual Site Model (CSM) for the Twyford Embankment Landscape Earthworks is already presented within Section 5 of this report; in written form (Section 5.2, Table 5-2) and diagrammatic cross section (Section 5.2, Figure 5-1). This CSM has been amended to include a clearer definition / labelling of the site and site conditions on Figure 5-1.

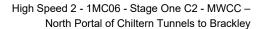
The CSM has been based on the environmental setting information (geology, hydrogeology, hydrology presented in Section 2.3), site-specific ground investigation data (presented in Section 2.4 and 2.5) and the proposed engineering design and mitigation measures for the asset (presented in Section 1.5). The CSM identifies the relevant sources, receptors and pathways, and the proposed engineered design to mitigate against these risks, which addresses comment 1.

2. **Conceptual Model Source Term** – Amend the conceptual site model source term by providing evidence that the waste deposited for recovery (post any treatment) will meet the requirements of Schedule 22 of The Environmental Permitting (England and Wales) Regulations 2016 (legislation.gov.uk), which states:

"take all necessary measures—

- (a) to prevent the input of any hazardous substance to groundwater, and
- (b) to limit the input of non-hazardous pollutants to groundwater so as to ensure that such inputs do not cause pollution of groundwater"

Reason The waste material has been characterised as non-hazardous under WM3 whilst acknowledging that a number of samples exceed the threshold and are hazardous. It does not follow that non-hazardous materials are inert. Additionally, the conceptual site model for Twyford differs significantly from that of Chetwode. At Chetwode, a site-specific conceptual model—supported by borehole logs—demonstrated that no aquifer units or groundwater were present beneath the proposed development. In contrast, this site partially overlays the River Terrace Deposits which is classified as a secondary A aquifer. This is a significant difference, and the current application provides no evidence to support the assumption that conditions of Twyford are comparable to those at Chetwode. Therefore, it cannot be assumed that the site meets the requirements of EPR2016 schedule 22.





There are 2 parts to this query (i and ii), and for ease we have split them out as follows.

i) The waste material has been characterised as non-hazardous under WM3 whilst acknowledging that a number of samples exceed the threshold and are hazardous. It does not follow that non-hazardous materials are inert.

RPS, as part of the DfR has undertaken waste classification and have confirmed the majority of samples are non-hazardous with some exceeding the hazardous waste threshold but the classification was carried out prior to remediation. 2/109 samples were classified as hazardous (1 on the basis of ecotoxicity, 1 due to Corrosiveness/pH) and 22/109 samples were forced (reclassified) as non-hazardous as free product was not recorded and flammability was not considered viable within soils. It is acknowledged that the non-hazardous classification does not mean that a waste would automatically be considered inert, and waste recovery activities are not restricted to inert waste only.

the conceptual site model for Twyford differs significantly from that of Chetwode. At Chetwode, a site-specific conceptual model—supported by borehole logs—demonstrated that no aquifer units or groundwater were present beneath the proposed development. this site partially overlays the River Terrace Deposits which is classified as a secondary A aquifer. This is a significant difference, and the current application provides no evidence to support the assumption that conditions of Twyford are comparable to those at Chetwode. Therefore, it cannot be assumed that the site meets the requirements of EPR2016 schedule 22.

A site-specific CSM is presented specifically for Twyford in Section 5.2, which demonstrates that the Site is directly underlain by cohesive Alluvium and in turn, by Oxford Clay. River Terrace Deposits (RTD); referred to above, has not been encountered within the Site itself and was only identified locally off-site; as part of the development of the ground model and CSM, logs within 50m of the site were reviewed, and limited RTD was confirmed within 4/20 off-site exploratory logs. RTD has been encountered adjacent to the site boundary, off-site.

Although RTD has not been recorded within the Site, the proposed area of reuse for the treated waste has been reduced in size so that the northern part of the Site boundary (north of Chainage 81+400) will not be used, to add another degree of conservatism, in relation to the reuse of the treated waste, as shown in Figure 2.4. In addition, the re-use area will be >175m from the offsite RTD.

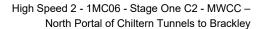
In addition, the treated waste has also been screened against the more conservative Zone 2B screening criteria (Section 4.3.1), which is protective of groundwaters at >4m bgl. Groundwater strikes have not been encountered on-site, however groundwater within the RTD in the vicinity of the site was encountered at >5m bgl, and therefore screening against the 2B criteria was appropriate.

The potential impacts to groundwater from the treated waste are considered very low given the proposals (engineering design and mitigation) and the underlying unproductive strata (>4m of OXC+ALV), i.e. absence of a viable pathway to controlled waters, and therefore meets the requirements of Schedule 22 of EPR 2016.

3. **Waste Source Term-** Provide an assessment of the waste as a source term with respect to the potential discharge of hazardous substances, or the potential for non-hazardous pollutants to cause pollution.

The Made Ground re-use screening criteria (presented in Appendix V) utilised within C2/C3 of the HS2 route was derived on the assumption that the placed Made Ground (e.g. treated waste) is the source (conservatively modelled as continuous) (Section 3).

Section 2 of this report has assessed that the Site falls within Zone 3 of the Made Ground re-use screening criteria, and therefore the treated waste has been assessed against this criteria (Section 4.3).





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In addition to this, given the presence of the RTD adjacent to the site (an aquifer unit), the treated waste has also been conservatively assessed against the Zone 2B criteria (protective of deeper groundwater encounters as exhibited within the ground investigation), this screening confirms the suitability of the treated waste against this more conservative screening criteria which is protective of the groundwater conditions on-site; Section 4.3.1.

In addition, the design of the landscape earthworks (in addition to the wastes being assessed as suitable for the site reduces the likelihood of potential pollution as follows:

- The engineering design will minimise the potential infiltration/leaching (Section 1.5 and 5)
- Placement of the restoration layer specific for plant growth and the engineered material overlying the landscape earthworks (Section 1.5 and 3)
- Presence of thick low-permeability, unproductive strata underlying the Site (Section 2.5)
- The contaminant linkage to groundwater, runoff to surface water and human health direct contact receptors are not considered viable (Section □).
- 4. **Mitigation Measures-** Provide an assessment of any mitigation measures, subject to the requirements of question 2 (ii) above.

Mitigation measures (Section 5-2) have previously been presented, and the main mitigation measures is the landscape earthworks engineering design itself (Section 1.5) and re-use strategy/criteria (Section 3) which are protective of groundwater receptors relevant to the site.

Furthermore, the treated waste will be remediated, and the Site is underlain by >4.0m of unproductive strata (ALV +OXC). We have screened the treated waste against a more conservative Zone 2B rather than Zone 3 (which would be acceptable for the Site), and results pass the more conservative Zone 2B criteria. A reduced re-use area has been implemented (Figure 2-4), some >175m from the RTD (north, off-site) and this reduced re-use area is now presented in the CSM Figure 5-1.

5. **Surface Water Risks-** Provide an assessment of the risk to surface water from contaminated runoff, supported by evidence on the leachability quality of the proposed waste materials.

The CSM (Section 5.2) has demonstrated the absence of a viable pathway between the treated waste and surface runoff due to the engineering design of the landscape earthworks (Section 1.5):

- The treated waste to be emplaced within compacted cohesive, low permeability OXC.
- The treated waste is to be placed within the landscape earthworks embankment beneath a restoration layer, preventing direct interaction with the waste.

Suitability of the material for re-use on site (Section 3 and 4.3):

- Although there is limited leachate testing, the post-remediation treated waste will be suitable for Zone 2B and Zone 3.
- The agreed reuse criteria is based on conservative Consim modelling [1], which models the leaching
 of a continuous source (in this instance, the source being the treated waste) and migration to surface
 water receptors, and adopting the agreed reuse criteria demonstrates that there is not a need for
 further remedial measures when considering surface water receptors due to the absence of a
 potential pollution linkage.



1 Introduction

1.1 Terms of Reference

The Arcadis/Setec and COWI Design Joint Venture (ASC) has been appointed by Eiffage/Kier/Ferrovial Agroman and BAM Nuttall (EKFB) to prepare an asset-specific conceptual site model (CSM) in support of the Deposit for Recovery Permit (DfR) application for the re-use of remediated waste within a portion of the Twyford Embankment Landscape Earthworks (the "Site") within section C2, of the Phase 1 High Speed 2 (HS2) development, as shown in Figure 1-1 below.



Figure 1-1 Site and HS2 Scheme

The Site is located at Twyford Embankment, east of the town of Twyford, Buckinghamshire, MK18 4ES. Planning permission has been granted by Buckinghamshire Council for the development of Twyford Embankment (24/02763/HS2 (awaiting decision), 21/03691/HS2 (approved)).



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1.2 Aims/Scope

This document has been prepared to provide an asset specific conceptual site model (CSM) in support of the submission of the DfR Permit for the Site within the Twyford Embankment Landscape Earthworks (TELE) as outlined within the Employer's Instruction, EI-1609, comprising the following:

- The geological, hydrogeological, and hydrological Site setting (published and from ground investigation)- Section 2
- The material re-use strategy and criteria with an overview of the derivation of the re-use criteria (which is on the basis of modelling of the waste as a source term)- Section 3
- An assessment of the landfill waste (pre- and post- remediation) against the re-use criteria- Section
- The mitigation measures incorporated into the landscape earthworks design- Section 5
- The Conceptual Site Model to demonstrate the suitability of the treated waste (post-remediation) for re-use at the Site- Section 5

This document has been produced in accordance with the Land Contamination Risk Management (LCRM) guidance [1], EA guidance for Deposit for Recovery permit applications [2] and the HS2 Technical Standard for Land Quality (LQ) [3] and is based on the EA comments received for an earlier submission of a separate EKFB DfR application at the Chetwode Embankment.

1.3 Project Background Information

At Barton to Mixbury Cutting, the scheme intercepts a historical landfill Finmere Railway Cutting Landfill (LQ 14-02) southwest of the village of Finmere in Oxfordshire. The geotechnical design of Barton to Mixbury Cutting requires the removal of the landfill waste to enable the construction of the cutting; the land quality assessment of LQ 14-02 is presented within the Finmere Quarry Landfill and Railway Cutting Landfill Geoenvironmental Assessment Report [5].

HS2 has set high sustainability standards for the project which include the aim to re-use 100% of excavated materials, therefore, excavated landfill material from LQ 14-02 will be re-used within landscape earthworks following remediation (see Section 4.2). A total of ~100,00m³ of landfill waste will be excavated and remediated from LQ 14-02 of which ~40,000m³ of treated waste will be re-used within the Site.

The Site is considered a suitable re-use location for the treated waste due to the design need, its proximity to LQ 14-02 and based on the site-specific ground conditions i.e. low permeability Oxford Clay Formation (unproductive stratum) underlying the Site and surrounding area.

1.4 Information Sources

The following information sources have been utilised in the preparation of this report:

- Finmere Railway Cutting Landfill Remediation Implementation Plan (Duo) [4]
- Jackson Mobile Treatment Plant Deployment Supporting Information- Finmere Quarry and Railway Cutting Landfill [5]- Agreed to in communication reference JB3101MS/W0007 from the Environment Agency
- Preliminary post-remediation landfill waste chemical testing data (Duo) provided as PDF copies
 of laboratory certificates.
- Aylesbury Link and Great Central Railway Geoenvironmental Assessment Report [6]
- Aylesbury Link and Great Central Railway Remediation Outline Strategy [7]



- Aylesbury Link and Great Central Railway Remediation Verification Plan [8]
- Finmere Quarry Landfill and Railway Cutting Landfill Geoenvironmental Assessment Report [9]
- Finmere Quarry Landfill and Railway Cutting Landfill Remediation Outline Strategy [10]
- Finmere Quarry Landfill and Railway Cutting Landfill Remediation Verification Plan [11]
- Derivation of Made Ground Assessment Criteria for the Protection of Controlled Waters [12]
- Calvert Cutting to Twyford Embankment: Hydrogeological Assessment Report [13]
- Twyford Embankment Geotechnical Design Report [14]
- IDR 218 Specification [15]
- Twyford Embankment Asset Specific Cross Section [16]

1.4.1 Remediation Strategies

The DfR permit application relates to two separate Land Quality Reporting areas as follows:

- The source materials are reported within the Finmere Quarry Landfill (LQ 14-02) and Railway Cutting Landfill Remediation Outline Strategy [10] where it summarises the geo-environmental assessment and the outline remedial measures required during excavation and handling.
- The re-use area is within Twyford Embankment and re-use of the material is detailed within the Aylesbury Link and Great Central Railway Remediation Outline Strategy [8]; i.e. handling of waste, remediation prior to re-use (as presented in Appendix III-1).

1.5 Proposed Development

The Twyford Embankment Landscape Earthworks (TELE) (HS2-00002BVH1) - the proposed location of reuse, is located on the south-western side of the Twyford Embankment and Calvert Cutting between chainages Ch. 81+175 to Ch. 81+520 and is designed to be a visual and audible screen between HS2 and the town of Twyford, located approximately 550m west. The TELE will be constructed of both treated waste (from LQ 14-02) and natural materials (as outlined below); the treated waste will be re-used within the southern section of the TELE (not across the entire Landscape Earthwork).

1.5.1 Design of Landscape Earthworks

The TELE is shown on Figure 1-2 below (adapted from [16])



High Speed 2 - 1MC06 - Stage One C2 - MWCC - North Portal of Chiltern Tunnels to Brackley

Twyford Embankment Landscape Earthworks Conceptual Site Model 1MC06-CEK-EV-NOT-CS06_CL10-000005 Rev.C01

Typical Twyford Embankment Section

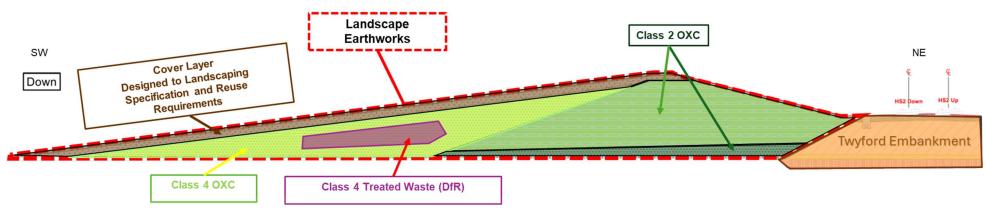


Figure 1-2 Annotated and Adapted Generalised Cross Section through Twyford Embankment and Landscape Earthworks

^{*}Figure is for indicative purposes and not to scale.



1.5.2 Geotechnical Design Report

The design of the TELE (including the Site) is presented within the Twyford Embankment Geotechnical Design Report (GDR) [14] and summarised as follows:

- Maximum height: +5.5m above track level.
- Thickness: Variable up to 10.5m above existing ground level.
- Slope: 1∨:4н.
- Source of Natural Material: Site won materials, to be sourced from Barton to Mixbury Cutting, Finmere Quarry Borrow Pit, Chetwode Cutting, Twyford Cutting, Twyford Viaduct and Calvert Cutting
- Fill classification: High plasticity clays(Class 2 and 4 natural clays) and the treated waste.

1.5.3 Earthworks Specification

The IDR 218 earthworks specification [15] states:

- The Made Ground (treated waste) can be re-used within the LOD / LLAU as landscape/engineering fill within the landscape earthworks subject to determination of acceptability against the appropriate material re-use criteria [12] (which are detailed in Appendix 6/14 & 6/15 of the earthworks specification).
- Material that exceeds the appropriate Material Re-use Criteria (Class U1B) can still be re-used if
 placed in an appropriate zone and depth within the works (in-line with the Material Re-use Zoning
 System, the proposed end-use of the land, and as previously agreed with the EA October 2020) or
 managed by treatment and processing to meet suitability requirements under a permit (where
 applicable).
- Natural excavated arisings will be classified as inert when segregated from Made Ground materials
 and free from cross-contamination. Hence, once characterised they will be considered chemically
 suitable without the need for further chemical testing and classification. All materials will need to be
 tested to ensure they are geotechnically suitable. Arisings will be stored in an appropriate manner to
 prevent leaching from the material.
- Visible discrete asbestos-containing materials and fibrous materials shall be removed and disposed off-site to an appropriately licenced facility in accordance with the protocols set out in CAR-SOIL[™] Control of Asbestos Regulations 2012 [17] and is in line with the DUO Remediation Implementation Plan [4].
- Within the works in the Limit of Deviation (LOD) and in areas of ecological mitigation planting within the LLAU, only, trace asbestos fibres (<0.001% v/v) within soils may be placed at appropriate depths (>600 mm in LOD, below landscaping requirements in ecological planting areas, min. >300mm), separated by an orange demarcation layer (not for protective measures). Soils containing ACM or detectable asbestos fibres cannot be used in the cover layer.



1.6 Limitations

- All chainages referred to are approximate with regards to the HS2 route and are based on the ASC Ground Engineering Viewer [17]. The Limit of Deviation (LOD) and Limits for Land Acquired and Used (LLAU) boundaries are based on information available at the time of writing.
- This document has been prepared for HS2 in accordance with the terms and conditions of the
 appointment. The Technical Note has been produced on behalf of EKFB for the sole purpose of
 supporting the DfR Permit application. The only third parties to review and/or utilise the information
 within the Technical Note are assumed to be Tetratech (EKFBs chosen consultant) and HS2 Ltd (the
 ultimate Client) only.
- The production and technical expertise in relation to the DfR permit is the sole responsibility of Tetratech (EKFBs chosen consultant). ASC are to provide specialist contaminated land support to Tetratech for this task only.
- This assessment has been based on data available at the time of writing. ASC does not warrant, nor
 does it accept any responsibility or liability for, the accuracy or completeness of the content or for
 any loss which may arise from reliance on information provided in the reports and any other third—
 party information on which this report is based.
- This assessment has been based on the asset design drawings and information available at the time
 of writing. Should significant variations be made to the asset design as described, then further
 consideration or assessment is likely to be required.
- The assessment has been undertaken based on the design of HS2 assets and also considered the construction and post-construction operational phases.
- Ground investigations, by nature only reveal a small percentage of the ground conditions present beneath the Site. The possibility of significant variation in ground conditions existing between sampling locations cannot be discounted.
- Groundwater conditions are based on observations made at the time of the investigation and during
 monitoring visits and may be subject to significant variation due to seasonal, or other effects. Depths
 stated are based on levels at the time of the individual ground investigations.
- Duo (remediation contractor) scheduled the post-remediation laboratory chemical testing.
- This report has been prepared, in part, based on the Environment Agency (EA) comments on the Chetwode Embankment Landscape Earthworks earlier EKFB DfR Application.



2 Setting

2.1 Site Setting

Table 2-1 Summary of Site Setting

Site Details [6] [17] [18] [19]					
Site Location	The Site (proposed re-use area) is located within the Twyford Embankment Landscape Earthworks situated between chainages Ch. 81+175 to Ch. 81+520, approximately 375m in length. The Site covers an area of approximately 2.5 Ha.				
	The Site is situated within Buckinghamshire, approximately 550m east of the town of Twyford.				
National Grid Reference	Ch.81+400: 467215, 226440 for the approximate centre.				
	The Site is situated within an area of agricultural farmland.				
	The Dismantled Rugby to Quainton Railway Land Quality (LQ) area (LQ 13-07) identified in the Environmental Statement [20] [21] crosses the southern extreme of the Site where the TELE follows West Street realignment.				
	LQ 13-06 Sewage works is located approximately 10m west of the northern extent of the Site.				
Site Description & Surrounding Area	The surrounding area is generally arable farmlands separated by hedgerows and treelines. Directly to the east of the Site is West Street, a road.				
	An unnamed tributary of Padbury Brook crosses the TELE and will be redirected into the Twyford East Culvert (HS2-000001428) at approximate chainage Ch. 81+715 (approximately 150m northwest of the Site), and Portway Stream crosses the TELE and will be redirected into the Portway Culvert (HS2-000001373) at approximate chainage Ch. 80+945 (approximately 200m southeast of the Site).				
Topography	The Site is generally flat in the northwest with elevations between ~82-84m AOD, and then gently rises to the southeast in a series of undulations, to a maximum elevation of ~86m AOD.				

2.2 Site History

The history of the Site and surrounding area has been summarised from the information reviewed as part of the Geoenvironmental Assessment Report [6] [17] [18] [19] [22] which shows the Site and surrounding areas to be predominantly agricultural.

Table 2-2 Summary of Site History

Year	Details
1880	The Site and surrounding areas are largely agricultural. The Portway Stream, Padbury Brook and an unnamed tributary to Padbury Brook are present. A road crossing is present to the south/east of the Site and is noted to be the present-day, West Street.
1888	Great Central Railway (LQ 13-07) mapped to the south and southwest of the Site.
1945	No significant changes.
2004	A sewage works (LQ 13-06) is now present immediately to the west of the Site.



Year	Details
2022	A HS2 access track is mapped to the north of the Site.

2.3 Physical Setting

2.3.1 Published Geology

The published Geology has been summarised from the Geoenvironmental report [6]

Table 2-3 Summary of Published Geology

Published Geology					
Artificial Ground	Not mapped within the Site. Made Ground associated with the Great Central Railway (LQ 13-07) is present adjacent to the Site and Made Ground is anticipated within the sewage works (LQ 13-06) situated off-site.				
Superficial Deposits	River Terrace Deposits (RTD), between approximate chainage Ch. 81+300 to Ch. 81+500. Off-Site Alluvium (ALV) is mapped offsite to both the north and south and is associated with the Padbury Brook tributary and Portway Stream.				
Bedrock	The following sequence of strata is recorded underlying the Site: Ancholme Group Oxford Clay (OXC) (at surface). Kellaways Formation (KLB). Great Oolite Group Cornbrash Formation (CB). Forest Marble (FMB). White Limestone (WHL).				

2.3.2 Hydrogeology

The hydrogeological setting has been summarised from the Geoenvironmental Assessment Report [6] and Hydrogeological Appraisal Report [13]



Table 2-4 Summary of Hydrogeology

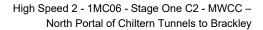
Hydrogeology				
	Secondary A Aquifer			
Superficial Deposits	River Terrace Deposits (RTD)- Off-Site.			
	Alluvium (ALV)- Off-Site.			
	Unproductive Aquifer (Aquitard)			
	Oxford Clay (OXC)- On-site.			
	Secondary A Aquifer			
Bedrock	Kellaways Sand Formation (KLB)- On-site.			
Dediock	Cornbrash Formation (CB) - Off-Site.			
	Forest Marble Formation (FMB) - Off-Site.			
	Principal Aquifer			
	White Limestone Formation (WHL) - Off-Site.			
Source Protection Zones (SPZ's)	No SPZ's identified within 2km of the Site.			

2.3.3 Hydrology

The hydrological setting has been summarised from the Geoenvironmental Assessment Report [6] and Hydrogeological Appraisal Report [13]

Table 2-5 Hydrological Features

Hydrology	
Surface Water Features	None mapped within the Site. Padbury Brook Padbury Brook is located 250m north of the Site, flowing east. A tributary of Padbury Brook is noted 200m northwest of the Site. WFD Compliance – Overall Moderate Chemical – Fail Ecological – Moderate HS2 C2.L.69 Catchment and Floodplain Compensation Area (FCA) The C2.L.69 Catchment pond is located 120m west of Site. The FCA is located 95m north of the site, on the opposing side of the Twyford Embankment. Portway Stream Located 200m southeast of the Site, flowing north.
Flooding	The Site is outside of flood risk zones.





2.3.4 Ecology

For ecological receptors we have reviewed the available satellite imagery, ASC Ground Engineering Viewer [17], and MAGIC Maps [23] (which includes environmental receptors), to identify potential receptors within 1km of the Site. This screening has noted protected habitats within the 1km radius of the site (the closest being a deciduous woodland, situated 400m east of the site), however given the distance to the site these are not considered further.

Within the close vicinity of the site (within a 50m radius), the Site is predominantly agricultural fields, with a hedgerow following a road to the southwest. Given the site setting (distance, topography etc.) and the engineered design of the landscape earthworks, there is not considered to be a viable pathway to the potential ecological receptors identified and therefore will not be considered further.



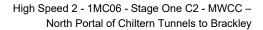
2.4 Ground Investigation Data

Three phases of Ground Investigation (GI) have been carried out between 2017-2023 [5] and the following 29 locations are available for the Site and in the immediate vicinity (within 50m) (Figure 2-1).

- 4 Cable percussion boreholes, with rotary coring follow on (CR), to depths of between 10.70mbgl to 25.00mbgl
- 4 Cable percussion boreholes (CP), to depths of between 7.35mbgl to 12.23mbgl
- 6 windowless sampling boreholes (WS), to depths of between 4.00mbgl to 5.00mbgl
- 5 Cone penetration test boreholes (CT), to a depth of between 6.88mbgl to 9.64mbgl
- 10 hand dug/ machine excavated trial pits (TP/HP), to depths of between 1.50mbgl to 4.00mbgl

81+700 81+600 Key **Ground Investigation** 81+500 ML081-TP426 ML081-CT400 TP / OP ⊕ML081-CP400 HP ML081-WS004 CT ML081-TP419 ML081-CP009 ML081-CP436 € CR ML081-TP407 ML081-WS435 ML081-TP448 ** CP ML081-HP003 ML081-CR011 ML081-WS012 ML081-CR440 WS ML081-TP416 ML081-CT001 Site ML081-CT002 ML081-CR402 **HS2 Design** 81+100 ML081-CR008 ML081-HP002 ML081-TP410 **Embankment** ML081-TP408 ML081-CT009 Cutting ML081-WS446 ML081-WS010 **Chainage Markers** ML081-WS447 100m

Figure 2-1 Exploratory Hole Location Plan (within 50m of Site)





For the purposes of this assessment, the 9 on-site exploratory holes (ML081-CT002, ML081-CT003, ML081-CT009, ML081-TP416, ML081-TP419, ML081-WS004, ML081-WS012, ML081-WS435 and ML081-WS446) are considered. 8 of the locations have demonstrated similar ground conditions, with variation noted in one location (ML081-WS004).ML081-WS004 is located on the western boundary of the earthworks and encountered a significantly thinner band of OXC than the remainder of the Site. GI conducted within the proposed re-use location terminates between 3.20mbgl and 9.48mbgl. An additional 20 borehole locations, situated within 50m of the Site have also been considered. Within the 5 cone penetration test locations, the geological formation was not recorded within bedrock strata, and therefore these positions have been used to only inform on topsoil thicknesses and the superficial deposits present.

Glaciofluvial Deposits and Mid Pleistocene Till were recorded in three locations (ML081-TP401, ML081-TP403 and ML081-TP419) however these are considered to have been mislabelled (not shown on BGS mapping or encountered in nearby GI). As such, these encounters have been re-classified as River Terrace Deposits based on similar geological descriptions and results of the particle size distribution tests.

The ground conditions encountered [6] are summarised below in Table 2.6 and geological model is discussed in Section 2.5. Generalised geological cross sections and the exploratory hole logs are presented in Appendix II.



Table 2-6 Summary of Encountered Geology within 50m of the Site No. Proven Depth Top. Depth Base. Exploratory Thickness Stratum (Range) (Range) Description Holes (Average) mbgl mbgl** Encountered On-site (within the re-use location boundary) Recorded within the southeastern end of the proposed TELE (where it transitions into the West Street Alignment), associated with LQ 13-07. Made Ground 1/9 0.00 1.95 1.95 Described as brown sandy gravel, and brown sandy, gravelly clay with occasional pockets of medium to high cobble content. Cobbles are angular of (MGR) brick and concrete. Grass over topsoil. 0.20-0.40 Topsoil 8/9 0.00 0.20-0.40 (TOP) (0.32)Generally described as a brown slightly sandy clay with some rootlets. Underlying TOP across the Site at all 7 locations. Depth proven in 7 locations. 0.70 - 2.40Alluvium 7/9 1.00-2.80 0.30 - 0.40Generally described as a soft to firm brown mottled grey, slightly silty, slightly sandy, slightly gravelly clay. Gravels were comprising flint and limestone, (1.30)(ALV) with occasional mudstones noted. Underlying MGR, TOP and ALV in 9/9 exploratory hole locations. Depth proven in 1/9 locations . Oxford Clay Formation 6/6* 0.20 - 2.803.00-9.48 1.05 Generally described as a firm to stiff greyish/bluish brown and dark grey slightly sandy clay. Occasional shell fragments were noted. Rare small fissuring (OXC) >1.15 Recorded at the far west boundary of the Site in WS081-WS004. Underlying OXC. Depth has not been proven. Kellaways Formation 1/6* 3.85 5.00 Depth not (KLB) Described as medium dense grey clayey fine sand with some shell fragments. proven Off-site (within a 50m radius of the Site) Topsoil 0.1 - 0.50Grass over topsoil. 20/20 0.00 0.10-0.50 (TOP) (0.30)Generally described as a brown slightly sandy gravelly clay with occasional rootlets. 0.90-5.80 Encountered across the entire Site area. Depth proven in 9/12 locations encountered. Alluvium 12/20 0.10-0.40 1.20-6.20 (ALV) (2.35)Generally described as soft to firm slightly sandy gravelly clay and slightly sandy clay. Gravel comprising chert, quartzite, limestone, and mudstone. 2.50-3.45 Encountered to the west and northwest of the Site. Depth proven in 3/4 locations encountered. River Terrace Deposits 4/20 0.30-6.20 2.90-9.65 (RTD) (3.12)Generally described as Firm light orangish brown mottled bluish grey slightly gravelly sandy clayey clay and clayey fine to coarse sand. Oxford Clay Formation 4.45-8.75 Underlying the entire Site. 14/18* 4.00-12.23 0.20 - 9.65(OXC) (6.42)Generally described as a firm to stiff fissured thinly laminated bluish grey/brown clay. Rare gravel, sand and silt inclusions were noted locally. 5.30-5.59 Kellaways Formation Encountered within the east and northeast of the Site (where confirmed) 5/18* 8.20-11.30 9.83-13.59 (KLB) (5.45)Generally described as a stiff to very stiff, very dense dark grey very sandy clay, and dark grey mudstone. Cornbrash Formation 1.76-5.63 Encountered primarily in the east and northeast of the Site. 3/18* 14.48-19.22 12.72-13.59 (3.54)(CB) Generally described as a strong light grey/dark grey fossiliferous limestone with thin bedding of very stiff sandy clays. Encountered primarily in the east and northeast of the Site. 1.22-4.14 Forest Marble Formation 3/18* 15.40-20.44 14.48-19.22 Generally described as a medium-strong to strong thinly and medium bedded grey fine-grained limestone. Bedding is of mudstones. Discontinuities (FMB) (2.94)noted. White Limestone Encountered primarily in the east to northeast of the Site. >4.83 Formation 3/18* 18.62-20.44 Base not proven (unproven) Generally described as a medium-strong to strong grey fossiliferous limestone and mudstone discontinuities noted throughout. (WHL)

^{*} CT exploratory holes have been discounted where a factual bedrock geology code has not been provided ** where proven



2.5 Discussion

2.5.1 Geology

2.5.1.1 Made Ground

The Site history confirms agricultural usage since the earliest mapping (1880). A review of the GI logs encountered Made Ground at 1 location (ML081-WS446) out of the total 29 exploratory holes on-site and nearby (within 50m) to a depth of 1.95mbgl described as a brown sandy, gravelly clay with frequent anthropogenic inclusions of concrete and brick and was considered to be associated with LQ 13-07, the Dismantled Rugby to Quainton Railway, at the southeastern end of the proposed re-use area (i.e. limited interaction ~550m²).

As part of the construction of the West Street Overbridge/realignment, Made Ground associated with LQ 13-07 (where interaction occurs) will be excavated and replaced with a geotechnically suitable fill material [6] [14]. Therefore, the impact of Made Ground associated with LQ 13-07 is not considered further. Visual and/or olfactory evidence of contamination was not encountered and results of PID (Photoionization detector) screening were below the limit of detection (<1ppm) for all MGR samples taken.

2.5.1.2 Superficial Deposits and Bedrock Geology

The published geology and ground investigation data shows the topsoil is underlain by superficial ALV, and was highly variable in thickness, ranging between 0.70m to 2.40m on-site and 0.9m to 5.8m off-site. ALV was not recorded at two locations (ML081-WS435 on-site and ML081-TP470 off-site), however, surrounding GI did record its presence. Due to the significant variation in thicknesses of ALV recorded on-site, there is potential that the ALV has been incorrectly logged and is instead weathered OXC, due to the similarities in their composition.

RTD was not recorded on-site, however has been recorded directly underlying topsoil in 2 GI locations off-site to the west of the re-use area (ML081-TP426 and ML081-CP436), and below the Alluvium at 2 location ML081-CP024 and ML081-CP400) (between 3.8-9.65mbgl) (off-site to the northwest of the re-use area). RTD is encountered as either a soft to firm slightly sandy clay or as medium dense to dense clayey fine to coarse sand. The RTD is confined to the northwestern end of the asset, north of Ch. 81+400.

OXC underlying the ALV or MGR (locally) was encountered across the entirety of the Site. The depth of the OXC across the Site was only proven in one location in the northwest (ML081-WS004), overlying KLB, however, this location is considered to be unrepresentative of the Site, as this encountered a thin band of OXC, 1.05m thick. Across the remaining GI undertaken on site, 2/5 locations encountered OXC at a thickness of >4.00m, whilst the remaining locations encountered the OXC between 0.8m and 2.05m thick, however, the base of the OXC was not proven at these locations due to the GI terminating at a shallow depth (<4.00m).

When considering the nearby off-site locations (within 50m), the thickness of the OXC has been proven to be between 4.45m to 8.75m (unproven thickness ranges from 0.15m to 9.23m). Spatially across the Site and the surrounding area, GI indicates that OXC is thickest in the southeast (adjacent to the proposed West Street Overbridge/realignment) and thins towards the northwest.

The OXC encountered on Site is described as fissured or thinly laminated, greyish brown, sometimes slightly sandy and/or silty clay. The ALV and OXC are considered to be roughly similar in composition and are considered to have high plasticity and have a low permeability (see 2.5.1.3). When considering the ALV and OXC as a single cohesive unit, the combined thickness underlying the Site ranges from 2.05m to 9.18m, however, this is conservative, on the basis of 8/9 locations that have not confirmed the base of the OXC. The following strata are encountered underlying the OXC on/adjacent to the Site but are not discussed further given the thickness of the OXC:

KLB (on-Site)

FMB (off-Site)

CB (off-Site)

WHL (off-Site)

Groundwater strikes were not recorded on-site; however, they were recorded off-site within 50m and are discussed further in Section 2.6. A generalised geological cross-section is presented below (Figure 2-2).



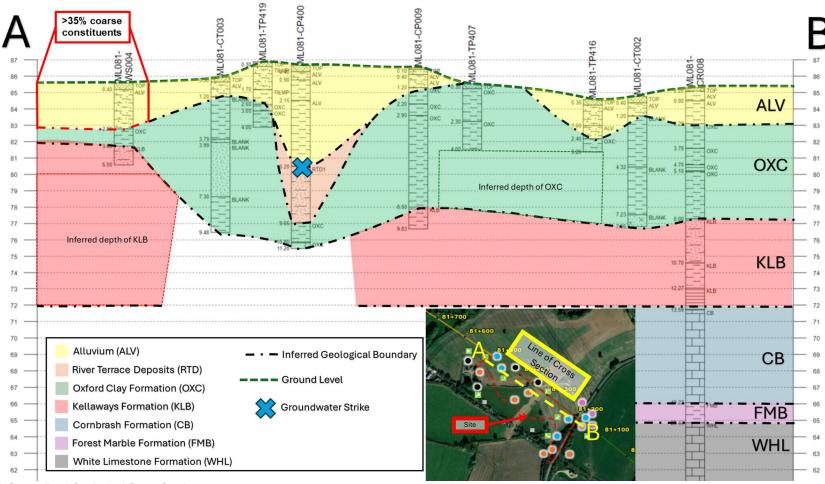


Figure 2-2 Generalised Geological Cross Section

This cross section was taken with a buffer of 20m either side, as such the Groundwater strike appears to be on-site however is situated off-site to the north of the re-use area



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2.5.1.3 Physical Parameters

The results of the available geotechnical laboratory testing are summarised below and on the basis of the testing and descriptions on the logs, the majority of ALV and OXC are similar in composition and are considered likely to behave similarly as a cohesive, low permeability unit (with 4 samples exhibiting coarser soils). RTD is shown to be generally less cohesive with a greater proportion of coarse constituents than OXC and ALV. The summarised results of Particle Size Distribution Testing and Atterberg Limit testing are presented below in Table 2-7 and 2-8.

Particle Size Distribution

- The logs show the ALV and OXC are described as slightly sandy to sandy and slightly gravelly clay.
 Occasional, discontinuous pockets of sand are recorded in the ALV. As shown in Table 2-7. Particle size
 distribution (PSD) testing undertaken show that the ALV and OXC are a both a sandy (locally very sandy,
 locally gravelly) silt/clay and are likely to be low overall permeability.
- Three samples of ALV from two boreholes (ML081-CP024 and ML081-WS004) contained greater than 35% coarse constituents and are likely to be of low to moderate permeability.
- All five samples of RTD contained greater than 35% coarse constituents and are likely to be of moderate permeability (and therefore unlike the properties displayed of the ALV/OXC). See Figure 2-3 below.

Atterberg Limit Testing

- The average plasticity index recorded for both strata is 35% for ALV and 32% for OXC, as shown in Table 2-8, with similar average liquid limit and plastic limits also recorded. This indicates both strata are formed primarily of a high-plasticity clay with a high degree of cohesiveness and are likely to both have a low overall permeability.
- The plasticity of five samples (1 ALV, 2 RTD and 2 OXC) plotted as low plasticity clays. Four of the samples (1 ALV, 10XC, 2RTD)were taken from the northwestern area from exploratory holes ML081-TP401, ML081-CP436, ML081-CP024, ML081-TP426, which are mapped as cohesive soil with coarse constituents or coarse soil on Figure 2-3 Indicative Location of Soils Grouped by Particle Size Distribution. Due to the lower plasticity, it is anticipated that these clays will be more permeable than the cohesive clays found underlying the majority of the Site.

PSD and Atterberg limits laboratory data is presented in Appendix II-2.

Table 2-7 Particle Size Distribution Testing Summary

Strata	Number of Samples Tested	Clay (%) Avg (range)	Silt (%) Avg (range)	Sand (%) Avg (range)	Gravel (%) Avg (range)	Cobble (%) Avg (range)
ALV	20	34 (10 – 59)	49 (13 – 97)	24 (2 – 55)	10 (0.1 – 44)	0.07 (0 – 1.4)
ALV (Coarse Samples Removed*)	16	38 (10 – 59)	55 (13 – 97)	23 (2 – 55)	6 (0.1 – 28)	0 (0 -0)
OXC	18	45 (26 – 58)	46 (24 – 96)	16 (2 – 46)	4 (0 – 12)	0 (0 -0)
RTD	5	18 (4 – 27)	22 (7 – 30)	46 (30 – 68)	17 (2 – 55)	0 (0 – 0)

^{*} Criteria for coarse ALV samples is detailed in Table 2-9



Table 2-8 Atterberg Limit Testing Summary

Strata	Number of Samples Tested	Liquid Limit (%) Avg (range)	Plastic Limit (%) Avg (range)	Plasticity Index (%) Avg (range)
ALV	21	57 (26 – 68)	23 (10 – 32)	34 (14 – 43)
OXC	38	54 (28 – 68)	23 (12 – 34)	32 (15 – 44)
RTD	7	37 (25 – 63)	17 (13 – 21)	24 (10 – 42)

Given the potential variability of the physical properties within a geological unit, the soils on site have been categorised (as per the BS5930 particle grading guidance [24]) into three units based on their PSD results. These categories are shown below in Table 2-9. Grouping the soils by particle size distribution rather than geological group allows for the Site to be divided into areas of anticipated greater permeability, for a better understanding of the potential risks to groundwater.

Table 2-9 Soil Categorisation Criteria

Category Name	% Fines (Clay and Silt)	% Coarse (Sand, Gravel, Cobbles)	Assumed Permeability
Cohesive soil	Greater than 62%	Less than 35%	Negligible
Cohesive soil with coarse constituents	Between 35% and 62%	Less than 35%	Low
Coarse soil	Less than 35%	Greater than 62%	Medium



The geology directly below the surface, excluding topsoil has been mapped to show the distribution of soils across the Site, shown in Figure 2-3.

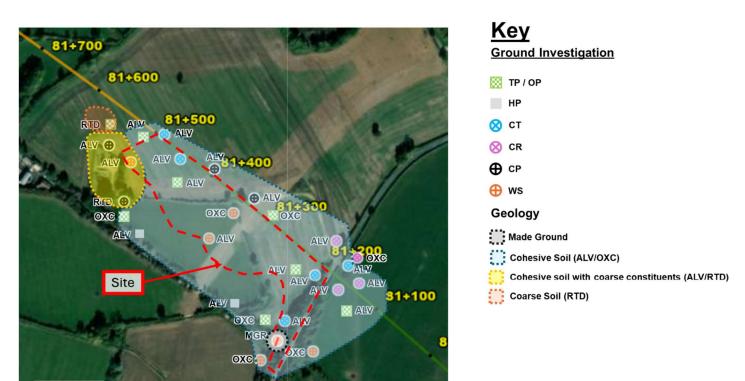


Figure 2-3 Indicative Location of Soils Grouped by Particle Size Distribution

2.5.1.4 In-situ Permeability Testing

100m

In-situ permeability tests were not conducted within the Site; however, 17 tests were conducted within 2km of the Site which have been reviewed. The results of the tests conducted show that the ALV, OXC and KLB have a **low permeability** (k) in the order of $\sim 10^{-7}$ to 10^{-9} m/s as shown in Table 2-10 In-situ Permeability Testing Summary.

Table 2-10 In-situ Permeability Testing Summary

Strata	Number of Tests	Min. k (m/s)	Max. k (m/s)	Average k (m/s)
ALV	2	3.00E-09	6.00E-07	3.02E-07
OXC	11	3.00E-09	3.70E-07	1.12E-07
KLB	4	2.00E-09	1.40E-08	6.25E-09



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2.5.1.5 Summary of Ground Conditions - Advised Re-use Area.

Coarse soils and cohesive soil with coarse constituents are likely to be more permeable than cohesive soil, and as such, are less protective of underlying groundwater. These potentially more permeable soils are confined to the northwest of the Site, where the thin band of OXC was recorded in ML081-WS004 as well as the RTD found at depth off-site. These three features may increase the permeability of the soils in the northwest of the Site, and as such, to add another degree of conservatism, it is recommended that treated waste is not reused in areas to the north of Ch. 81+400. Figure 2-4 below indicates the suggested acceptable re-use area to the south of chainage Ch.81+400.

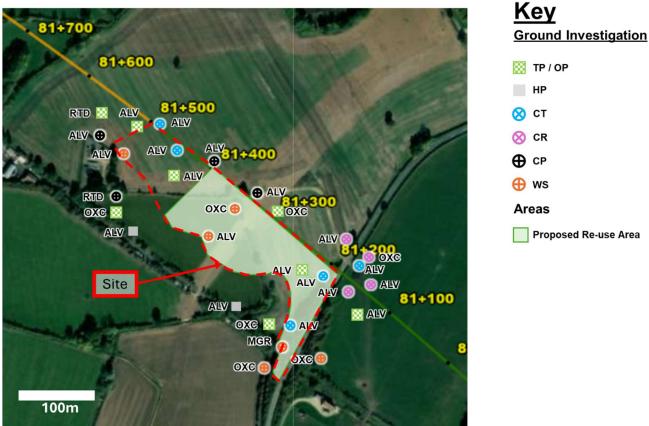


Figure 2-4 Proposed Treated Waste Re-use Area.

2.6 Hydrogeology

To assess the potential risks to Controlled Waters receptors (Groundwater) we have assessed the groundwater strikes encountered, and groundwater monitoring undertaken, to understand the hydrogeological characteristics of the Site (and surrounding area).

Groundwater has not been encountered on-site, with groundwater strikes and monitored levels noted adjacent to the site (within 50m of the site)

2.6.1.1 Groundwater Strikes



Groundwater strikes were not recorded in the ALV or OXC within the 9 locations on-site. Groundwater strikes were recorded off-site in 4/20 locations within RTD (2 locations), OXC (1 location) and KLB (1 location).

Table 2-11 Groundwater Strikes encountered (On-site and within 50m buffer)

Location ID	Geology	Depth	Change over time (20 Minutes	
On-Site (9 Exploratory Hol	On-Site (9 Exploratory Holes)			
Not encountered	Not encountered			
Off-Site (within 50m of the Site) (20 Exploratory Holes)				
ML081-CP024	RTD	5.1	0.5m rise	
ML081-CP400	RTD	6.2	0.40m rise	
ML081-CP436	OXC	9.15	1.15m rise	
ML081-CR402	KLB	8.20	No change (seepage)	

It is considered that the groundwater within the RTD (situated off-site) is perched on top of the underlying OXC, and not representative of a continuous groundwater table.

Figure 2-5 below shows that groundwater within the RTD was struck between 80.56mAOD and 79.67mAOD and rose by 0.5m and 0.4m over a 20-minute observation period. The rise recorded indicates the groundwater within the RTD is confined by the ALV under relatively low hydrostatic pressure.

Groundwater within the OXC was struck at 78.26mAOD and rose by 1.15m over a 20-minute observation period. The rise recorded suggests the groundwater within the OXC is restricted to sandy/gravelly lenses within the clay formation and confined by the clay-rich layers under relatively low hydrostatic pressure.

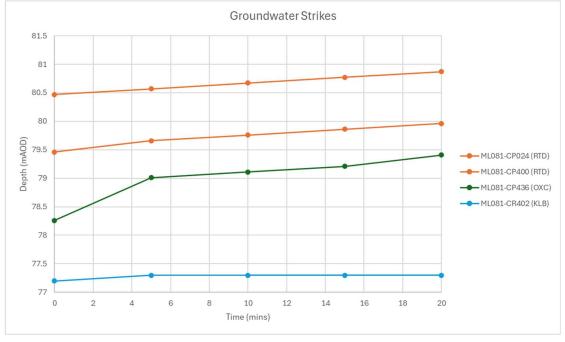


Figure 2-5 Groundwater Strike Elevation Readings over 20-Minute Observation Period



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2.6.1.2 Groundwater Monitoring

Groundwater elevation monitoring has been conducted in standpipes in the vicinity of the Site (none on-site, 7 off-site). Monitoring was conducted monthly over a 1-year period between May 2017 to September 2018 (ML081-CP009, ML081-CP024 and ML081-CR011), between June 2019 to July 2021 (ML081-CP400) or September 2020 to December 2021 (ML081-CP436 [2 standpipes] and ML081-CR440). The standpipe installations are detailed in Table 2-12 below.

Table 2-12 Groundwater Monitoring Installations

Location ID	Strata	Ground Level (mAOD)	Response Zone Top (mAOD)	Response Zone Base (mAOD)
ML081-CP400	RTD	86.67	80.67	77.17
ML081-CP436 Shallow	RTD/OXC	87.41	84.91	81.91
ML081-CP436 Deep	OXC	87.41	80.91	77.41
ML081-CR440	OXC/KLB	85.97	81.47	75.47
ML081-CP009	OXC/KLB	86.5	79	77
ML081-CR011	FMB/WHL	85.07	65.57	64.57
ML081-CP024	ALV/RTD	84.56	83.06	78.06

Boreholes ML081-CP024 and ML081-CR011 were only successfully dipped for 4 rounds before being destroyed, and as such have not been included in this assessment.

Monitoring standpipes primarily within the OXC (ML018-CP436 Shallow and Deep) indicates there is limited groundwater present, with limited seasonal changes in elevation. This is considered likely to be perched groundwater present in pore spaces and discontinuous sand pockets noted rarely in the OXC. It is considered that groundwater flow through the OXC will be limited due to the overall cohesive nature of the deposits [13].

The monitoring standpipe primarily within the RTD (ML081-CP400) generally recorded groundwater at ~83mAOD, approximately 3m above the top of the RTD, and is considered to represent the piezometric head of perched groundwater within the RTD.

The monitoring standpipes within the OXC/KLB (ML081-CP009 and ML081-CR440) generally recorded groundwater at ~83mAOD, approximately 4.5-5.5 m above the top of the KLB, and is considered to represent the piezometric head of groundwater within the KLB. For the purposes of this assessment, it is considered that the shallowest groundwater aquifer underlying the Site is the KLB (Secondary A Aquifer), with the RTD not encountered on-site and not considered to be a significant groundwater unit, with water within the unit being perched and discontinuous.

Annotated groundwater elevation graphs are presented in Appendix II-3.

2.7 Hydrology

2.7.1 Surface Watercourses

Two watercourses are recorded within the vicinity of the Site; an unnamed tributary of Padbury Brook located 200m northwest of the Site, and Portway Stream located 200m southeast of the Site [17], and these are both considered receptors.



Both the unnamed tributary and Portway Stream will be partially diverted by the HS2 scheme, as shown on Figure 2-6. The unnamed tributary will be diverted ~100m southeast from the existing watercourse and will be culverted under the Twyford Embankment. The Portway Stream will be diverted ~30 northwest from the existing watercourse and will be culverted under the Twyford Embankment.

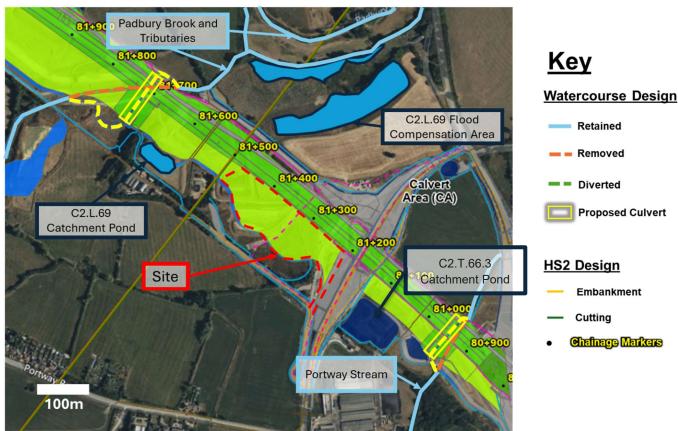


Figure 2-6 Proposed Surface Watercourse Diversions

2.7.2 Catchment Ponds/Settlement Ponds

HS2-constructed catchment ponds are located within the vicinity of the Site, with C2.L.69 Catchment located 85m west, and the C2.L.69 Flood compensation area located 95m north on the opposite side of the HS2 trace (when built), show on Figure 2-6. The catchment and flood compensation area and their associated ponds are in place for track drainage and to prevent flooding due to HS2 structures impacting the local hydrology.

The closest catchment pond to the proposed re-use area is the C2.T.66.3 (located 90m east), which is a catchment pond designed for track drainage. Although being the closest surface water receptor to the Site, there is not considered to be a viable pathway to the receptor as it is on the opposing side of the earthworks for the West Street overbridge and road realignment.



3 Made Ground Re-use Criteria.

3.1 Derivation of the Re-use Criteria

Materials re-use criteria has been derived by ASC (using ConSim modelling) for Made Ground (which includes the treated waste) material [12] protective of controlled waters and summarised below:

Derived for the re-use of Made Ground across 6 Zones within Section C23 of the HS2 route (Zones 1A, 1B, 2A, 2B, 2C, and 3) based on geology, aquifer classification, depth to groundwater, proximity to surface water and proposed thickness of clay cover.

Table 13-1 Material Re-use Classification Zones

Zone	Situation
1A	Soil chemical assessment criteria protective of the underlying aquifer in Zone 1 (chalk aquifer units) where groundwater is encountered at <10m below ground level (bgl)
1B	Soil chemical assessment criteria protective of the underlying aquifer in Zone 1 (chalk aquifer units) where groundwater is consistently encountered at 10m bgl or more
2A	Soil chemical assessment criteria protective of the underlying aquifer in Zone 2 (non-chalk aquifer units), where groundwater is encountered < 4mbgl and the distance between the LE and surface water features is > 50m
2B	Soil chemical assessment criteria protective of the underlying aquifer in Zone 2 (non-chalk aquifer units) where groundwater is consistently encountered at 4m bgl or more and the distance between the LE and surface water features is > 50m
2C	Soil chemical assessment criteria protective of surface water features located within 5 to 50m of a LE in Zone 2 (non-chalk aquifer units). Where the derived Zone 2c criteria is higher than Zone 2a/2b, the lower of the Zone 2a/2b criteria is adopted.
3	Zone 3 comprises bedrock geologies which are considered as non-aquifers (unproductive aquifers). Screening criteria is driven by Human Health factors.

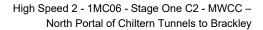
- Zone 1 is the most sensitive (e.g. chalk aquifer, Source Protection Zones with groundwater recorded <10mbgl (1A) or >10mbgl (1B)) and Zone 3 is the least sensitive (non-aquifer areas).
- In Zone 3 areas, the assessment will then be driven by human health risk (S4UL [25]/C4SL [26] screening values), as sensitive aquifer receptors are not present. Human health re-use criteria are also assessed within Zone 1A/B and 2A/B/C.

The human health re-use criteria consider the following 3 scenarios:

- >1.2m in parts of the LLAU to be returned to agriculture (S4UL/C4SL Allotment criteria).
- ≤ 300mm in Ecological Planting Area (S4UL/C4SL Public Open Space (park) criteria).
- ≤ 600mm in the LOD (S4UL/C4SL Commercial / Industrial criteria).

In Zone 3, re-use below 300mm/600mm in planting areas/the LOD there are no derived screening criteria due to unproductive stratum and being below the depth which human health receptors are likely to interact with.

3.2 Testing Requirements





Made Ground materials will be tested at a rate of a minimum of 1 sample per 1,000m³ (in accordance with the approved strategy). Samples will be collected under the chain of custody and tested in a suitable laboratory which is UKAS-accredited and MCERTS-compliant.

3.3 Site Specific Requirements

The Site (and wider area) was originally classified as suitable for re-use Zones 2A, 2B (due to the presence of RTD) and 3. However, upon review of the site-specific information provided within Section 2, the Site has been reclassified to Zone 3, and therefore, the treated waste can be re-used within the Site (within LOD and LLAU) and shall meet the chemical acceptance criteria for Zone 3. Given the presence of the RTD geologies adjacent to the site, the treated waste has also been conservatively screened against the Zone 2B screening criteria, to ensure the wastes are protective of potential groundwater adjacent to the site.

The re-use criteria for Zone 3 (and the more conservative zones) is presented within Appendix V.



4 Waste Assessment- Remediation and Verification Results

The following summarises the remediation works and results of the verification testing of the treated waste assessed against the re-use criteria (confirming suitability for re-use within the Site).

Assessment of the treated waste (Section 4.3) demonstrates the treated waste shows lower concentrations and a significant reduction in exceedances of contaminants following remediation and is suitable for re-use within the Site. Therefore, the treated waste is suitable for re-use within the Site as structural fill below the restoration layer in the LOD (>600mm thick), in ecological planting areas (>300mm thick) and in areas to be returned to agriculture (>1,200mm thick).

4.1 Pre-Remediation Chemical Data Summary

82 landfill waste samples (40 exploratory holes) from LQ 14-02 were tested for a general suite of heavy metals, Polycyclic Aromatic Hydrocarbons (PAH), Total Petroleum Hydrocarbons (TPH), Volatile and Semi-Volatile Organic Hydrocarbons (VOC/SVOC), and inorganic determinands [9]. Not all samples were tested for the full suite. The available assessed data is presented in Appendix III-1, confirming that remediation is required prior to re-use.

4.2 Remediation Strategy and Implementation Plan

An outline remediation strategy for Finmere [10] developed by ASC identified mechanical sorting and removal of deleterious materials for the excavated landfill materials. EKFB appointed a specialist remediation contractor (Duo) who further developed the remediation strategy and prepared a Remediation Implementation Plan (RIP) [4] and deployment form [5]. The RIP/deployment form is summarised further below and in Figure 4-1 [4].

The remediation is ongoing at the time of writing and Duo have provided ASC with the initial laboratory testing results for the treated waste.

- The excavation works will generate approximately 100,000m³ of arisings (of which approximately 40,000m³ to be re-used at the Site).
- Remediation has been/will continue to be carried out under a mobile treatment licence issued by the Environment Agency for mechanised sorting/processing of material as detailed below:
 - Excavation and segregation of landfill waste into its different components (e.g., soils, aggregate, plastics, glass, brick, timber, fabric etc.). The segregation has been achieved by utilising a combination of soil screening (size separation) and complex manual sorting/hand picking to remove deleterious materials.
 - Materials such as concrete, rubble, and brick have been processed as necessary by (i.e. by crushing or shredding etc) and, where possible, re-used within the scheme to infill excavations or recycled at a suitable licensed facility if required.
 - Visually identifiable Asbestos Containing Materials (ACM) has been picked by suitably trained operatives and disposed of at a suitable licensed facility.
 - Note: it is considered that not all free fibres can be removed from the waste, but trace-free fibres of <0.001% v/v will be acceptable given the location of the treated waste as structural fill.
 - Any recoverable metal, glass and plastics has been segregated and, where possible, recycled at a suitable licensed facility.
 - Materials that are not suitable for recycling or re-use (such as some types of plastics, fabrics, paint tins, wood) have been disposed of offsite at a suitable licensed facility.



- The treated waste has been stockpiled, tested and assessed against the material re-use criteria to inform suitability for re-use within the scheme.
- For the duration of the remediation, stockpiles of the segregated materials have and will be managed appropriately, in accordance with the EKFB Construction Environmental Management Plan (CEMP) for the Twyford to Greatworth Area (T2G) [27] and Calvert Area (CA) [28]. Stockpiles are suitably lined, bunded and covered to prevent the mobilisation of contaminants due to rainfall ingress and/ or the generation of dust and not located within 5m of watercourses.

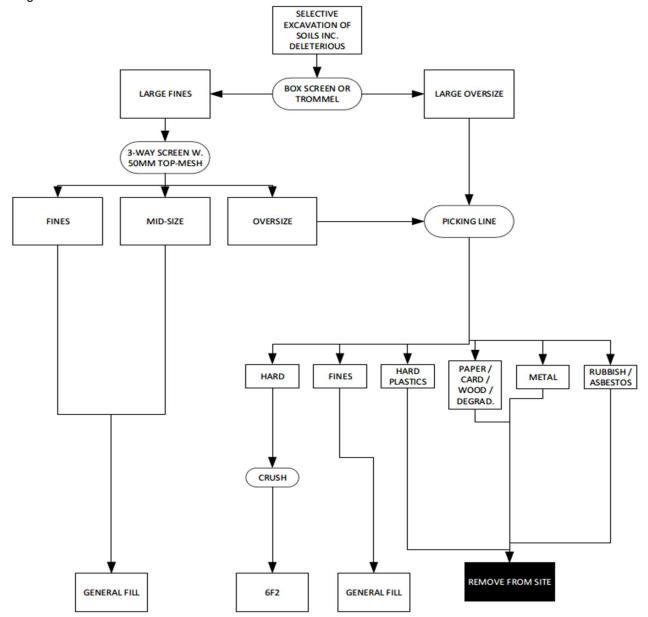


Figure 4-1 Duo Treatment Activities and Acceptance Procedures Summary Flow Diagram



4.3 Treated Waste Chemical Data Summary

The remediation of the excavated landfill waste is ongoing. The available verification results provided to ASC are summarised below. 40 validation results will be required (based on 40,000m³ of excavated waste), and additional re-use suitability testing will be undertaken by EKFB on the treated waste directly prior to deposition to confirm suitability. 25 samples are currently available for review.

Assessment of the 25 samples shows that they pass the commercial/industrial and Public Open Space (park) re-use criteria, and the majority of the results are suitable for re-use within Zone 3, with the following notes, which will have an impact on the re-use recommendations of the treated waste:

- 1/17* samples slightly exceeded the screening value of the Allotment end-use for 2 PAH compounds (benzo(a)pyrene and benzo(b)fluoranthene). *8 samples deviated and will be re-tested.
- Trace chrysotile asbestos-free fibres were identified in 3/25 samples (12% of samples), but quantification testing recorded values of <0.001% v/v.

Therefore, the treated waste is considered suitable for re-use as structural fill within the Site below the restoration layer (and utilising a demarcation layer) in the LOD (>600mm), within ecological planting below the landscaping cover (minimum >300mm), and below the agricultural land cover (>1.2m). This is discussed further in Section 5.

4.3.1 Zone 2B Assessment

Given the presence of the RTD (a secondary aquifer unit) adjacent to the Site, the treated wastes have been assessed, conservatively, against the Zone 2B re-use criteria, on the basis of deeper (>4m bgl) groundwater being encountered within the RTD located adjacent to the Site.

The treated waste when screened, generally passes the re-use criteria for Zone 2B. Minor exceedances of naphthalene was noted in 3/25 samples but was not considered significant on the basis that;

- PAHs are considered to be hydrophobic, i.e. they do not readily dissolve in water but tend to sorb to
 organic matter in the soil. Their low mobility in groundwater, therefore, considerably reduces the risk
 to Controlled Water; and
- The proposed re-use of the materials will be within the landscape earthworks bund (placement within low-permeability OXC below a restoration layer).

Therefore, the wastes are considered suitable for re-use when screened against both Zone 2B and Zone 3 screening criteria.



5 Updated Conceptual Site Model

Based on the assessment of the Site setting, asset design, and chemical testing of the post-remediation treated waste, the potential risk to the identified receptors has been evaluated in accordance with the Land Contamination Risk Management (LCRM) Guidance [3] to identify the 'plausible contaminant linkages' (contaminant source-pathway relationships) that may be present at the Site.

The site-specific CSM assumes the use of the treated waste (placed as specified within the design of the landscape earthworks) and following the completion of the **construction of the landscape earthwork**.

5.1 CSM Risk Assessment

Risk assessment is the process of collating known information on a hazard or set of hazards (to determine the potential severity of any impact) along with details on the likelihood of impact on identified receptors. Risks are generally managed by isolating the sensitive receptor or by intercepting or interrupting the exposure pathway, thus no pollutant linkages are formed and there is no risk. The following risk assessment focuses on the potential contaminants identified on the Site and the proposed development.

CIRIA guidance (C552) [29] states that the designation of risk is based upon a consideration of both:

- The likelihood of an event (probability); (takes into account both the presence of the hazard and the receptor and the integrity of the pathway)
- The severity of the potential consequence (takes into account both the potential severity of the hazard and the sensitivity of the receptor).

Under such a classification system the following categorisation of risk has been developed and the terminology adopted as presented in Table 5-1 below.

Table 5-1 Summary of risk classification categories

Term	Description
Very High Risk	There is a high probability that significant harm could arise to a designated receptor from an identified hazard at the Site without appropriate remedial action.
High Risk	Significant harm is likely to arise to a designated receptor from an identified hazard at the Site without appropriate remedial action.
Moderate Risk	It is Possible that without appropriate remedial action, harm could arise to a designated receptor, but it is relatively unlikely that any such harm would be severe and if any harm were to occur, it is likely that such harm would be relatively mild.
Low Risk	It is Possible that significant harm could arise to a designated receptor from an identified hazard, but it is likely that at worst this harm if realised would normally be mild.
Very Low Risk	There is a low Possibility that harm could arise to a receptor. In the event of such harm being realised, it is not likely to be severe.



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5.1.1 Sources

Based on the information presented in Section 4, for the purposes of this assessment the contaminative source is the remediated treated waste from LQ 14-02 is considered suitable for re use.

The screening of chemical testing results provided to date has indicated that the post-remediation treated waste (the source) is suitable for re-use as structural fill within the Site (re-use Zone 3) below the restoration layer given the lack of viable contaminant linkages present.

5.1.2 Pathways

Based on the information presented in Sections 1.5, 2.5, 3, and 4, viable pathways (contaminant linkages) to the receptors outlined below have not been identified.

5.1.3 Receptors

5.1.3.1 Human Health

Based on the design of TELE the potential future human health receptors for the Site are as follows:

- Farmers and uptake from crops, within land returned for agricultural use within the LLAU.
- · Visitors (recreational users e.g. walkers), within agricultural land or planting areas.
- Employees/maintenance workers, within the LOD.

However, given the proposals to re-use the treated waste within the landscape bund and given the proposed engineering design (emplacement of the treated waste within low permeability OXC clay, below the proposed restoration layer) there is not considered to be a viable contaminant linkage to human health.

In the LOD the restoration layer will be of a minimum 600mm thickness, in landscaped areas of the LLAU, a minimum of 300mm, and in agricultural areas a minimum of 1200mm. In addition, a demarcation layer will be installed at the top of the treated material to indicate the presence of the waste in case of future excavation into the bund.

The placement of the deposited and treated waste will be recorded on an as built drawing for inclusion within the Health and Safety file for the landscape earthworks.

Risks to workers during the construction of the TELE are considered to be low if appropriate mitigation measures (such as the use of suitable PPE where necessary) are employed.

5.1.3.2 Controlled Waters

Groundwater

The groundwater table is at depth, at the top of the KLB aquifer which underlies the ALV and OXC (typically >4m thick).

Surface water

The nearest surface water receptors to the Site are the:

- Portway Stream, which, once diverted (lined and partially culverted), will be located approximately 200m away from the Site, on the opposing side of the West Street realignment.
- C2.L.69 Catchment (specifically the catchment pond), which will be lined, and located 120m northwest of the Site.



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- C2.L.69 Floodplain Compensation Area, located approximately 95m north of the Site on the opposing side of the Twyford Embankment.
- A tributary of the Padbury Brook, which, once diverted (lined and partially culverted), will be located approximately 200m away from the Site.
- The C2.T.66.3 Track drainage catchment pond is situated 90m east of the proposed re-use site, however, it will be situated on the opposing side of the West Street Overbridge/realignment earthworks.

5.2 Tabulated CSM and Cross Section

A CSM table and cross-section are presented below; however, viable S-P-R contaminant linkages have <u>not</u> been identified.

Table 5-2 Conceptual Model Table

Twyford Embankment Landscape Earthworks Conceptual Site Model 1MC06-CEK-EV-NOT-CS06_CL10-000005 Rev.C01

Contaminant Source	Sensitive Receptor	Pathway	Comments
	R1		There is no viable contamination linkage. The treated waste will be placed in compacted layers within low-permeability OXC clay below the "clean" restoration layer and will be subject to the proposed engineering design. Within the LOD, the restoration layer will be of a minimum 600mm thickness, in landscaped areas of the LLAU, a minimum of 300mm, and in agricultural areas a minimum of 1200mm.
	Human Health (future site users)	No linkage	A demarcation layer will be placed between the treated waste and overlying soils, and the re-use location will be recorded on an as-built drawing in the asset Health and Safety file.
S1 Treated Waste (DfR)	(131313 5115 55515)		Management and re-use of the treated waste and soils are to be undertaken in accordance with the measures and re-use criteria outlined within the relevant Remediation Outline Strategies (as agreed with the Environment Agency) [7] [10], and Earthworks Specification [15] including testing and appropriate placement of materials within the works.
Remediated Landfill Waste recovered from Finmere			There is no viable contamination linkage. The Site is identified as re-use Zone 3 [12], and the treated waste is suitable for re-use within this zoning (and within the more conservative Zone 2B rather than Zone 3).
Railway Cutting Landfill (LQ 14-02)	R2		A review of the ground investigation information has confirmed that the Site is underlain by >4m of low permeability, cohesive soils (ALV + OXC) which overlie the shallowest aquifer within the KLB.
	Controlled Waters (underlying aquifers – KLB below OXC	No linkage	The RTD identified is located off-site adjacent to the re-use area, however, as it is a water-bearing unit in the vicinity of the site, to add another degree of conservatism, the re-use area has been reduced to help mitigate against the groundwater that may be encountered within the unit.
	onsite & RTD offsite)		The design of the landscape earthworks, constructed from compacted low-permeability high-plasticity clays, will further mitigate the risk to the underlying KLB aquifer.
			Furthermore, the treated waste will be placed on compacted emplaced OXC and not on in-situ soils, further reducing potential infiltration.



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Contaminant Source	Sensitive Receptor	Pathway	Comments
	R3		There is no viable contamination linkage. The CSM has demonstrated that there is no contaminant linkage between the treated waste and surface runoff into surface waters, due to the design of the landscape earthworks, constructed from compacted low-permeability high-plasticity clays, which will greatly reduce infiltration.
	Controlled Waters (Portway Stream, Padbury Brook and tributaries, C2.L.69	No linkage	Although there is limited leachate testing, the treated waste will be suitable for Zones 2b and 3. This is based on conservative Consim modelling [12], which models the leaching of a continuous source (treated waste) and migration to surface water receptors, which does not consider remediation and the absence of the linkage.
	Catchment)		The nearest surface water receptor to the Site is the Portway stream to the south and, a HS2 Catchment Pond (C2.T.66.3) located to the east. These assets will either be diverted and lined or given the topographical setting and their distance from the Site, no viable linkage is present.



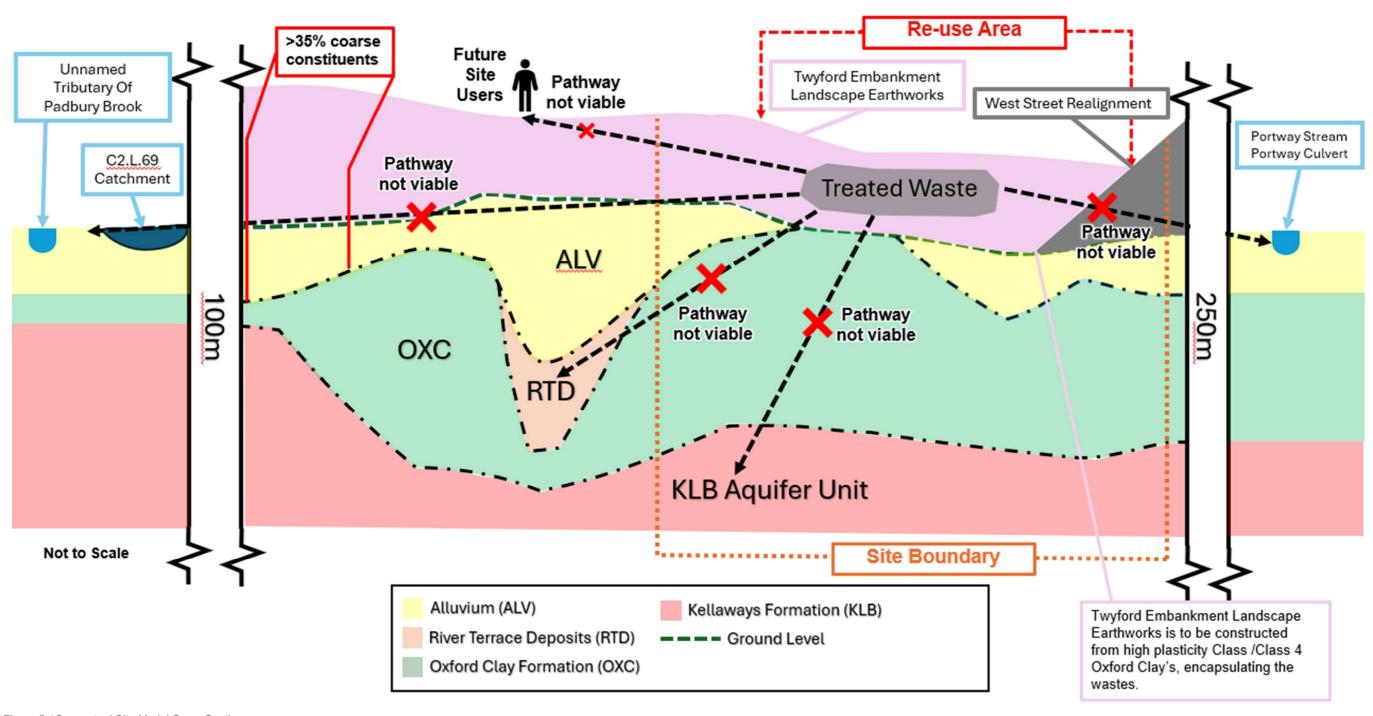
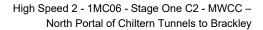


Figure 5-1Conceptual Site Model Cross Section





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5.3 Notes

The remediation of Finmere Railway Cutting Landfill (LQ 14-02) is ongoing, and additional sampling and testing will be required to be undertaken to satisfy the requirement for a testing frequency of 1 sample per 1,000m³ (a total of 40 samples will be required based on the proposed re-use of 40,000m³). Once the samples have been tested EKFB will screen the results against the re-use criteria in line with this report. If the screened results indicate significant variation to the 25 samples assessed in this report, then further assessment will be required. Where the results demonstrate similar properties to those described in this report, then further assessment will not be required.

During the construction of the Twyford Embankment Landscape Earthworks, should ground conditions vary from the geological model and assumptions within this report, further assessment (e.g. updated CSM) may be required.

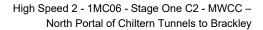


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1MC06-CEK-EV-NOT-CS06_CL10-000005

6 References

- [1] Environment Agency, "Land Contamination: Risk Management (LCRM). https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm," 2021.
- [2] Environment Agency, "Waste recovery plans and deposit for recovery permits," [Online]. Available: https://www.gov.uk/government/publications/deposit-for-recovery-operators-environmental-permits/waste-recovery-plans-and-deposit-for-recovery-permits. [Accessed October 2024].
- [3] HS2, "Technical Standard Land Quality, HS2-HS2-EV-STD-000-000027, 2017".
- [4] Duo, "Remediation Implementation Plan Finmere Cutting Landfill, 1MC12-EKF-EV-PLN-CS09-000012".
- [5] Jackson Remediation, "Mobile Treatment Plant Deployment Supporting Information- Finmere Quarry and Railway Cutting Landfill," 2022.
- [6] ASC, "Aylesbury Railway Link and Disused Railway Spurs Geoenvironmental Assessment Report, 1MC06-CEK-EV-REP-CS05-000001," 2023.
- [7] ASC, "Aylesbury Link and Dismantled Great Central Railway Remediation Outline Strategy, 1MC06-CEK-EV-REP-C002-000200, Rev C03, January 2023".
- [8] ASC, "Aylesbury Link and Dismantled Great Central Railway Remediation Verification Plan, 1MC06-CEK-EV-REP-C002-000199, Rev C04, January 2023".
- [9] ASC, "Finmere Quarry Landfill and Railway Cutting Landfill Geoenvironmental Assessment Report, 1MC06-CEK-EV-REP-CS06 CL21-000001, Rev. C05, December 2022".
- [10] ASC, "Finmere Quarry Landfill and Railway Cutting Landfill Remediation Outline Strategy, 1MC06-CEK-EV-REP-CS06_CL21-000035, C04".
- [11] ASC, "Finmere Quarry Landfill and Railway Cutting Landfill Remediation Verification Plan, 1MC06-CEK-EV-REP-CS06 CL21-000036, C03".
- [12] ASC, "Derivation of Made Ground Assessment Criteria for the Protection of Controlled Waters 1MC06-CEK-EV-REP-C002-000090 C02, September 2021".
- [13] ASC, "Calvert Cutting to Twyford Embankment Hydrogeological Assessment Report, 1MC06-CEK-EV-REP-CS06_CL09-000046," 2021.
- [14] ASC, "Twyford Embankment Geotechnical Design Report (GDR), 1MC06-CEK-GT-REP-CS06_CL10-000002, C05," 2023.
- [15] ASC, "IDR 218 Specification, 1MC06-CEK-AU-SPE-CS06-00001".
- [16] ASC, "Twyford Embankment Asset Specific Cross Section, 1MC06-CEK-GT-DGA-CS06_CL10-000027".
- [17] ASC, "Project Explorer Ground Engineering Viewer, 2024, https://uk.gis.arcadis.com/portal/apps/webappviewer/index.html. Accessed 2022," [Online].
- [18] Google LLC, "Google Eath Pro, Version 7.3.4.8248, accessed 2022," [Online].
- [19] HS2, "gViewer CORE, 2017, https://gviewer.hs2.org.uk/Silverlight/#, accessed 2017.," [Online].
- [20] HS2, London-West Midlands Environmental Statement Volume 5, Map books Land Quality, 2013.
- [21] HS2, London–West Midlands Environmental Statement Volume 5 | CFA 15 Technical Appendices Land Quality, 2013.
- [22] National Library of Scotland, "https://maps.nls.uk/geo/explore/side-by-side, accessed November 2021," [Online].





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1MC06-CEK-EV-NOT-CS06_CL10-000005

- [23] DEFRA, "MAGIC Maps," Natural England, 2025. [Online]. Available: https://magic.defra.gov.uk/MagicMap.html. [Accessed 03 2025].
- [24] B. C. Standard, "BS 5930:2015+A1:2020".
- [25] C. P. M. C. G. A. G. O. R. C. a. N. J. F. 2. Nathanail, "The LQM/CIEH S4ULs for Human Health Risk Assessment, Land Quality Press, Nottingham. "Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3223. All rights reserved".
- [26] CL:AIRE, "Contaminated Land: Applications in Real Environments, 2014. Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination SP1010. Environmental quality standards applicable to surface water, 2008. Directive 2008/105/EC".
- [27] EKFB, "Twyford to Greatworth Construction Environmental Management Plan (CEMP), 1MC12-EKF-EV-PLN-CS09-000002.".
- [28] EKFB, Calvert Area (CA) Construction Environmental Management Plan (CEMP), 1MC12-EKF-EV-PLN-CS08-000002 C02..
- [29] D. J. L. R. M. M. P. N. Rudland, "CIRIA C552, Contaminated Land Risk Assessment. A guide to good practice.," 2001.



High Speed 2 - 1MC06 - Stage One C2 - MWCC - North Portal of Chiltern Tunnels to Brackley

Twyford Embankment Landscape Earthworks Conceptual Site Model

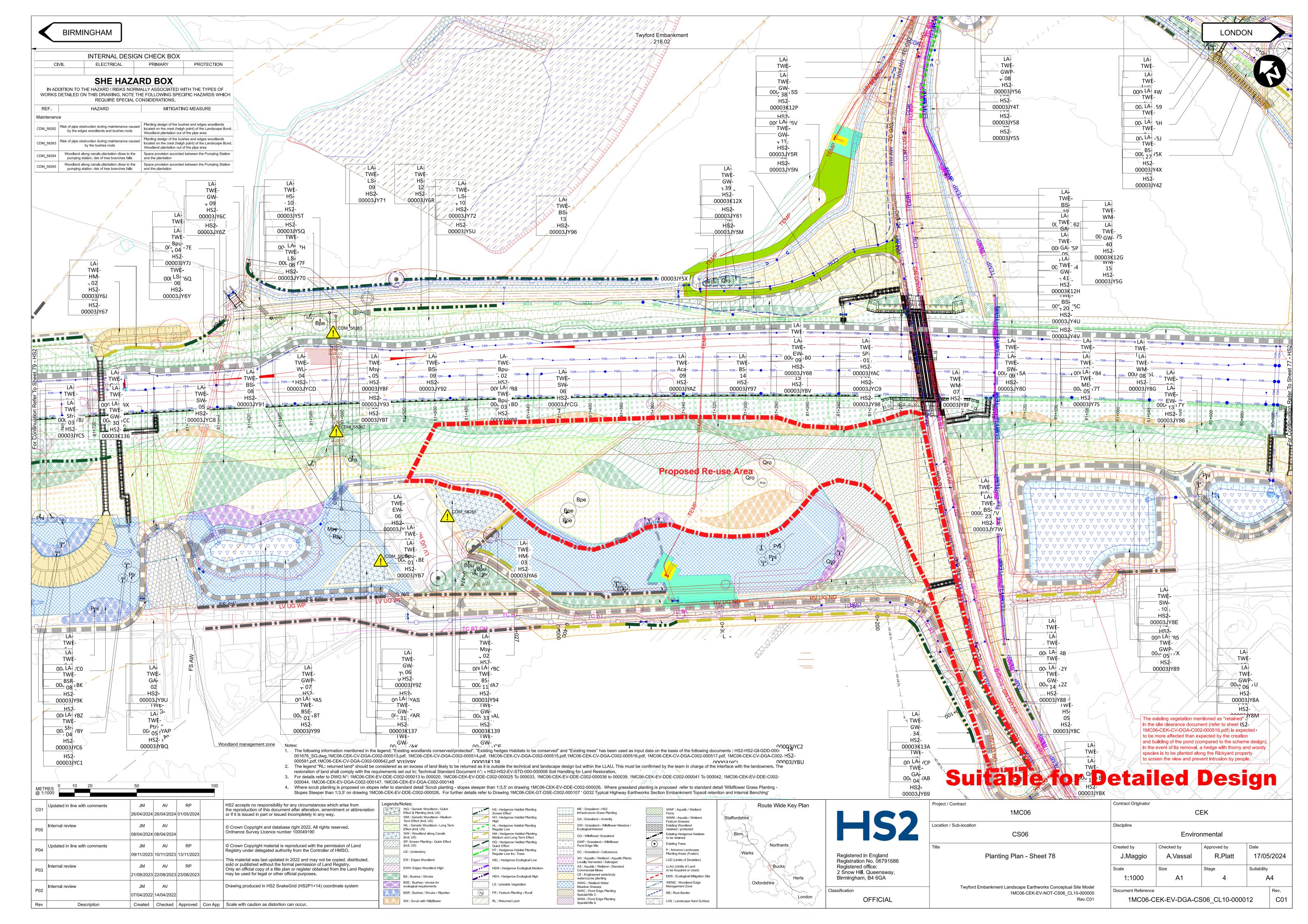
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APPENDIX I

Drawings

Number of Pages: 1





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APPENDIX II

II-1 Exploratory Hole Logs
II-2 ALV, RTD and OXC Physical Laboratory Testing Figures
II-3 Annotated Groundwater Elevation Graphs

Number of Pages: 45



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Appendix II-1

Exploratory Hole Logs

37 pages



FINAL-MON

ML081-TP416

 Project ASC C2 & C3 Controlled Data Client
 Project No.
 Ground Level (mAOD) 84.58
 GI Phase ASC Scheme GI ASC Scheme GI
 C2-C3-CONT-ASC Easting (OSGB) Northing (OSGB) Northing (OSGB)
 ASC Scheme GI Asset Group
 Offset End Date End Date
 End Date

 HS2
 467370.57
 226339.71
 Calvert Cutting Group
 -27
 17/04/2019
 Sheet 1 of 1

132			407	310.31		2200	39.71 Calvert Cut			72010		1001 1	
SAMPLE	S		TE	ESTS		e es		STRATA			Donth		Inete
Depth	Type/ No.	Depth	Type/ No.	Results	PI	Water Strikes		Description	Legend	Geol Code1	Depth (Thickness)	Level	Insta Back
0.00 - 0.35	LB1	- - - -	NO.				occasional rootlets (<1r subrounded to rounded	slightly sandy slightly gravelly clay with mm x 30mm). Sand is fine to medium. Gravel is I fine to medium of mudstone and limestone. P] Factual Geolcode 2 [C] C Z]		Code1	(0.35)		
0.50 - 0.60 0.60 - 0.90	D3 LB4	- - - - 0.50 - 0.50 - 0.50	HV(1) HV(2) HV(3)	72(21)kPa 75(30)kPa 87(27)kPa	PL 20 LL 53 PI 33 NMC 28		CLAY. Sand is fine to m mudstone and limeston	MP] Factual Geolcode 2 [C]			0.35	84.23	
0.90 - 1.00	D5	- - - - - 1.00 - 1.00	HV(1) HV(2) HV(3)	69(27)kPa 75(27)kPa 81(24)kPa			from 0.9	0m to 1.60m greenish grey mottled orangish brown			(1.25) ₋		
1.40 - 1.50 1.60 - 1.90	D6 LB7	- - - - - 1.50 - 1.50 - 1.50	HV(1) HV(2) HV(3)	63(27)kPa 69(24)kPa 72(21)kPa	PL 26 LL 64 PI 38 NMC 42						- 1.60	82.98	
1.90 - 2.00	D8	- - - - - - - - - -	HV(1)	63(18)kPa			slightly gravelly CLAY v (<1mm x 30mm) and ra clayey fine to medium s subangular to rounded	brown mottled yellowish brown slightly sandy with occasional partially decomposed rootlets are lenses (<30mm x 30mm) of yellowish brown sand. Sand is fine to medium. Gravel is fine of limestone and mudstone. MPJ Factual Geolcode 2 [C]			(0.80)		
2.40 - 2.50	D9	- 2.00 - 2.00 - - - - -	HV(2) HV(3)	72(21)kPa 75(21)kPa			Firm to stiff bluish grey	slightly sandy CLAY. Sand is fine.			2.40	82.18	
2.50 - 3.00	LB10	- 2.50 - 2.50 - 2.50 	HV(1) HV(2) HV(3)	102(36)kPa 96(30)kPa 99(30)kPa			Factual Geolcode ĬOΧC Geology Code 3 [OXC-	Cl Factual Geolcode 2 [Cl			(0.80)		
3.10 - 3.20	D11		HV(1) HV(2) HV(3)	111(42)kPa 117(39)kPa 135(45)kPa				from 3.00m to 3.20m locally thinly laminated			3.20	81.38	
		- - - - - - - -											
		- - - - - - -											
		- - - - - - -											
		- - -										<u> </u>	
Depth	Type/No.	Depth	Type/No.	Results		Water Strikes	Description		Legend		Depth (Thickness)	Level	Installitia
AN DETAIL:	S							Remarks					
—		4.4		Lon	g Axis Or	ientation:		PAS 128 Type B survey conducted over positio	n. 2. Wate	er seepa	age observe	d at 1.30	m.
T						340	0						
				Sho	oring / Sup	pport: No	ne						
.7							B unstable						
					undwater			THIS LOG HAS BEEN REPRODUCED F AGS DATA. CHANGES TO GEOLOGY C BE REFLECTED ON THIS L	ODES V		OT Excava	ion Depth: tion terminated wall of	



FINAL-MON

ML081-TP419

 Project ASC C2 & C3 Controlled Data Client
 Project No. C2-C3-CONT-ASC Easting (OSGB)
 Ground Level (mAOD) 86.88 ASC Scheme GI ASC Scheme GI ASSET Group
 Chainage (SG Grid) 17/04/2019 1:25 End Date 17/04/2019
 Start Date Scale 17/04/2019 1:25 End Date 17/04/2019

 HS2
 467210.68
 226458.80
 Calvert Cutting Group
 Offset -33
 17/04/2019
 Sheet 1 of 1

HS2			407	210.68		2204	58.80 Calvert Cutt	ing Group -33	17/04	72013		neet 1 of	<u>-</u>
SAMPLE	S		TE	ESTS		es		STRATA			- Depth	le le	nstall/
Depth	Type/ No.	Depth	Type/ No.	Results	PI	Water Strikes		Description	Legend	Geol Code1	(Thickness)		ackfill
- 0.00 - 0.30 - 0.10 - 0.20 	LB1 D2	- - - - - - - - - - - -	HV(1)	81(27)kPa	PL 23		with occasional rootlets is subrounded to round Factual Geolcode [TOP-Geology Code 3 [TOP-Firm to stiff greenish gravelly CLAY. Sand is fine of limestone and m	ey and orangish brown slightly sandy slightly fine to medium. Gravel is subangular to rounded udstone.		Code	(0.30)	86.58	
- 0.60 - 0.90 0.90 - 1.00	LB4	- 0.50 - 0.50 - - - - -	HV(2) HV(3)	87(30)kPa 93(30)kPa	LL 63 PI 40 NMC 30		Geology Code 3 [TILM	IP] Factual Geolcode 2 [C] P-C Z] with rare to occasional lenses (<50mm x 50mm) of orangish brown fine to medium sand					
- - - - - - - - - - -		- 1.00 - 1.00 - 1.00 - 1.00 	HV(1) HV(2) HV(3)	81(24)kPa 90(27)kPa 93(33)kPa							(1.40) -		
- 1.50 - 1.60 - - - - 1.70 - 2.00	D6 LB7	- 1.50 - 1.50 - 1.50 - 1.50 -	HV(1) HV(2) HV(3)	81(30)kPa 84(27)kPa 90(36)kPa				vn and grey mottled yellowish brown slightly			1.70	85.18	
- - - 2.00 - 2.10	D8	- - - - - 2.00 - 2.00 - 2.00	HV(1) HV(2) HV(3)	81(27)kPa 81(30)kPa 87(30)kPa			x 20mm). Sand is fine t Factual Geolcode [TILM Geology Code 3 [TILM	IP] Factual Geolcode 2 [C]			-		
- - - - - 2.50 - 2.60	D9	- - - - - - 2.50	HV(1) HV(2)	102(36)kPa 99(30)kPa							(0.90)		
- 2.60 - 3.00 - - - - - -	LB10	- 2.50 - - - - - -	HV(3)	99(36)kPa			to frequent fossilised sh medium.	wn and dark grey slightly sandy CLAY with a few lell fragments (<2mm x 10mm). Sand is fine to C] Factual Geolcode 2 [C] C Z]			(0.40)	84.28	
-3.00 - 3.10 	D11	3.00 3.00 3.00 	HV(1) HV(2) HV(3)	111(45)kPa 120(42)kPa 135(57)kPa			CLAY with a few to freq Sand is fine to medium. Factual Geolcode [OXC Geology Code 3 [OXC-	c] Factual Geolcode 2 [C]			3.00 -	83.88	
- 3.40 - 3.50 - 3.50 - 3.80 	D12 LB13	- 3.50 - 3.50 - 3.50 - 3.50	HV(1) HV(2) HV(3)	123(36)kPa 141(48)kPa 150(45)kPa			at c	from 3.50m to 4.00m stiff to very stiff			(1.00) -		
- - 3.90 - 4.00 - - - - -	D14	- - - - - -			PL 28 LL 57 PI 29 NMC 24						4.00 -	82.88	
		- - - - - - -									-		
· · · ·		- - - - -									-		
PLAN DETAILS	TypeNo.	Depth	TypeNo.	Results		Water Strikes	Description	Remarks	Legend	1	Depth (Thickness)	Level Is	Install Backfil
		4.7		Lor	ıg Axis Ori	ientation:		1. PAS 128 Type B survey conducted over position	ı. 2. No g	roundw	ater encount	ered.	
T						340)						
0.7					oring / Sup	port: Noi	ne						
					oundwater			THIS LOG HAS BEEN REPRODUCED F AGS DATA. CHANGES TO GEOLOGY C BE REFLECTED ON THIS L	ODES W		~ _	on Depth: ed Scheduled	4.00m d

JCB Excavator

FINAL

ML081-**WS004**

Ground Level (mAOD) 85.58 Northing (SnakeGrid) 226491.78

GI Phase HS2 Main Gl Asset Group Twyford Embankment Group Chainage (Snake grid) Start Date 06/07/2017 End Date Offset 07/07/2017 -55

1:50 Sheet 1 of 1

S2			46713	2.26		226491.7	'8	Twyford Embankment Gro	up	-55	i	07/07/	2017	Sh	eet 1 o	f 1
SAM	IPLES		TEST	S		PROGR			S	TRATA				Donth		Insta
Type -	+ Depth	Type + Depth	Results	PI	Water Depth	Date & Time	Casing & Water		Description	1		Legend	Geol Code1	Depth (Thickness)	Level	Back
(D2 (LB3)	2) 0.40 0.50-0.80 0.80-1.20	Верин		PL 28 LL 65			Depth	TOPSOIL: Dark brown Factual Geolcode [TC Geology Code 3 [TOF Firm orangish brown I Sand is fine to mediuu fine to coarse of flint a Factual Geolcode [AL	DP] Factual Geo P-C Z] mottled grey slig m. Gravel is sub and limestone. V] Factual Geol	olcode 2 [C ghtly sandy pangular to	gravelly CL/ subrounded	AY.		(0.40)	85.18	
(D6) 1	1.20-1.65 1.25-2.30 1.30-2.35	SPT(S) 1.20	N=10 (2,2,2,2,3,3)	PI 37 NMC 34		06/07/2017 18:00 07/07/2017 07:30	1	Geology Code 3 [ALV	'-C Z]					(2.40)		
(D8) 2	2.20-2.65	SPT(S) 2.20	N=16 (2,3,3,4,4,5)											-	 	
(B10) 2	2.85-2.90 2.90-2.95 3.20-3.65	SPT(S) 3.20	N=15 (2,3,3,3,4,5)	PL 25 LL 58 PI 33 NMC 26				from 2.60m t Firm to stiff thinly lami Sand is fine. Factual Geolcode [OX Geology Code 3 [OX	(C] Factual Geo	ey slightly	materi sandy CLAY.	ıs 🕂 ∸		- 2.80 - (1.05)	82.78	
	3.90-3.95 3.95-4.00		(2,3,2,3,1,1,0)						om 3.10m to 3.3		• •	n)		3.85	81.73	
	4.20-4.65	SPT(S) 4.20	N=16 (2,3,3,4,4,5)					Factual Geolcode [KL Geology Code 3 [KLB	.É] Factual Geol	lcode 2 [S]				(1.15)	† † † †	
						11:00										
														-		
														-		
														-		
														_	‡	
	ype DRILLING	Type S TECHNIQU	Results	Cr	Water HISELLING	Date Time	Casing Water	WATER OBSERVA	Description TIONS		HOLE/CASI	Legend NG DIAMET		Depth (Thickness)	Level R ADDE	
rom	To	Typ		Hard S From	Strata		ate/Time	Depth Strike Duration (min)	Rise To Casing	Sealed Ho	le Dia. Depth		Depth			olume (I
0.00 1.20	1.20	Inspect														

THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.

Termination Depth: 5.00m Achieved Scheduled Depth



^{1.} PAS 128 Type B survey conducted over position. 2. Where structure is not described, such features were not observed in the available samples. 3. No groundwater

FINAL

ML081-**WS012**

Ground Level (mAOD) Northing (SnakeGrid) 226383.98

GI Phase HS2 Main GI **Asset Group**

Chainage (Snake grid) Start Date 18/07/2017 Offset End Date

1:50

S2		467245	5.27		226383.9	98	Calvert Cutting Group	-71		18/07/2	2017	Sh	eet 1 o	f 1
SAMPLES		TEST			PROGI			STRATA				Danti		Ineta
Type + Depth	Type + Depth	Results	PI	Water Depth	Date & Time	Casing & Water	De	scription		Legend	Geol Code1	Depth (Thickness)	Level	Instal Backf
(B2) 0.05-0.20 (D1) 0.05 (D3) 0.30 (LB4) 0.50-0.80	Берит			Берит		Depth	TOPSOIL: Brown clay with ra Factual Geolcode [TOP] Fact Geology Code 3 [TOP-C Z] Firm brown mottled grey sligt Sand is fine. Gravel is angula	tual Geolcode 2 [C]	elly CLAY.		CodeT	(0.30) 0.30	85.46	
(LB5) 1.00-1.20 (D6) 1.20-1.25 (B7) 1.25-2.80			PL 31 LL 63 Pl 32				flint. Factual Geolcode [ALV] Fact Geology Code 3 [ALV-C Z] Firm thinly laminated brown r Factual Geolcode [OXC] Fac Geology Code 3 [OXC-C Z]	ual Geolcode 2 [C]				(0.70) 1.00 -	84.76	
			NMC 31					m with abundant pocke				(1.85) ₋	- - - - -	
(D8) 2.85-2.90 (B9) 2.90-4.95							Stiff to very stiff thinly laminat shell fragments (up to 30mm; Factual Geolcode [OXC] Fac Geology Code 3 [OXC-C Z]	ted dark grey CLAY wit).				2.85 -	82.91	
							from 3.00m to 3.10m a	abundant crystals of sel	enite (up to 15mm)			(2.15)		
(D10) 4.95-5.00													+ + + + + + + + +	
, ,,					18/07/2017 15:05							5.00 -	80.76	
												-	† - - - - - - - - -	
												-		
												-	† † † †	
												-		
												-	<u> </u>	
Type	Туре	Results			Date Time	Casing Water		escription	I E/CACINO	Legend		Depth (Thickness)		
DRILLING	TECHNIQU	JE		ISELLING	3		WATER OBSERVATIONS	НО	LE/CASING	DIAMETI	ER	WATE	RADDE	D
		e on Pit	CH Hard St From	ISELLING	3	Casing Water Date/Time		HO		DIAMETI		WATE	RADDE	

THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.

Termination Depth: 5.00m Achieved Scheduled Depth



^{1.} PAS 128 Type B survey conducted over position. 2. Where structure is not described, such features were not observed in the available samples. 3. No groundwater observed.



FINAL

Rev.C01 ML081-**WS435**

Project No.
ASC C2 & C3 Controlled Data C2-C3-CONT-ASC Client Easting (OSGB)
467290 28

Ground Level (mAOD) Northing (SnakeGrid)

GI Phase ASC Detailed GI Asset Group

Offset

Chainage (Snake grid) Start Date 04/08/2021 End Date 12/08/2021

Shoot 1 of 1

Scale

1:50

S2		467280			226418.3	4	Calvert Cutting Group	-22	12/08	/2021	Sh	eet 1 of	1_
SAMPLES		TESTS	S		PROGF	RESS		STRATA					Inat
Type + Depth	Type + Depth	Results	PI	Water Depth	Date & Time	Casing & Water Depth	De	escription	Legen	Geol Code1	Depth (Thickness)		Insta Back
(D1) 0.00-0.10 (B2) 0.20-0.50	HP (1) 0.15 HV(1) 0.15			·		Бораг	clay with frequent roots. San	ne to coarse of flint and chert.			(0.20)	85.90	
(D3) 0.70							Geology Code 3 [TOP-C Z] Firm brown and grey slightly	sandy slightly gravelly CLAY v			(0.60)	95.30	
(B4) 0.80-1.20 (D5) 1.00							occasional rootlets. Sand is t subangular to rounded fine to	coarse of flint.			0.80 (0.40) -	85.30	
(B12) 1.20-1.70	SPT(S)	N=4			04/08/2021		Factual Geolcode [OXC] Factorial Geology Code 3 [OXC-C Z]				1.20	84.90	
(D6) 1.20-1.65	1.20	(1,1,1,1,1,1)			17:30 12/08/2021 07:30			to 0.80m gravel content decrea from 0.50m to 0.80m no re				-	
(0.40) 4.00.0.00					07.50		Firm mottled orangish brown Factual Geolcode [OXC] Facture [OXC]					+	
(D13) 1.80-2.00							Geology Code 3 [OXC-C Z]	from 1.00m to 1.20m			(4.70)		
(B14) 2.20-2.70	SPT(S)	N=11						nge brown and yellowish brow e orange brown iron nodules (5			(1.70)	+	
(D8) 2.20-2.65	2.20	(1,2,2,2,3,4)					x 5mm). Sand is fine. Factual Geolcode [OXC] Fac	tual Geolcode 2 [C]					
							Geology Code 3 [OXC-C Z]	n nodules. Rare orange brown	fine			<u>-</u>	
(D15) 2.90-3.10							1	to <u>medium sand lenses (30-40r</u> nge brown mottled yellowish bro	nm)	-	2.90	83.20	
(B16) 3.20-3.70	SPT(S)	N=11					Firm to stiff dark grey and blu occasional gypsum crystals (<u>×_</u>			-	
(D10) 3.20-3.65	3.20	(2,2,2,3,3,3)					Factual Geolcode [OXC] Factual Geology Code 3 [OXC-C Z]		×_×	-			
							from 3.40m to 4.20m no gyp	osum crystals. Rare fossilised s fragments (2mm x 2r	\ I×—		(1.30)	-	
(D17) 3.80-4.00									<u>×_×</u>	_	_		
					12/08/2021				<u>×_</u>		4.20	81.90	
					17:30								
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Type DRILLING	Type TECHNIQU	Results	CHI	Water SELLING	Date Time	Casing Water	WATER OBSERVATIONS	Description HOLE/CAS	Legend SING DIAME		Depth (Thickness)	Level In:	nstall
rom To	Тур	е	Hard Str From	ata		ate/Time	Depth Strike Duration (min) Rise To	Casing Sealed Hole Dia. Depth	Casing Dia.	Depth		To Volu	
0.00 1.20 1.20 4.20	Inspecti Dynamic	on Pit Sample						86 3.20 74 4.20					

1. PAS 128 Type B survey conducted over position.

THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.

Termination Depth: 4.20m Achieved Scheduled Depth





FINAL

ML081- Rev.C01 **WS446**

 Project
 Project No.

 ASC C2 & C3 Controlled Data Client
 C2-C3-CONT-ASC Easting (OSGB)

 HS2
 467338.87

Ground Level (mAOD) 85.79 Northing (SnakeGrid) 226225.75

GI Phase ASC Detailed GI Asset Group Calvert Cutting Group

Offset -135

Chainage (Snake grid) Start Date 09/09/2021 End Date 09/09/2021

Sheet 1 of 1

1:50

HS2		467338	3.87		226225.7	15	Calvert Cutting Group	-135	09/09/	2021	Sr	ieet 1 o	11
SAMPLES		TEST	S		PROGI	RESS		STRATA					
Type + Depth	Type +	Results	PI	Water	Date & Time	Casing & Water	Descripti		Legend	Geol	Depth (Thickness)	Level	Install/ Backfill
(D1) 0.05 (ES2) 0.05 (B3) 0.10-0.40	Depth PID (1) 0.05		F1	Depth	Date & Time	Depth	MADE GROUND: Dark brown sand subrounded fine to coarse gravel.	dy subangular to Sand is fine to coarse.	Legend	Code1	(0.45)		
(D4) 0.45 (B6) 0.50-1.00 (ES5) 0.50	PID (1) 0.50	<1ppm	PL 25 LL 64 PI 39 NMC 34				Factual Geolcode [MGR] Factual G Geology Code 3 [MGR-S V SV] from 0.20m to 0.45m gravel with h sized fragme MADE GROUND: Yellowish brown	high cobble content. Cobbles ents are angular of concrete.			0.45	85.34	
- (ES7) 1.00 (B18) 1.20-1.95	PID (1) 1.00 SPT(S)	<1ppm N=16	NMC 40				gravelly clay. Sand is fine to coarse are angular to subangular fine to co Factual Geolcode [MGR] Factual G	e. Gravel sized fragments parse of brick.			(1.50)	‡	
(Ď8) 1.20	1.20	(1,3,5,5,3,3)					Geology Code 3 [MGR-C Z] from 1.50m to 1.95m becoming	gravelly with medium cobble	-			†	
_ (D17) 1.95-2.00	SPT(S)	N=5	PL 23				content. Cobble sized fra	ngments are angular of brick. wn slightly sandy slightly			1.95	83.84	
(D10) 2.00-2.45 (ES14) 2.00 (D15) 2.30	2.00 PID (1) 2.00	(1,1,1,1,1,2) <1ppm	LL 48 PI 25 NMC 33 PL 22				gravelly CLAY. Sand is fine to coars medium of mudstone. Factual Geolcode [OXC] Factual G	se. Gravel is angular fine to					
(B16) 2.60-3.00			LL 59 PI 37 NMC 32 NMC 14				Geology Code 3 [OXC-C Z] from 1.95m to 2.00m frequent bla					†	
- (D12) 3.00-3.45 (ES19) 3.00	SPT(S) 3.00 PID (1) 3.00	N=11 (1,2,2,3,3,3) <1ppm									(2.05)	<u> </u>	
(D20) 3.30 - (B21) 3.60-4.00	112 (1) 0.00	Тррш	PL 23 LL 56 PI 33 NMC 28									†	
- (52.1) 0.00 1.00			NIMIC 20		09/09/202		from <u> 3.8</u>	35m to 4.00m becoming stiff.			4.00	81.79	
					18:00						4.00	1 01.75	
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Туре	Туре	Results	Ł	Water	Date Time	Casing Water	Description		Legend		Depth (Thickness)		
DRILLING From To	TECHNIQU Typ	-	Hard St	ISELLING		ate/Time	WATER OBSERVATIONS Depth Strike Duration (min) Rise To Casir	HOLE/CASING ng Sealed Hole Dia. Depth Cas		ER Depth	From	To Vo	D lume (ltr)
0.00 1.20 1.20 4.00	Inspecti Dynamic	ion Pit	From	То			, 2 1100 10 00011	100 3.00 87 4.00	- 1	3.00		- 100	(111)
Remarks													

1. PAS 128 Type B survey conducted over position.

THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.

Termination Depth: 4.00m Achieved Scheduled Depth

Checked By



Twyford Embankment Landscape Earthworks Conceptual \$ 1MC06-CEK-EV-NOT-CS06_CL1 Keynetik		Log	Borehole No ML081-CT002 Sheet 1 of 1
me Project No	Co-ords: 467396.94 - 226330.99	Cone Used: S15-CFIP.0915	Hole Type
C3 Controlled Data C2-C3-CONT-ASC MC06 North Portal of Chiltern Tunnels to Brackley & 1MC07 Brackley to Long Itchington Wood Green	Level: 84.77 m AOD	CPT Rig: Insulated Hand Tools+20.5 Tonne Track-Truck	IP+CPT Scale
uth Portal	D. L 44/00/0047 . 00/00/0047	Mounted CPT Unit	1:100
2	Dates: 14/06/2017 - 22/06/2017	Operator: Danny Cundill+UK15	Logged By DF
Cone Resistance, qc [MPa] 8 16 24 32 40 48 56 64 72	Friction Ratio, Rf [%] 80 0 4 8 12		
200 400 600 800 1000 1200 1400 1600 1800	2000	Estimated Soil Type	
Sleeve Friction, fs [kN/m2]		TOPSOIL: Brown slightly sandy clay with some rootlets.	E
		TOP Soft to firm light brown mottled grey slightly gravelly silty CLAY subangular to subrounded fine to medium of flint. ALV	with rare rootlets. Gravel is
		Clays - clay to silty clay; Very stiff fine grained	
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		Clays - clay to silty clay BLANK	
s .			
		<u> </u>	
3		<u> </u>	
		Sand mixtures - silty sand to sandy silt; Very stiff sand to clayey	sand
		SUNCE BLANK	
			-
			E

Twyford Embankment Landsc: 1MC	ape Earthworks Concept 06-CEK-EV-NOT-CS06			Borehole No ML081-CT003 Sheet 1 of 1
Project Name Project No	Co-o	ords: 467203.08 - 226494.04	Cone Used: S15-CFIP.0915	Hole Type
ASC C2 & C3 Controlled Data C2-C3-CONT-AS				IP+CPT
Location: 1MC06 North Portal of Chiltern Tunnels to Brackley & 1MC07 Brackley to Long Itch Tunnel South Portal	nington Wood Green Leve	el: 85.94 m AOD	CPT Rig: Insulated Hand Tools+20.5 Tonne Track-Truck Mounted CPT Unit	Scale 1:100
Client: HS2	Date	es: 15/06/2017 - 22/06/2017	Operator: Danny Cundill+UK15	Logged By PS
	64 72 80			
0 200 400 600 800 1000 1200 1400 ——— Sleeve Friction, fs [kN/m2]	1600 1800 2000	0	Estimated Soil Type	
			TOPSOIL. Soft brown slightly sandy clay.	o
			TOP Soft to firm brown mottled grey slightly sandy slightly gravelly C gravel sized pockets of black organic material and occasional n Gravel is subangular to subrounded fine to coarse of quartzite a ALV	AY with rare medium to coarse potlets. Sand is fine to medium. 1 2 3 4 5 6 7 10 11 11 11 11 11 11 11 11
			Clays - clay to silty clay BLANK	E
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			Sand mixtures - silty sand to sandy silt BLANK	4
			Sands - clean sand to silty sand BLANK	
			ON DLANK	
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			Clays - clay to silty clay	
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Twyford Embankment Landscape Earthw 1MC06-CEK-EV			9	Borehole No ML081-CT009 Sheet 1 of 1
Project Name Project No	С	Co-ords: 467352.85 - 226267.01	Cone Used: S15-CFIP.0915	Hole Type
ASC C2 & C3 Controlled Data C2-C3-CONT-ASC				IP+CPT
Location: 1MC06 North Portal of Chiltern Tunnels to Brackley & 1MC07 Brackley to Long Itchington W Tunnel South Portal	ood Green L	Level: 84.48 m AOD	CPT Rig: 20.5 Tonne Track-Truck Mounted CPT Unit +Insulated Hand Tools	Scale 1:100
Client: HS2	D	Dates: 16/06/2017 - 22/06/2017	Operator: UK15+Craig Blackett	Logged By
				JC
—— Cone Resistance, qc [MPa] 0 8 16 24 32 40 48 56 64				
0 200 400 600 800 1000 1200 1400 1600	1800 2	2000	Estimated Soil Type	
Sleeve Friction, fs [kN/m2]			TOPSOIL: Dark brown clay with rare rootlets.	0
			TOP Firm dark brown silty CLAY.	1 1 2 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
			ALV Firm brown mottled grey CLAY.	
			ALV Clays - clay to silty clay; Very stiff fine grained	
			— BLANK	E
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			<u>=-</u>]	3
		3	 -	=
			- Clays - clay to silty clay	4
			BLANK	<u>E</u>
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			Very stiff sand to clayey sand BLANK	7
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Rev.C01



Cable Percussive Borehole

Final data

ML081-CP009

Scale

1:50

ASC C2 & C3 Controlled Data HS2

Project No.
C2-C3-CONT-ASC
Easting (OSGB)
467308.61

Log Ground Level (mAOD) 86.50 Northing (SnakeGrid) 226437.76

HS2 Main GI Asset Group Calvert Cutting Group

Offset

Chainage (SG Grid) 11 m

30/05/2017 End Date 31/05/2017

Sheet 1 of 1

	PLES		TEST	S		PROGR	RESS	STRATA					Ι.
Type +	Depth	Type + Depth	Results	PI	Water Depth	Date & Time	Casing & Water Depth	Description	Legend	Geol Code1	Depth (Thickness)	Level	In Ba
(D1)	0.10	Борит			Борин		Depth	TOPSOIL: Brown slightly sandy clay with rootlets. Factual Geolcode [TOP] Factual Geolcode 2 [C]	V/AV		0.10	86.40	5
(D0)	10.40							Factor Geology Code 3 [TOP-C Z]	/ <u> </u> = _		(0.30)	00.46	
) 0.40).50-0.80							rootlets. Sand is fine to medium. Gravel is subangular fine to coarse of carbonaceous material and flint.			0.40	86.10	1
(D4)	0.80			PL 21				Factual Geolcode [ALV] Factual Geolcode 2 [C]			(0.80)	Ī	
	0.80-1.20			LL 63				Geology Code 3 [ALV-C Z] Firm to stiff orangish brown slightly sandy slightly gravelly CLAY with rare			(0.80)	Ī	
(116) 1	.20-1.65		U6 20 blows	PI 42 NMC 22		30/05/2017	0 00 Drv	rootlets. Sand is fine to medium. Gravel is angular to subrounded fine to coarse of flint.			1.20	85.30	n
(00) 1.	.20-1.00		100%rec.			17:30 31/05/2017	0.00 Dry	Factual Geolcode [ALV] Factual Geolcode 2 [C] \Geology Code 3 [ALV-C Z]	/=		1.20	00.00	
						07:30		Firm thinly laminated light brown mottled orange CLAY. Factual Geolcode [OXC] Factual Geolcode 2 [C]	<u></u>			†	
) 1.70 .70-2.15	SPT(S) 1.70	N=10 (1,2,2,2,3,3)					Geology Code 3 [OXC-C Z] at 1.70m occasional pockets (up to 30mm) with abundant orange	オ───		(1.00)	1	
(- /			(, , , , , , , , , , , , , , , , , , ,					staining	JF_=_			‡	
(D9)	2.20							Firm brown mottled grey and orange CLAY with rare locally some shell			2.20	84.30	o
(U10) 2	2.40-2.85		U10 15					fragments (up to 5mm) and rare partings of light brown silt.				‡	
			blows 100% rec.					Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]	<u> </u>		(0.70)	Ţ	
									F	-		‡	
) 2.90 2.90-3.35	SPT(S) 2.90	N=12 (1,1,3,3,3,3)	NMC 25				Firm to stiff thinly laminated dark grey slightly sandy CLAY with occasional shel fragments (up to 5mm). Sand is fine.			2.90	83.60)
								Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]	 			1	
(D10)	50 40-		UT 115					from 2.90m to 3.35m with rare reddish brown staining along	#=			†	
(B13) 3 UT-NR)	3.50-4.00 3.50-3.95		UT-NR 25 blows 0%					laminations from 3.05m to 3.45m 2 No subangular medium gravel sized crystals	14 三			Ţ	
			rec.					of selenite				‡	
(D14) 4	.00-4.45	SPT(S)	N=19	PL 25								+	
		4.00	(2,2,4,4,5,6)	LL 58 PI 33								1	
(LIT4E)	4.50-4.95		UT15 50	NMC 22								Ī	
(0115)	4.50-4.95		blows 100%									Ŧ	
			rec.									1	
	5) 5.00 5.00-5.45	SPT(S) 5.00	N=26 (4,5,6,6,7,7)	NMC 19								+	
(017) 5	0.00-5.45	5.00	(4,5,6,6,7,7)									1	
												1	
											(5.60)	ł	
(D18	3) 5.75							at 5.75m fissured. Fissures are randomly orientated extremely			(3.00)	1	
(UT19)	6.00-6.45		UT19 50 blows 100%					closely spaced planar smooth.				+	
			rec.									1	
(D20) 6.50	SPT(S)	N=24									‡	
	5.50-6.95	6.50	(4,5,5,6,6,7)					at 6.50m 2 No subangular to subrounded medium to coarse gravel sized fragments of pyritised shell and 1 No belemnite (12mm				1	
								diameter by 30mm)				1	
												†	
(D22	2) 7.25			PL 26								1	
(UT23)	7.50-7.95		UT23 65	LL 62 PI 36								‡	
,			blows 78% rec.	NMC 21								‡	
												†	
	8.00-8.39	SPT(S) 8.00	50/240mm (5,8,12,17,17					from 8.00m slightly sandy and indistinctly laminated				Ť	
			,4/15)									†	
(D26	6) 8.50							Very stiff dark grey sandy CLAY with occasional shell fragments (up to 4mm).			8.50	78.00	, اد
								Sand is fine. Factual Geolcode [KLB] Factual Geolcode 2 [C]				I	
(B27) 0	0.00-9.50		UT-NR 65					Geology Code 3 [KLB-C Z]				1	
UT-NR)	9.00-9.50		blows 0%								(1.33)	f	
			rec.									1	
(D28) 9	9.50-9.83	SPT(S) 9.50	50/175mm (8,15,20,20,1	LL 26 NMC 10								†	٠
		a.50	0/25)	INIVIC IU		24/05/2247	2.00.5	from 9.70m to 9.83m some gravel sized fragments of shell			0.00	70.0	,
						31/05/2017 17:30	∠.∪∪ Dry				9.83	76.67	
	ре	Туре	Results		Water		Casing Water	Description	Legend		Depth (Thickness		In
rom	DRILLING To			Ha	CHISEL ord Strata	LING Duration	-	WATER OBSERVATIONS HOLE/CASING Time Strike At Time Elapsed Rise To Casing Sealed Hole Dia. Depth C				To V	_
	1.20	Ins	Type ection Pit	From	То	Duration	Date	Time Strike At (mins) Rise To Casing Sealed Hole Dia. Depth C 200 9.83		Depth 2.00	From	10 V	/olur
0.00	9.83	Cable	Percussion										
0.00 1.20					1	1	1				1	1	
1.20							-						_
narks PAS			ey conducte			. 2. Where	structi	re is not described, such features were not observed in the	S	PT Ha	ımmer:		58

THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.

9.83m

Termination Depth:

Rev.C01



Data

HS2

Cable Percussive Borehole

Final data

ML081-CP024

Project No.
C2-C3-CONT-ASC
Easting (OSGB)
467101.62

Log Ground Level (mAOD) 84.56 Northing (SnakeGrid) 226512.79

HS2 Main GI Asset Group Twyford Embankment Group

Offset -56 m

Chainage (SG Grid)

15/06/2017 End Date 16/06/2017 Scale 1:50 Sheet 1 of 1

32		467	101.62		2265	12./9	Twyford Embankment Group -56 m	16/06/	2017	011	eet 1 of 1
SAMPLES		TEST	S		PROGR	ESS	STRATA				
Гуре + Depth	Type +	Results	PI	Water	Date & Time	Casing & Water	Description	Legend	Geol	Depth (Thickness)	Level Bac
(ES1) 0.05	Depth PID (1)	<1ppm		Depth	Date & Time	Depth	TOPSOIL: Brown slightly sandy gravelly clay.	Z//XV/	Code1		
(D2) 0.20	0.05 PID (1)	<1ppm					Factual Geolcode [TOP] Factual Geolcode 2 [C] Geology Code 3 [TOP-C Z]			(0.20) 0.20	84.36
(ES3) 0.20	0.20						Soft brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is				
(LB4) 0.50-0.80							subangular to subrounded fine to coarse of flint and quartzite. Factual Geolcode [ALV] Factual Geolcode 2 [C]			(0.60)	
(D5) 0.80	PID (1)	<1ppm	PL 19				Geology Code 3 [ALV-C Z] Soft to firm thinly laminated brown mottled grey slightly sandy CLAY. Sand is			0.80	83.76
(ES6) 0.80 (LB7) 1.00-1.20	0.80		LL 55 PI 36				fine to coarse. Gravel is subangular to subrounded fine to coarse of flint.			_	
(UT8) 1.20-1.65		UT8 15	NMC 24				Factual Geolcode [ALV] Factual Geolcode 2 [C] Geology Code 3 [ALV-C Z]				
,		blows 100% rec.									
		100.								-	
(B11) 1.70-2.20 (D10) 1.70-2.15	SPT(S) 1.70	N=8 (1,2,2,2,2,2)	PL 17 LL 51							(1.90)	
(D9) 1.70	1.70	(1,2,2,2,2,2)	PI 34 NMC 21							_	
(D12) 2.20		UT13 19	NIVIC 21								
UT13) 2.20-2.65		blows 100%									
		rec.								-	
(B16) 2.70-3.20	SPT(S)	N=8					Soft to firm light brown sandy CLAY. Sand is fine to medium.			2.70	81.86
(D14) 2.70 D15) 2.70-3.15	2.70	(1,0,1,2,2,3)					Factual Geolcode [KLB] Factual Geolcode 2 [C] Geology Code 3 [ALV-C Z]				-
							Geology Code 3 [ALV-0 2]			-	
(B19) 3.20-3.70 (D17) 3.20	SPT(S) 3.20	N=13 (2,2,3,3,4,3)								(1.10)	
(D18) 3.20-3.65										-	
(D20) 3.80			PL 17 LL 27				Medium dense grey clayey fine to coarse SAND. Factual Geolcode [KLB] Factual Geolcode 2 [S]	-		3.80	80.76
			PI 10 NMC 23				Geology Code 3 [RTD-S V SV]			-	
JT21) 4.20-4.65		UT21 19 blows 100%	141110 20								
		rec.								(1.40)	
(B24) 4.70-5.20	SPT(S)	N=18								()	
(D22) 4.70 (D23) 4.70-5.15	4.70	(4,4,3,4,5,6)									
(W25) 5.10										-	
(D26) 5.20		UT27 23	PL 21 LL 63				Soft to firm very thinly bedded slightly sandy CLAY. Sand is fine.			5.20	79.36
UT27) 5.20-5.65		blows 100% rec.	PI 42				Factual Geolcode [KLB] Factual Geolcode 2 [C] Geology Code 3 [RTD-C Z]				
(000) 5 70 0 00	007(0)		NMC 26				Coolingy Code of [1112 O 2]			-	
(B30) 5.70-6.20 (D28) 5.70	SPT(S) 5.70	N=19 (2,2,3,4,5,7)		5.10				-			
(D29) 5.70-6.15										_	
					15/06/2017	5.50				(2.00)	
					18:00 16/06/2017	5.10 6.20					
					07:30	3.50				-	
(D31) 6.70 UT32) 6.70-7.10		UT32 70 blows 100%									
,		rec.						-		-	_
(D33) 7.20							Madium atoms light was LIMFOTONE			7.20	77.36
, ,	SPT(S) 7.30	50/30mm (25/20,50/30		7.00	16/06/2017		Medium strong light grey LIMESTONE. Factual Geolcode [CB] Factual Geolcode 2 [LMST]			7.20 (0.15) 7.35	77.21
		mm)			13:30	7.00	\Geology Code 3 [OXC-LMST]	/		-	-
										-	
										-	
										-	
T				107.1	D-/ -		2	1.		-	-
Type DRILLING	Type G TECHN	Results IQUE	1	Water CHISEL		Casing Water	Description WATER OBSERVATIONS HOLE/CASING	Legend DIAMET		Depth (Thickness) WATE	Level Install
	-	Туре	Ha From	ard Strata	Duration	Date	Time Strike At Time Elapsed (mins) Rise To Casing Sealed Hole Dia. Depth Cas	sing Dia.	Depth	From	To Volume
rom To					04.00	16/06	5/2017 5.10 20 4.60 5.10 200 7.35	200	7.20	100 5	.10
00 1.20 20 7.35	Ins Cable	ection Pit Percussion	7.20	7.30	01:00	07:3	30:00 15 4.70 20 7.55	200	7.20	1.20 5	.10

1. PAS 128 Type B survey conducted over position. 2. Where structure is not described, such features were not observed in the available samples.

THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.

SPT Hammer: 71 Energy Ratio (%):

Termination Depth:

Logged By Checked By

53

7.35m

Unless otherwise stated: Depth (m), Diameter (mm), Time (hhmm), Thickness (m), Level (mOD).

Equipment Used **Insulated Hand Tools** Contractor



Cable Percussive Borehole

Final, Monitoring in **Progress**

ML081-CP400

ASC C2 & C3 Controlled Data

HS2

Project No.
C2-C3-CONT-ASC
Easting (OSGB)
467251.86

Log
Ground Level (mAOD) 86.67 Northing (SnakeGrid) 226480.44

ASC Scheme GI Asset Group Calvert Cutting Gr

Offset 9 m

Chainage (SG Grid) Start Date 06/06/2019 End Date 10/06/2019

1:50 Sheet 1 of 2

			407																$\overline{}$
SAMF	PLES		TEST	S		PROGF					STRAT	A					Depth	Lavial	Inst
ype +	Depth	Type + Depth	Results	PI	Water Depth	Date & Time	Casing & Water Depth			Descri	ption				Legend	Geol Code1	(Thickness)	Level	Bac
D2) 0. ES3) 0	00-0.40 10-0.20 .10-0.20	200			2 3 5 111		Бери	TOPSOIL: Crop of gravelly clay with Gravel is subangular Factual Geolcode	frequent root ular to rounde	lets (<1mn ed fine to m	n x 30mm). ledium of m	Sand is fir	ne to med	dium.			(0.40)	00.0	
D5) 0.	40-0.90 40-0.50 .50-0.60							Geology Code 3 Soft to firm greyis	[TOP-C Z] sh brown and	orangish b	rown slightl						0.40 (0.50)	86.27	/
37) 0.	90-1.20 90-1.00			PL 24 LL 60				locally gravelly Cl medium of mudst Factual Geolcode	one and lime [ALV] Factua	stone.		ilai to iou	naea iine	e 10			0.90	85.77	7
0) U.	90-1.00			PI 36 NMC 25				Geology Code 3 Firm grey and bro	ownish grey lo	ocally mottl	ed orangish	brown sli	ghtly sar	ndy	/F-F				
				NIVIC 25				CLAY. Sand is fin Factual Geolcode Geology Code 3	[ALV] Factua	al Geolcod	e 2 [C]						(1.25)	1	
Т9) 1	.70-2.15		UT9 13 blows 78% rec.														(1.23)		
12) 2	.15-2.20 .20-2.70	SPT(S) 2.20	N=7 (1,1,1,2,2,2)					Firm dark grey me fragments (<2mm				CLAY wit	th rare sh	nell			2.15	84.52	2
	.20-2.65							Factual Geolcode Geology Code 3	e [ALV] Factua [ALV-C Z]	al Geolcod	∋ 2 [C]	d with ve	llowish	brown				-	
13) 2	2.70-3.15		UT13 25 blows 100% rec.					from 2.20m	1 to 4.40m io		eyish brov							†	
8) 3	.15-3.20								4.70	–	***						-	Ť	
	.40-3.50			PL 25				from 3.15m to	o 4.70m gre	enish gre –	y with occ		hell frag <4mm x					+	
	.70-4.20	SPT(S)	N=14	LL 63 PI 38 NMC 25														Ī	
5) 3	.70-4.15	3.70	(1,2,2,3,4,5)															1	
																	(4.05)	İ	
7) 4	.40-4.50							from 4.4	40m to 4.70		e to occas							+	
19) 4	1.70-5.15		UT19 29 blows 100%						froi		o 6.20m s							-	
20) 5	.15-5.20		rec.														-	<u> </u>	
21) 5	.60-5.70																	‡ ‡	
																	-	-	
	.20-6.70 .20-6.65	SPT(S) 6.20	N=36 (3,4,5,7,9,15					Dense to very de	nse greenish	grey and d	ark grey sli	ghtly claye	ey fine to	medium			6.20	80.47	7
,			()					SAND. Factual Geolcode Geology Code 3	e [RTD1] Fact [RTD1-S V S	ual Geolco V]	de 2 [S]							-	۰
4) 6	.90-7.00																	ļ	
	.20-7.70	SPT(S)	N=57	LL 25	6.50			from 7.20m	to 9 20m ve	rv dense	grev and I	aht arev	eliahtly	clavev			-	Ī	۰
5) 7	.20-7.65	7.20	(6,8,10,13,16 ,18)	NMC 22					.5 0.20m VG	, uonse _	9.0y and 1		mediur					-	
7) 7	00 0 00																	1	
	.90-8.00	007/21															(3.45)	+	
9) 8 8) 8	.20-8.70 .20-8.65	SPT(S) 8.20	N=61 (7,9,11,13,16 ,21)		7.60			from 8.20m	to 9.20m w	rith rare fo	ssilised sh	nell fragm	nents (<	2mm x 2mm)				Ī	
																		Ī	
8 (08	.90-9.00																	‡	
	.20-9.70 .20-9.65	SPT(S) 9.20	N=38 (6,7,8,9,10,1		8.80			from 9.20	0m to 9.65m	n grey and	I greenish	grey and	locally	clayey	# 			†	٠
131 C	.70-10.15		1) UT33 39					Stiff to very stiff th	ninky laminato	d arev and	greenish a	rev sliahth	/ sandy /	CI AV			9.65	77.02	2
.0,0	0-10.13		blows 100% rec.					Sand is fine. Factual Geolcode	(OXC) Factu		-	oy ongriu	, suriuy (J-111.				<u> </u>	
Туј		Type G TECHN	Results IQUE		Water CHISEL	Date Time	Casing Water	Geology Code 3 WATER	[OXC-C Z]	Descrip	otion		HOLE/C	CASING	Legend DIAMET		Depth (Thickness)	Level	
m	То		Туре	Ha From	rd Strata	Duration	Date	e/Time Strike At	Time Elapsed (mins)	Rise To		aled Hole	Dia. D	epth Ca	sing Dia.	Depth			Volume
0	1.20	Insi	ection Pit Percussion	10.80	10.90	01:00	06/0	6/2019 6.20 40:00	20	5.80	2.70	1.70	50 1	1.20	150	10.20		1	

1. PAS 128 Type B survey conducted over position.

Energy Ratio (%): 73

THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.

Termination Depth: 11.20m Encountered Bedrock



ASC C2 & C3 Controlled

Data

HS₂

Cable Percussive Borehole

Final, Monitoring in **Progress**

Rev.C01 ML081-CP400

Log

C2-C3-CONT-ASC

467251.86

Ground Level (mAOD) 86.67 226480.44

ASC Scheme GI Asset Group

Calvert Cutting Gro

Chainage (SG Grid) Offset

9 m

Start Date 06/06/2019 10/06/2019

1:50 Sheet 2 of 2

SAMPLES TESTS PROGRESS STRATA Install/ Depth (Thickness) Level Type + Depth SPT(S) Water Geol Code1 Backfill Type + Depth ы Results Water Depth
06/06/2019 9.70 Dry
17:30 9.70 Dry
10/06/2019
08:00 Date & Time Description Legend Depth (D34) 10.15-10.20 (B36) 10.20-10.70 (D35) 10.20-10.65 Stiff to very stiff thinly laminated grey and greenish grey slightly sandy CLAY. Sand is fine.

Factual Geolcode [OXC] Factual Geolcode 2 [C]
Geology Code 3 [OXC-C Z]
from 10.20m to 10.70m very stiff grey locally dark bluish grey sandy PL 23 LL 61 PI 38 NMC 23 N=31 (3,5,6,7,9,9) 10.20 (1.15)10.80 75.87 Grey LIMESTONE. (Driller's description)
Factual Geolcode [OXC] Factual Geolcode 2 [LMST]
Geology Code 3 [OXC-LMST] SPT(C) 10.90 SPT(C) 11.05 100/85mm (25/60,70,30/ 10) 100/95mm (25/50,65,35/ (0.40)10/06/2019 17:30 10.20 *Dry* 11.20 75.47 20) Type Type Re
DRILLING TECHNIQUE CHISELLING WATER OBSERVATIONS HOLE/CASING DIAMETER WATER ADDED From Rise To To Type Duration Strike At Casing Sealed Hole Dia. Depth Casing Dia. Depth From Volume (Itr) Date/Time 06/06/2019 12:40:00 From 10.80 (mins To 10.90 6.20 9.70 0.00 1.20 11.20 15 5.90 10

PAS 128 Type B survey conducted over position.

SPT Hammer:

Energy Ratio (%): Termination Depth: 11.20m

Encountered Bedrock

THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE

Logged By

Unless otherwise stated: Depth (m), Diameter (mm), Time (hhmm), Thickness (m), Level (mOD). Equipment Used Dando 3000

REFLECTED ON THIS LOG.

Contractor

JΡ

Checked By

69

73



Data

HS₂

Cable Percussive Borehole

Final data

ML081-CP436

Log Ground Level (mAOD) C2-C3-CONT-ASC 87.41

467127.48

ASC Detailed GI Asset Group 226425.59 Calvert Cutting Gro

Chainage (SG Grid) Offset

-110 m

Start Date 24/09/2020 25/09/2020

1:50 Sheet 1 of 2

Scale

SAMPLES TESTS PROGRESS STRATA Install/ Depth (Thickness) Casing & Water Level Water Type + Geol Backfill ы Type + Depth Results Date & Time Description Legend Depth Depth Code² Depth TOPSOIL: Grass over dark brown slightly gravelly sandy clay with occasional rootlets. Sand is fine to medium. Gravel is subangular to rounded fine of limestone and mudstone.

Factual Geolcode [TOP] Factual Geolcode 2 [C]
Geology Code 3 [TOP-C Z]

Firm orange brown and blush grey slightly gravelly slightly sandy locally sandy
CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of limestone, sandstone and mudstone.

Factual Geolcode [RTD] Factual Geolcode 2 [C]
Geology Code 3 [RTD-C Z] (B3) 0.10-0.50 (D1) 0.10 (ES2) 0.20-0.25 PID (1) 0.20 NMC 14 <1ppm (0.50)0.50 86.9 (D4) 0.60 IV(1) 0.60 65(18)kPa HV(2) 0.60 HV(3) 0.60 HV(3) (1) 0.70 (ES5) 0.70-0.75 (B6) 0.80-1.20 NMC 8 PL 18 LL 48 PI 30 NMC 18 <1ppm (D7) 1.20 from 1.20m to 1.70m orange brown and brown clay. UT8 21 blows 100% (UT8) 1.70-2.15 from 1.70m to 3.00m greyish brown mottled orange brown and (2.50)yellowish brown clay rec. from 2.15m to 3.00m rare partially decomposed rootlets (<1mm). from 2.20m to 3.00m locally thinly laminated. (1,2,1,2,3,4) (D10) 2.20-2.65 (D12) 3.00 3.00 Firm to stiff dark grey slightly gravelly sandy CLAY with rare to occasional fossilized shell fragments (2x2mm). Sand is fine. Gravel is subangular to subrounded fine to medium of mudstone. 17:30 1.50 *Dry* 25/09/2020 (UT13) 3.20-3.65 UT13 30 blows 89% Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z] rec. PL 27 LL 67 (D14) 3.65-3.70 PI 40 NMC 25 (D15) 4.00 (B17) 4.20-4.70 (D16) 4.20-4.65 SPT(S) (2.1.2.3.4.4) 4.20 (D18) 5.00 (UT19) 5.20-5.65 UT19 44 blows 100% rec. (D20) 5.65-5.70 (EWMW1 (P1)) 6.00 (EWMW1 (P2)) 6.00 PL 34 LL 67 PI 33 NMC 32 (6.80)(D21) 6.20 (B23) 6.70-7.20 SPT(S) 6.70 N=46 (3,7,11,12,17 (D24) 7.50 SPT(S) 7.70 (B26) 7.70-8.20 N=62 (6,8,9,12,18, 23) (D25) 7.70-8.15 LL 28 PI 15 NMC 22 (D27) 8.50 (6,11,14,19,2 1,23) 8.70 (D28) 8.70-9.15 (D30) 9.50 Stiff dark grey and dark blush grey slightly sandy CLAY with rare fossilized shell fragments (4x4mm). Sand is fine.
Factual Geolcode [OXC] Factual Geolcode 2 [C] (B32) 9.70-10.20 (D31) 9.70-10.15 SPT(S) N=35 PL 21 LL 49 9.80 (6.8.9.8.9.9) Geology Code 3 [OXC-C Z] DRILLING TECHNIQUE CHISELLING WATER OBSERVATIONS HOLE/CASING DIAMETER WATER ADDED From To Type Duration Strike At Rise To Hole Dia. Depth Casing Dia. Depth From Volume (ltr) Casing Sealed From 12.20 (mins To 12.20 9.15 9.50 1.20 12.23 15 8.20 10

1. PAS 128 Type B survey conducted over position

SPT Hammer: Energy Ratio (%): 58 62

12.23m

THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.

Termination Depth: Achieved Scheduled Depth



Rev.C01

ASC C2 & C3 Controlled

Data

HS2

Cable Percussive Borehole

Final data

ML081-CP436

Scale

Log

C2-C3-CONT-ASC

467127.48

Ground Level (mAOD) 87.41 226425.59

ASC Detailed GI Asset Group Calvert Cutting Grou

Offset -110 m

Chainage (SG Grid)

24/09/2020 1:50 25/09/2020 Sheet 2 of 2

SAMPLES TESTS PROGRESS STRATA Install/ Depth (Thickness) Level Type + Depth Water Geol Code1 Backfill ы Results Date & Time Type + Depth Description Leaend Depth Stiff dark grey and dark blush grey slightly sandy CLAY with rare fossilized shell fragments (4x4mm). Sand is fine. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z] × (D33) 10.50 X (UT34) 10.70-11.15 UT34 58 X blows 89% rec. × (D35) 11.15-11.20 from 11.15m to 12.23m locally indistinctly fissured × Х. (D36) 11.50 (B38) 11.70-12.20 (D37) 11.70-12.15 N=36 (6,7,8,9,9,10 SPT(S) 11.70 from 11.70m to 12.20m stiff to very stiff. ×. 100/20mm (25/10,100/2 0mm) SPT(S) 12.20 (D39) 12.20-12.23 25/09/2020 9.50 *Dry* 15:30 12.23 75.18 from 12.20m to 12.23m very stiff. Type Type Re
DRILLING TECHNIQUE CHISELLING WATER OBSERVATIONS HOLE/CASING DIAMETER WATER ADDED From Rise To То Type Duration Strike At Casing Sealed Hole Dia. Depth Casing Dia. Depth From Volume (Itr) To 12.20 From 12.20 (mins 9.15 9.50 0.00 1.20 12.23 15 8.20 10

PAS 128 Type B survey conducted over position.

SPT Hammer:

Energy Ratio (%): 62 12.23m Termination Depth:

58

Achieved Scheduled Depth

REFLECTED ON THIS LOG. Unless otherwise stated:

Equipment Used Dando 3000

THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE

Contractor

Logged By Checked By

Rev.C01

Rotary Borehole Log

Ground Level (mAOD)

FINAL Chainage (SG Grid) ML081-CR008

Scale

ASC C2 & C3 Controlled Data C2-C3-CONT-ASC Client 23/06/2017 1:50 85.29 HS2 Main GI 81164.000 End Date Northing (SankeGrid) Easting (SnakeGrid) Offset (m) 26/06/2017 Sheet 1 of 3 HS2 467427.28 226313.78 Calvert Cutting Gro Strata TCR Progress Water Install/ FΙ ы SCR Results Samples Thic Level Geol Code Casing & Water Backfill RQD Date & Time Description Legend TOPSOIL: Brown sandy clay with occasional rootlets.
Factual Geolocde [TOP] Factual Geolcode 2 [C]
Geology Code 3 [TOP-C Z]
Firm to stiff orange and brown mottled slightly sandy CLAY with rare rootlets. Sand is 0.20 85.09 (D1) 0.20 (LB2) 0.50-0.80 fine to medium.
Factual Geolcode [ALV] Factual Geolcode 2 [C] (0.60)Geology Code 3 [ALV-C Z] PL 21 LL 63 PI 42 NMC 26 (D3) 0.80 0.80 84 49 Soft to firm thinly laminated grey mottled orange brown speckled black slightly sandy CLAY with rare rootlets. Sand is fine to coarse. Factual Geolcode [ALV] Factual Geolcode [2 [C] Geology Code 3 [ALV-C Z] (LB4) 1.00-1.20 (D5) 1 20 U6 13 (U6) 1.20-1.65 blows 100%rec (1.40)-(B9) 1.70-2.20 (D7) 1.70 (D8) 1.70-2.15 SPT(S) N=5 (1,0,1,1,1, 2) LL 68 PI 40 NMC 46 (D10) 2.20 (U11) 2.20-2.65 U11 15 blows 100%rec. 2.20 83.09 Firm indistinctly fissured thinly laminated light grey CLAY with occasional fine to medium gravel sized crystals of selenite. Fissures are extremely closely to closely spaced randomly orientated planar smooth.
Factual Geolcode [OXC] Factual Geolcode 2 [C] (B14) 2.70-3.20 (D12) 2.70 SPT(S) N=13 Geology Code 3 [OXC-C Z] (D13) 2.70-3.15 (2.2.3.3.3)(1.50) 4) (D15) 3.20 (U16) 3.20-3.65 PL 21 LL 55 PI 34 U16 37 blows 100%rec NMC 26 (B19) 3.70-4.20 SPT(S) 3.70 81.59 Firm to stiff thinly laminated dark grey slightly sandy CLAY with abundant shell (D17) 3.70 LL 59 PI 35 N=20 fragments (up to 15mm). Sand is fine to medium. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z] (D18) 3.70-4.15 (3,3,3,5,5, 7) NMC 2 U21 40 (D20) 4.20 (1.00)(U21) 4.20-4.65 blows 100%rec NMC 1 SPT(S) Extremely weak light grey calcareous MUDSTONE with occasional fine to coarse gravel sized crystals of calcite and occasional shells (bivalves) and shell fragments (D22) 4.70 4.70 80.59 (D23) 4.70-5.10 50/50mm (25/25.50 (0.40)(up to 10mm).
Factual Geolcode [KLB] Factual Geolcode 2 [CAMDST] 50mm) 80.19 5.10 Geology Code 3 [OXC-CAMDST]

Very stiff thinly laminated dark grey slightly sandy locally sandy CLAY with some shell fragments (up to 10mm). Sand is fine.

Factual Geolcode [KLB] Factual Geolcode 2 [C]

Geology Code 3 [OXC-C Z] U-NR 70 (B24) 5.20-5.70 blows 0% rec. (U-NR) 5.20-5.65 (B26) 5.70-6.20 (D25) 5.70-6.15 SPT(S) (3,4,6,7,8, 10) (D27) 6.20 (2.90)U28 53 blows 100%rec. (U28) 6.70-7.15 (B31) 7.20-7.70 SPT(S) N=37 (D30) 7.20-7.65 (3,4,4,7,10 PI 23 NMC 17 8.00 + 77.29 Very dense dark grey very clayey fine SAND. Factual Geolcode [KLB] Factual Geolcode 2 [S] (D32) 8.20 (U33) 8.20-8.65 U33 65 Geology Code 3 [KLB-S V SV] at 8.20m 1 No belemnite (6mm x 35mm) 100%rec (B36) 8.70-9.20 SPT(S) at 8.70m with occasional tabular fragments of black organic material (up (D34) 8.70 (D35) 8.70-9.08 50/225mm to 25mm) and 1 No belemnite (5mm x 30mm) (8,15,15,1 6,19,0/0) (2.70)

10.70

From

(D37) 10.00

To

DRILLING TECHNIQUE

Type

Rotary Core

1. PAS 128 Type B survey conducted over position. 2. Where structure is not described, such features were not observed in the available samples. 3. No groundwater

WATER OBSERVATIONS

Strike At Time (mins) Rise To

THIS LOG HAS BEEN REPRODUCED FROM AGS DATA. FOR THE ORIGINAL LOG PLEASE CHECK THE RELEVANT FACTUAL REPORT.

4.20

Date/Time

Casing Water

21/06/2017

Date 118-00

Termination Depth: 25.00m Achieved Scheduled Depth

WATER ADDED

To

Volume (Itr)



PL 18

RESULTS Water

FLUSH DETAILS

From To Rtn% Flush Type

100

Casing Sealed

lole Dia.

From

Depth

4.20 10.70

HOLE/CASING DIAMETER

Depth Casing Dia.

200 150

10.70 25.00

Rev.C01



Rotary Borehole Log

FINAL

Chainage (SG Grid)

ML081-CR008

Project ASC C2 & C3 Client HS2	3 Controlle	ed Dat	Project a C2-C Easting 46742	3-CON g (Snake	NT-A eGrid)	SC	85.29	ıg (Sanke			Main GI Group Cutting Group				nage (S0 64.000 et (m)		23 Er	nd D	3/2017		Scal 1:50 She		i 3
_	TCR					ē	Progre	ess					Str	rata							Depth		Instal
Samples	SCR RQD	FI	PI	Resu	lts	Water	Date & Time	Casing & Water				De	scription						Legend	Geol Code1	(Thick ness)	Level	Backf
(B39) 10.20-10.70 (D38) 10.20-10.57			PI 8 NMC 25 NMC 27		mm 5,1	4.60	22/06/2017 07:30	2.50 Dry	Factu	ual Geolco	rk grey very c ode [KLB] Fac 3 [KLB-S V S	tual Geolco	SAND. ode 2 [S]								-	·	
(C40) 11.02-11.37							22/06/2017 11:30 23/06/2017 07:30	10.70 10.70 2.94 4.60	(up to smoot Factu	o 12mm). oth. ual Geolco	ed locally thin Fissures are ode [KLB] Fac	andomly o	rientated ext	CLAY v	with rare closely	shell fra spaced	agments planar				10.70	74.59	
										from 10.	3 [KLB-C Z] 70m to 11.0 fro 91m to 10.9	m 10.70r	n to 11.37n	n sligh	tly sand	ly. San	d is fine				(1.57)	· · · · · · · · · · · · · · · · ·	
(C41) 12.27-12.61			PL 22 LL 68							from mely wea	om 11.98m 12.00m to 1	2.24m re	covered as	s soft to	o firm (p	robabl di gments	e drilling sturbed (up to	g)/			12.27	73.02	
(C42) 12.84-13.17	TCR: 100 SCR: 55 RQD: 0	NI 20 70	PI 46 NMC 24 PL 23 LL 67 PI 44						plana Factu	ar rough c ual Geolco	ntinuities: 1) ra lean. ode [KLB] Fac 3 [KLB-MDS	tual Geolco		,	closely t	o closel	y spaced	i			(1.32)	-	
(C43)			F144						West	k to medii	ım strong ligh		n abundant)			13.59	71.70	
13.59-14.01	TCR: 100								space muds close fragm	ed thick to stone and ly to medi nents (up	medium bed rare shell fragi ium spaced u	s of extrem gments (up ndulating re	nely weak thi to 5mm). Di ough clean, l	inly lam iscontin locally i	ninated of nuities: 1	ark grey) 0 to 10	/ degree	s II			- - - -	· · -	
(C44) 14.50-15.00	SCR: 97 RQD: 87	NI 170 500								ogy Code	3 [CB-LMST] rom 14.20m				with cla	y (up to	30mm				- - - - -	· -	
									f	from 15.3	30m to 16.15	im set 1)	dis <u>continu</u> it	ties ev	tremely	closely	v to ver	v			-	=	
(C45) 15.65-16.01	TCR: 100 SCR: 95 RQD: 27	NI 20 30								10.11	, om to 10.10	,		100 00			/ space				-	· - ·	
(C46)													1m to 16.2								(5.63)	-	
16.54-16.94																				-		· · · -	
(C47) 17.33-17.82	TCR: 100 SCR: 100 RQD: 70	NI 150																			- - -		
		310					23/06/2017 17:30 26/06/2017	10.70 10.70 16.80		fro	m 18.08m to	o 18.10m	ab <u>undant s</u>	shell fra	agment	s (up to	o 40mm)			- -	· -	
(C48) 18.49-18.91	TCR: 100 SCR: 65 RQD: 57						07:30	16.90														-	
									CLAY	′ .	y thinly lamina	_		tled bro	wnish b	ack glau	uconitic				19.22	66.07	
(C49) 19.50-19.85 (C50)											ode [FMB] Fa 3 [FMB-C Z]	ctual Geolo	ode 2 [C]								(1.22)	-	
20.00-20.33 SAMPLES	TCR SCR RQD	Fracture Inde	ĸ	RESUI	TS	Water	Date Time	Casing Water				п	escription						Legend		Depth (Thickness)	Level	Install/Ba
DRILL	ING TECH	NIQUE		F	LUSI	I DET	AILS				R OBSERVA	TIONS		، المام			NG DIA	_	TER			RADDE	D
From To 0.00 1.20 1.20 10.70 10.70 25.00	Cal	Type rspection ble Percus Rotary Co	ssion	10.70	To 25.00		Flush Type Air/Mist	Date/Ti	inė	Strike At	Time (mins)	Rise To	Casing Sea	aled Ho	200 146	10.70 25.00	200 150	ла.	4.20 10.70	1.20	- 1	.00 Vo	olume (I

1. PAS 128 Type B survey conducted over position. 2. Where structure is not described, such features were not observed in the available samples. 3. No groundwater

THIS LOG HAS BEEN REPRODUCED FROM AGS DATA. FOR THE ORIGINAL LOG PLEASE CHECK THE RELEVANT FACTUAL REPORT.

Termination Depth: 25.00m Achieved Scheduled Depth





Rotary Borehole Log

FINAL

ML081-CR008

IS2			46742			~,	22631	13.78		utting Group		<u>-1</u>	11		26/0	6/2017		She	eet 3 o	f 3
	TCR					-	Progre	ess				Strata	1					Depth		lasta
Samples	SCR RQD	FI	PI	Res	ults	Water	Date & Time	Casing &			Des	scription				Legend	Geol	(Thick ness)	Level	Insta Backt
	RQD							Water	Very stiff locally	thinly lamina			hrownish	hlack dlai	uconitic	Eogona	Code1	11000)		
(C51)									Very stiff locally				Diowillon	bidok gidi	dooriido		-	20.44	64.85	
(C51) 20.44-20.72	TCR: 100 SCR: 33								Factual Geology Geology Code	3 [FMR_C 7]						H	Ц	20.44	. 04.00	
	RQD: 17								Medium strong degrees mediu	to strong gre	y fossilifero	us LIMESTON	E. Disconti	inuities: 1) 0 to 10					
									Factual Geolog	de [WHL] Fa	ctual Geolog	ode 2 [LMST]				\vdash				
									Geology Code from 20.4	3 เพнL-LMS 4m to 20.70	I J m 1 No dis	scontinuity 70	to 80 de	arees un	ndulating		_			
(C52) 21.21-21.65												to stepp	ed rough	clay infi	ill (3mm)	\vdash	Ц			
									froi			ecovered as r fine to coars						1		
	TCR: 100								from 21	.40m to 21.4	5m cavitie	es (up to 25m	m) infilled	with sa	ndy clay	\vdash				
	SCR: 89 RQD: 84																1			
(C53) 22.00-22.48										20 00 4- 0	00 0 N			- 10	h		Ц	_	_	
22.00-22.48									from	22.02m to 2	2.06m 3 N	o calcite pocl	cets (up to	5 10mm	50mm) [
									from 2	2.18m to 22	23m 1 No	discontinuity	45 degre	es curve	ed rough	\vdash				
		NII													clean		_	-		
		NI 240														\vdash	Ц	(4.56)		
		460									fron	n 22.87m to 2	23 08m da	ark arev	and silty					
(C54)	TCR: 100												.0.00 uc	an groy	uu oy	4		-	-	
(C54) 23.09-23.55	SCR: 95																_			
	RQD: 82															\vdash	Ц			
											fron	n 23.55m to 2	23.58m da	ark grey	and silty					
																	Г			
																	1	_	_	
																\vdash	Ц			
	TCD: 100																			
(C55)	TCR: 100 SCR: 94																	_		
24.48-24.55	RQD: 74										fron	n 24.53m to 2	4.70m da	ark grey	and silty		1			
(C56) 24.78-24.96											fuan	- 04 00m to 0	E 00 de		and aller	\vdash	Ц			
							26/06/2017 15:20	10.70 24.52			11011	n 24.88m to 2	:5.00III ua	ark grey	and Silly			25.00	- 60.29	
																		:		
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	TCR SCR RQD					Water SH DET	Date Time	Casing Water		R OBSERVA		escription	но	E/CASI	NG DIAME	Legend	Ι,		Level R ADDE	
From To	NG IECH	Type		From	_		Flush Type	Date/T				Casing Sealed		1	Casing Dia.	Depth	From			olume (
0.00 1.20 1.20 10.70	Ir	nspection F ble Percus	Pit		25.0		Air/Mist			/		- J	200 146	10.70 25.00	200 150	4.20 10.70	1.20		0.00	
10.70	Lai	Rotary Cor	e										140	23.00	130	10.70				
	1			1	1	- 1	1 1					1	1	Ì	1			- 1		

Remarks

1. PAS 128 Type B survey conducted over position. 2. Where structure is not described, such features were not observed in the available samples. 3. No groundwater observed.

THIS LOG HAS BEEN REPRODUCED FROM AGS DATA. FOR THE ORIGINAL LOG PLEASE CHECK THE RELEVANT FACTUAL REPORT.

Termination Depth: 25.00m Achieved Scheduled Depth





Rotary Borehole Log

FINAL

ML081-CR011

Ground Level (mAOD) 85.07 Northing (SankeGrid) 226380.96 Chainage (SG Grid) Start Date Scale 21/06/2017 End Date 1:50 81208.000 Offset (m) HS2 Main GI Asset Group 22/06/2017 Sheet 1 of 3 Calvert Cutting Group 40

S2			46742	25.72			22638	0.96	Calvert C	utting Group			40			22/0	6/2017		She	eet 1 of	f 3
	TCR					Ŀ	Progre	ess				;	Strata						Depth		Inc
Samples	SCR RQD	FI	PI	Resu	ults	Water	Date & Time	Casing & Water			De	scription	1				Legend	Geol Code1	(Thick ness)	Level	Ins Bad
	INQD					_		vvater	TOPSOIL: Dark	c brown clay w							X//XX///	Code1			\vdash
(D1) 0.20									Factual Geolco Geology Code	de [TOP] Fact									(0.20) 0.20	84.87	
(AMAL1)									Soft to firm dark	k brown slightl				el is suba	ngular to		×		(0.30)		
0.40-1.65 LB2) 0.40-0.80			PL 24 LL 61						subrounded fine Factual Geolco	e to coarse of de [ALV] Facti	flint, limes ual Geolco	tone and de 2 [C]	coal.						0.50 -	84.57	
(D3) 0.50			PI 37						Geology Code Firm fissured or	3 [ALV-C Z]			/ Figgur	aa ara 15	doarooo	avtramah.					
(DE) 4.00			NMC 33						closely spaced	planar smooth	٦.	-		es are 45	degrees	extremely					
(D5) 1.00 LB4) 1.00-1.20									Factual Geolco Geology Code		ual Geolo	ode 2 [C]								-	
(U6) 1.20-1.65				U6 ² blov						- []							<u></u>				
				100%	rec.														(1.90)	-	
(B9) 1.70-2.20				SPT	(S)																
(D7) 1.70				N=	8																
(D8) 1.70-2.15				(1,1,2, 2)													<u></u>		-	-	
(D10) 2.20			NMC 36	U11													<u></u>				
U11) 2.20-2.65				blov 100%					Firm to stiff fiss	ured thinly less	inated bl	ioh arav	CLAV F		ro 15 do	*****			2.40	82.67	
									extremely close	ely spaced pla	nar smoot	h.		issures a	11e 45 de	grees				-	
B14) 2.70-3.20 (D12) 2.70			PL 21 LL 62	SPT					Factual Geolco Geology Code	de [OXC] Fac 3 [OXC-C Z]	ual Geolc	ode 2 [C]									
D13) 2.70-3.15			PI 41	(1,2,2,	,2,2,				3, 2220	1							<u></u>				
(D45) 0.55			NMC 22	3)																	
(D15) 3.20 IT16) 3.20-3.65				UT16 blov	vs														(1.80)		
				100%	rec.												<u> </u>			-	
B19) 3.70-4.20			NMC 25	SPT	(S)																
(D17) 3.70			1	N=1	14																
D18) 3.70-4.15				(2,3,3,4)															-	-	
(D20) 4.20				UT21	52				Stiff to very stiff	ficeured think	/ laminate	d dark ar	ev eliaht	tly candy	CL AV wi	h			4.20	80.87	
T21) 4.20-4.65				blov 100%					occasional loca	illy abundant s	hell fragm	ents (up	to 10mr	n). Sand i	is fine. Fi	ssures are	-				
				10070					45 degrees exti Factual Geolco	remely closely de [OXC] Fac	spaced p ual Geolc	lanar smo ode 2 [C]	ooth and	d polished	i.				-	-	
324) 4.70-5.20			PL 33 LL 66	SPT					Geology Code								-				
(D22) 4.70 D23) 4.70-5.15			PI 33	(4,5,6	,6,7,																
(===) = ==			NMC 26	8)															-	-	
(D25) 5.20 JT26) 5.20-5.65				UT26 blov			12/06/2017 17:30	3.20 3.20													
,				100%	rec.		13/06/2017 07:30	Dry Dry												-	
B29) 5.70-6.20				SPT	(S)		07.50	Diy													
(D27) 5.70				N=2	25																
D28) 5.70-6.15				(2,3,3,															-	-	
(D30) 6.20			NMC 24																(4.00)		
																			-	-	
JT31) 6.70-7.15				UT31													-				
				blov 100%																	
																			_	-	
B34) 7.20-7.70 (D32) 7.20			PL 18 LL 46	SPT: 50/285	(S) 5mm				from 7.20m	to 8.20m slig	ghtly sand	dy clay a	and ind	istinctly							
D33) 7.20-7.64			PI 28	(2,3,7, 8,15/	10,1										San	d is fine.	-				
(D35) 7.70				3,10/	50)																
,200) 1.10																	-				
																			-	-	
JT36) 8.20-8.65				UT36					Very dense dar	k arev clavev	fine SANF)							8.20	76.87	
				blows					Factual Geolco	de [KLB] Fact											
									Geology Code	ა [KLB-C Z]									-	-	
B39) 8.70-9.20 (D37) 8.70			NMC 22	SPT 50/145		6.50															
(D37) 8.70 D38) 8.70-9.00				(4,10,	20,3																
				0/70	0)														(3.10)	-	
(D40) 9.20																			(0.10)		
																			-		
342) 9.70-10.20			11.26	QDT.	(8)	7.00															
342) 9.70-10.20 341) 9.70-10.01			LL 26 NMC 32		5mm	7.00															
				(8,12,2 5,4/															-	-	
	TCR SCR RQD			RESU	LTS			Casing Water				escription			= 10 : -		Legend		Depth (Thickness)		Insta
DRILLIN rom To	IG TECH			From	To	Rtn%		Date/T		Time (mins)		Casing	Sealed		E/CASI Depth	NG DIAME Casing Dia.	Depth	From		R ADDE	ED olum
0.00 1.20	1	Type nspection F ble Percus	Pit	12.00			Air/Mist	Date/ I	e Suike At	rime (milis)	11100 10	Jasiily	Sealeu	200 146	10.50	200	3.20	1.20		20 20	aut10
	ı Ca	ble Percus	sion	l	1	1	1							146	25.00	1		5.20	8	20	
1.20 12.00 2.00 25.00		Rotary Cor	e							- 1			l							- 1	

1. PAS 128 Type B survey conducted over position. 2. Where structure is not described, such features were not observed in the available samples. 3. No groundwater observed.

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Equipment Used

Dando 3000

Termination Depth: 25.00m Achieved Scheduled Depth



Rev.C01



Rotary Borehole Log

FINAL

Chainage (SG Grid)

ML081-CR011

oject SC C2 & ient S2	k C3 C	ontrolle	d Data	Project C2-C3 Easting 46742	3-CON g (Snak	NT-A eGrid)	sc	85.07	ıg (Sanke	-		Main Gl Group Cutting Group			Chainage 81208.0 Offset (m) 40	00	21/ End	rt Date 106/201 I Date 106/201			Scale 1:50 She		3
		TCR					_	Progre	ess					Str	ata					T _C	epth		
Sample	es	SCR RQD	FI	PI	Resu	ılts	Water	Date & Time	Casing & Water				De	scription				Lege		eol (Level	In: Ba
(D43) 10.								13/06/2017 18:00 15/06/2017 07:30	10.50 10.50 3.70 7.00	Facti Geol	ual Geolco	rk grey claye ode [KLB] Fa 3 [KLB-C Z]											
(B46) 11.20-11.7 (D44) 11.20-11.6 (D45) 11. (D47) 11.	70 64 .30				SPT(50/290 (6,9,9, 4,16/6	mm 11,1	5.00			extre dusti Facti	mely close ng of fine ual Geolco	ff fissured da ely to closely sand and sill ode [KLB] Fa	spaced pla	nar and und							1.30	73.77	
				-				15/06/2017 00:00 21/06/2017	12.00 12.00 11.98	Very 10mi	stiff fissur	3 [KLB-C Z] ed dark grey es are rando ode [KLB] Fa	mly orientat	ed extremely						1	2.00	73.07	
(C48) 2.35-12.								07:30	5.00	fro	m 13.44r	from to 13.50r	m 13.31m n slightly s		1 No fragm abundant s	nent of pyr hell fragm to	ritic shell ents (up o 10mm)][(1	1.50)		
										local fragn Facti Geol	y widely s nents (up t ual Geolco ogy Code	ey mottled da spaced thin b to 10mm). So ode [KLB] Fa 3 [CB-LMST Om to 14.07	eds of very and is fine to ctual Geoloo]	stiff sandy c coarse. ode 2 [LMST	lay and with	abundant :	shell			1	3.50+	71.57	
	Т	·CR: 100								fi	rom 14.3 rough	9m to 14.40 infilled with)m 1 No di n slightly gi	scontinuity ravelly clay	50 to 60 d . Gravel is med	egrees ur subangula dium of lin	staining ndulating ar fine to nestone.				† 		
(C49) 4.40-14.8	, S	SCR: 83 RQD: 76	NI 240 890							fro	from 15. m 15.32r	12m to 15.40m	13m 1 No o	discontinuit continuities	y 0 to 20 d 10 to 20 d ough infille	rou egrees ur rou egrees ur d with cla	gh clean ndulating gh clean ndulating y (3mm)			(2	2.18)		
										Stiff to	issured da omly orien ual Geolco	54m to 15.8 ark grey CLA stated extremode [KLB] Fa 3 [CB-C Z]	Y with rare	shell fragme	nts (up to 16	rou	gh clean				1		
		CR: 100 SCR: 53 RQD: 41		_						extre undu Facti	mely weal lating rougual Geoloco ogy Code	to strong gr k mudstone. gh clean. ode [KLB] Fa 3 [CB-SLST n 16.37m to	Discontinui ctual Geolo]	ties: 1) 0 to 1	10 degrees o	closely spa	ced				5.68	69.39	
		-	NI 100 180							16mi Facti	stiff locallyn).	y thinly lamin ode [KLB] Fa 3 [FMB-C Z]	ated dark g	rey CLAY wi		•	10mm)	××× ××× ××× ×××	× × × × × ×	((6.21 0.51)	68.86	
(C50) 6.82-17.	.14 T	CR: 100 SCR: 51								Medi Facti Geol	um strong ual Geolco ogy Code	to strong lig ode [CB] Fac 3 [FMB-LMS m 1 No disc	ht grey foss tual Geolco [T]	de 2 [LMST]	rees undula	ating roug					0.64)	68.35	
		RQD: 37	NI	_						f	rom 17.8	73m to 17.7 31m to 18.0 1 1 No disco	5m rare m	edium to co	hell fragme Sand parse grave	nts (up to is fine to el sized po	10mm). medium ockets of silt			1	7.36	67.71	
			190 510					21/06/2017 17:30 22/06/2017 07:30	12.00 12.00 15.71 Dry	Very fragn Facti	stiff locally nents (up	h slightly sa y thinly lamin to 10mm). So ode [FMB] Fa	andy clay v ated dark g and is fine to	vith some s from rey slightly s o medium.	hell fragme 18.23m to	ents (up to 18.27m g	o 10mm) grey clay			(1	1.20)		
(C51) 8.84-19.2	. S	CR: 100 SCR: 33 RQD: 19								Medi Facti Geol	um strong ual Geolco ogy Code	3 [FMB-C Z] to strong grode [FMB] Fa 3 [FMB-LMS	ey fossilifero ictual Geolo ST]	ode 2 [LMS ⁻ from	T] 19.47m to						8.56 0.91)	66.51	
											from ghtly san	20.04m to dy clay with edium. Gra	20.17m da some she	rk grey thir	c nly laminate ts (up to 10 ubrounded	urved rou ed slightly mm). Sar fine to me	gh clean gravelly nd is fine edium of			1	9.47	65.60	
SAMPLES	S TO	CR SCR RQD	NI 30 130		RESUI	LTS	Water	Date Time	Casing Water	degre	ees closel	um strong cre y to medium ode [WHL] Fa 3 [WHL-LMS	spaced, loc actual Geolo ST]	ally widely s	E. Discontinu		to 10	Leger	nd		0.70)	64.90 Level	Ins
DF	RILLING	TECHI	NIQUE		F	LUSI	I DET	AILS				R OBSERV	ATIONS			LE/CASI	1	/ETER			_	ADDE	D
om .00	To 1.20	In	Type spection P	Pit	From 12.00	To 25.00		Flush Type Air/Mist	Date/T	ime	Strike At	Time (mins)	Rise To	Casing Sea	aled Hole Di 200	a. Depth 10.50	Casing Dia	a. Depth		om .20	5.2		lun
.20	12.00 25.00	Cab	le Percuss Rotary Core	sion	1.2.00	20.00		, w., what							146	25.00		5.20	5	.20	8.2	0	

THIS LOG HAS BEEN REPRODUCED FROM AGS DATA. FOR THE ORIGINAL LOG PLEASE CHECK THE RELEVANT FACTUAL REPORT.

Termination Depth: 25.00m Achieved Scheduled Depth

Checked By



^{1.} PAS 128 Type B survey conducted over position. 2. Where structure is not described, such features were not observed in the available samples. 3. No groundwater observed.



Rotary Borehole Log

FINAL

ML081-CR011

 Project
 Project No.
 Ground Level (mAOD)
 GI Phase
 Chainage (SG Grid)
 Start Date
 Scale

 ASC C2 & C3 Controlled Data Client
 C2-C3-CONT-ASC Easting (SnakeGrid)
 85.07 Northing (SankeGrid)
 HS2 Main GI Asset Group
 81208.000 Offset (m)
 21/06/2017 End Date
 1:50

 HS2
 467425.72
 226380.96
 Calvert Cutting Group
 40
 22/06/2017
 Sheet 3 of 3

Col.	IS2			46742	2 <u>5</u> .72		- ,	22638	30.96	Calvert (Cutting Group		4	0		22/0	6/2017		She	et 3 of	f 3
Semploys SCR File Till Results Semploys Data 5 to Clott 4, Am Clott		TCR						Progre	ess				Strata	1					Depth		Ī
Control Cont	Samples	SCR	FI	PI	Res	ults	Vate	Data & Time	Casing &			Do	porintion				Logond	Geol	(Thick	Level	Install Backfi
TCR 100		RQD					>	Date & Time	Water								Legend	Code1	ness)		200
TCS: 100										Weak to medit degrees closel	ım strong crea y to medium s	am to grey L spaced, loca	IMESTONE. D	discontinuit ded undula	ies: 1) 0 t ing rough	o 10 i clean.					
ROD_ 56 ROD_ 57 ROD_ 50 ROD_		TCR: 100		-						Factual Geolog	ode [WHL] Fa	ctual Geolco	ode 2 [LMST]			Г			-	-	100
COS TOR: 101 Section Sectio		RQD: 56								from 20.50	m to 21.00m	frequent i	medium to co	arse grav	el sized	pockets					
2.1.00.21 55										f 00	70 4 00	00 4 N		70 +- 00	of s	siltstone					
TCR: 100 SCR 90	(C52)									lion 20)./ 3III to 20.	52111 I INO	rouah v	าบ เอ อบ เ vith black	surface	stainina	\vdash		-	-	
TOR: 100 SCR 99 100 10	21.00-21.33																				
TOR. 100 SCR. 80 ROD. 79 TOR. 100 SCR. 80 ROD. 21 TOR. 21										from 21.35	m to 21.51m	very stiff	slightly sandy	clay with	shell fra	agments	\Box				
SCR 160 From 22 16m to 22 25m 1 No calcular vein (5mm to 4 mm) From 22 35m very dark grey From 22 35m to 22 35m very dark grey From 22 35m to 22 35m very dark grey From 22 35m to 22 35m very dark grey From 22 35m to 22 35m very dark grey From 22 35m to 22 35m very dark grey From 22 35m to 22 35m very dark grey From 24 45m to 24 45m 1 No discontinuity (0 to 30 degrees undulating stepped rough clean From 24 44m to 24 45m 1 No discontinuity (0 to 30 degrees undulating stepped rough clean From 24 44m to 24 45m 1 No discontinuity (0 to 30 degrees undulating stepped rough clean From 24 44m to 24 45m 1 No discontinuity (0 to 30 degrees undulating stepped rough clean From 24 44m to 24 45m 1 No discontinuity (0 to 30 degrees undulating stepped rough clean From 24 44m to 24 45m 1 No discontinuity (0 to 30 degrees undulating stepped rough clean From 24 44m to 24 45m 1 No discontinuity (0 to 30 degrees undulating stepped rough clean From 25 45m 1 No discontinuity (0 to 30 degrees undulating stepped rough clean From 25 45m 1 No discontinuity (0 to 30 degrees undulating stepped rough clean From 25 45m 1 No discontinuity (0 to 30 degrees undulating stepped rough clean From 25 45m 1 No discontinuity (0 to 30 degrees undulating stepped rough clean From 25 45m 1 No discontinuity (0 to 30 degrees undulating stepped rough clean From 25 45m 1 No discontinuity (0 to 30 degrees undulating stepped rough clean From 25 45m 1 No discontinuity (0 to 30 degrees undulating stepped rough clean From 25 45m 1 No discontinuity (0 to 30 degrees undulating stepped rough clean From 25 45m 1 No discontinuity (0 to 30 degrees undulating stepped rough clean From 25 45m 1 No discontinuity (0 to 30 degrees undulating stepped rough clean From 25 45m 1 No discontinuity (0 to 30 degrees undulating stepped rough clean From 25 45m 1 No discontinuity (0 to 30 degrees undulating stepped rough clean From 25 45m 1 No discontinuity (0 to 30 degrees undulating stepped rough clean From 25 45m 1 No discont		TCD: 100										•							-	-	
Column C		SCR: 89																			
(CS3) (CS3) (CS4) (CS5) (CS5) (CS6) (CS7)		RQD: 79																			
(C.S.3) (C.S.1) (C.S.1																			-		
C(S4) C(S5) C(S6) C(S6											from 22	2.16m to 2	2. <u>25m 1 No c</u>	alcite vei	n (3mm t	to 4mm) _					
C(S4) C(S5) C(S6) C(S6																			-	-	
251-0.33 TOR- 100 SOUTH STATE OF THE STATE O													from 22.58m	to 22.85	n very da	ark grey			(4.83)		
TCR: 10 SCR 10 S	()		210 830																		
TCR: 100 Single 98 22.47.24.00 TCR: 100 Single 98 22.0662017 17.30 17.	(C53) 22.91-23.30		000																	-	
ACD: 90 ACD:																					
### TOR: 100 SCR. 23 **ROD. 21 **TOR: 100 SCR. 23		RQD: 90																			
TOR: 100	(C54)																		-	-	
TCR: 100 SCR: 23 ROD: 21	23.47-24.00																				
TOR. 100 SCR. 23 ROD. 21 RESILTS Water Date Time Comp Water WATER OBSERVATIONS ROD. 24 ROD. 25 ROD. 25 ROD. 25 ROD. 26 ROD. 26 ROD. 26 ROD. 27																					
TOR. 100 SCR. 23 ROD. 21 RESILTS Water Date Time Comp Water WATER OBSERVATIONS ROD. 24 ROD. 25 ROD. 25 ROD. 25 ROD. 26 ROD. 26 ROD. 26 ROD. 27												fro	m 24.00m to	25.00m v	ery foss	iliferous			-	-	
SCR. 23 RQD, 21																					
## RQD 21		TCR: 100								from 24.37	m to 24.43m	randomly	orientated ca	lcite vein	s (2mm t	to 6mm)					
SAMPLES 700 503 R03 National RESULTS Water Data Time Data Time Description HOLE/CASING DIAMETER WATER ADD		SCR: 23 RQD: 21								from 24.4	4m to 24.45	m 1 No dis	scontinuity 10	to 30 de	grees un	dulating			-	-	
17.30 17.00														step	ped roug	gh clean					
17.30 17.00								22/06/2017	12.00										25.00	60.07	
DRILLING TECHNIQUE FLUSH DETAILS WATER OBSERVATIONS HOLE/CASING DIAMETER WATER ADD From To Type From To Rtn% Flush Type Date/Time Strike At Time (mins) Rise To Casing Sealed Hole Dia. Depth Casing Dia Depth Casing Dia Depth From To Variable Time (mins) Time								17:30	17.00										25.00	00.07	
DRILLING TECHNIQUE FLUSH DETAILS WATER OBSERVATIONS HOLE/CASING DIAMETER WATER ADD From To Type From To Rtn% Flush Type Date/Time Strike At Time (mins) Rise To Casing Sealed Hole Dia. Depth Casing Dia. Depth From To V 0.00 1.20 Inspection Pit L20 12.00 25.00 100 Air/Mist Air/Mist WATER OBSERVATIONS HOLE/CASING DIAMETER WATER ADD 0.00 1.20 Casing Sealed Hole Dia. Depth Casing Dia. Depth From To V 1.20 1.200 Cable Percussion 12.00 25.00 10.00 Air/Mist 8.20 20.00 1.050 200 3.20 1.20 5.20 8.20																					
DRILLING TECHNIQUE FLUSH DETAILS WATER OBSERVATIONS HOLE/CASING DIAMETER WATER ADD From To Type From To Rtn/s Flush Type Date/Time Strike At Time (mins) Rise To Casing Sealed Hole Dia. Depth Casing Dia Depth From To V 0.00 1.20 Inspection Pit 12.00 25.00 10.50 200 3.20 12.0 5.20 8.20 1.20 1.20 Casing Dia Depth Casing Dia Depth From To V	SAMPLES	TCR SCR ROD	Fracture Index		RESI	JLTS	Water	Date Time	Casing Water			De	escription				Legend		Depth (Thickness)	Level	Install/Ra
0.00 1.20 Inspection Pit 12.00 25.00 100 Air/Mist 200 10.50 200 3.20 1.20 5.20 1.20 12.00 Cable Percussion 146 25.00 5.20 8.20	DRILLI			•		FLUS	SH DET	AILS		WATER		TIONS					TER		WATE	RADDE	D
1.20 12.00 Cable Percussion		1.		Dit					Date/T	ime Strike At	Time (mins)	Rise To	Casing Sealed								olume (It
	1.20 12.00	Cal	ble Percus	sion	12.00	≥5.0	100	All/MISE						146	25.00	200	3.20	5.20	8.	20	

Remark

1. PAS 128 Type B survey conducted over position. 2. Where structure is not described, such features were not observed in the available samples. 3. No groundwater observed.

THIS LOG HAS BEEN REPRODUCED FROM AGS DATA. FOR THE ORIGINAL LOG PLEASE CHECK THE RELEVANT FACTUAL REPORT.

Termination Depth: 25.00m Achieved Scheduled Depth



JC



Rotary Borehole Log

FINAL-MON

ML081-CR402

Ground Level (mAOD) 85.40 Northing (SankeGrid) 226322.27

GI Phase
ASC Scheme GI
Asset Group
Calvert Cutting Group

Chainage (SG Grid) 81146.000 Offset (m) 15

Start Date 23/04/2019 End Date 25/06/2019

Sheet 1 of 3

Scale

1:50

S2			46745	7.84			22632	22.27	Calvert Cutting Group		15	5	25/	06/2019		She	et 1 of	: 3
	TCR					e	Progre	ess			Strata					Depth		Inst
Samples	SCR RQD	FI	PI	Resu	lts	Water	Date & Time	Casing & Water		Des	scription			Legend	Geol Code1	(Thick ness)	Level	Bac
(B2) 0.00-0.40									TOPSOIL: Grass over br			velly clay. Sa	nd is fine. Grave		3			
(D1) 0.10-0.20									is subangular to subroun Factual Geolcode [TOP]							(0.40)		
(D3) 0.40-0.50			PL 25						Geology Code 3 [TOP-C Firm orangish brown slig		AV Crovel is s	ubangular ta	rounded fine to			0.40	85.00	
(B4) 0.50-1.00			LL 62 PI 37						medium of flint.			abangulai to	Tourided line to			1		
			NMC 33						Factual Geolcode [ALV] I Geology Code 3 [ALV-C	Factual Geolcod Z]	ie 2 [C]				-			
															1		-	
(D5) 1.30-1.40																		
															-	(2.20)		
JT6) 1.70-2.15				UT6														
				blow 100%r												I		
(D7) 2.15-2.20														·		1	-	
(B9) 2.20-2.70			PL 27 LL 57	SPT(
(D8) 2.20-2.65			PI 30 NMC 32	(1,1,1,	2,1,										-			
JT10) 2.70-3.15			INIVIC 32	2) UT10					Firm thinly laminated gre	y CLAY.					-	2.60	82.80	
3110) 2.70-3.13				blow	'S				Factual Geolcode [ALV] I Geology Code 3 [ALV-C		de 2 [C]					-		
				100%r	ec.				ocology code o [/ LEV-O	-]					-		-	
D11) 3.15-3.20									from 3.15m to 3.70m	n with occasion	nal fine to me	edium sand	sized selenite	+		(1.10)		
D12) 3.40-3.50													crystals	¬F =				
,														 				
B14) 3.70-4.20 D13) 3.70-4.15				SPT(Stiff thinly laminated grey	/ CLAY with occ	asional to abur	ndant fossilis	ed shell	+		3.70	81.70	
D13) 3.70-4.13				(1,2,3,	3,5,				fragments (<10mm x 10r Factual Geolcode [OXC]	nm). Factual Geolco	de 2 [C]				-	+		
				9)					Geology Code 3 [OXC-C		[]			<u> </u>	-	1		
D15) 4.40-4.50			PL 28 LL 63											<u> </u>	-	1		
JT16) 4.70-5.15			PI 35 NMC 28	UT16	55									<u> </u>				
,			14100 20	blow 100%r										<u> </u>				
				100701	CO.									F_=_		-	-	
D17) 5.15-5.20							23/04/2019									1		
							17:30 24/04/2019	Dry						L	-	1		
							08:00	Dry								1		
D18) 5.70-5.80														<u> </u>	-			
																(4.45)	-	
B20) 6.20-6.70				SPT(S)													
D19) 6.20-6.65				N=2 (2,3,4,	2									<u> </u>				
				7)										<u> </u>		+		
															-	I		
D21) 7.00-7.10			PL 19 LL 45														-	
			PI 26 NMC 16											<u></u>	-			
			INIVIC 10											<u> </u>		1		
JT22) 7.70-8.15				UT22 -	100											l		
3122) 7.70-0.13				blow	s									<u> </u>	-	+		
				100%r	ec.									<u> </u>		-	-	
D23) 8.15-8.20 B25) 8.20-8.70				SPT(s) 🔁	10			Very dense grey slightly	clayey fine SAN	ID with occasio	nal fossilised	shell fragments	77.		8.15	77.25	
D24) 8.20-8.65				N=10 (5,8,13					(<10mm x 10mm). Factual Geolcode [KLB]	Factual Geolcoo	de 2 [S]				:	‡		
				30,37	7)				Geology Code 3 [KLB-S	V SV]					:	(0.99)		
(D26) 8.70-9.14				SPT(100/29		.60									-	(0.58)		
				m													_	
				(7,11,1 5,31,29			21/06/2019		Assumed Zone of Core L	nee Grey dove	ev SAND (Drill	er's descripti	on)			9.14	76.26	
)			07:30 24/04/2019		Factual Geolcode [KLB]	Factual Geolcoo		or a describili	л <i>.</i> ј.		:	(0.33)		
			-				17:30		Geology Code 3 [BLANK Grey and light greenish of	א-NCKJ grey silty fine SA	AND. Locally w	ith occasions	ıl medium to	× ×		9.47	75.93	
									coarse gravel sized fragr lithorelicts.					_× × ×				
									Factual Geolcode [KLB]	Factual Geolcoo	de 2 [S]			×××	:	(1.03)		
									Geology Code 3 [KLB-S	-				××^		-	-	
	TCR SCR RQD		<u> </u>		TS W			Casing Water	WATER OBSER		escription	HOLE/	CASING DIAN	Legend METER	1 ,	WATER	Level R ADDE	
rom To		Туре		From	То	Rtn%	Flush Type	Date/Ti	me Strike At Time (mir	ns) Rise To (Casing Sealed	Hole Dia.	Depth Casing Dia	a. Depth	From	_		olume
		onestion C	it	9.14	20.00	100	Air/Mist 2	24/04/2019 (8:50:00 8.20 5 10	8.10	2.00	200	2.00 200	2.00 8.70				_
0.00 1.20 1.20 9.14 9.14 20.00	Ir Cal	nspection P ble Percuss Rotary Core	sion				'		15	8.10 8.10		150 146	9.14 150 20.00	0.70			, ,	

1. PAS 128 Type B survey conducted over position.

THIS LOG HAS BEEN REPRODUCED FROM AGS DATA. FOR THE ORIGINAL LOG PLEASE CHECK THE RELEVANT FACTUAL REPORT.

Termination Depth: 20.00m
Achieved Scheduled Depth.



Insulated Hand Tools



Rotary Borehole Log

FINAL-MON

ML081-CR402

Ground Level (mAOD) 85.40 Northing (SankeGrid) 226322.27

GI Phase
ASC Scheme GI
Asset Group
Calvert Cutting Group

Chainage (SG Grid) 81146.000 Offset (m) 15

Start Date 23/04/2019 End Date 25/06/2019

Sheet 2 of 3

Scale

1:50

S2			46745	7.84		2263	22.27	Calvert Cutting Group	15	25/06/	/2019		She	et 2 of	<u>3</u>
	TCR				_	Progr	ess		Strata				Depth		la et
Samples	SCR	FI	PI	Resu	Water stl	Date & Time	Casing &	Dα	escription		Legend	Geol	(Thick ness)	Level	Ins
	RQD						Water		'		Legena	Code1	iless)		
						24/06/2019 16:00		Grey and light greenish grey silty fine S coarse gravel sized fragments of extrer			×××		. 1		
						25/06/2019	5.40	lithorelicts.		H;	××		I		
21) 10.59-10.85			PL 17			07:30	9.70	Factual Geolcode [KLB] Factual Geolco Geology Code 3 [KLB-S V SV]	ode 2 [S]	#			10.50	74.90	
,			LL 30					\	from 10.40m to 10.50m c	layey			, †	l	
			PI 13 NMC 16					Very stiff thinly laminated dark grey CL/ (<20mm x 35mm) of light brown fine sa		II-			. I	l	
								Factual Geolcode [KLB] Factual Geolco			= = 1		(1.00)		
								Geology Code 3 [KLB-C Z] at 10.60	0m 1 No. pyrite nodule (10mm x 10	0mm)			. I	l	
									ossilised shell fragment (2mm x 10r				. Į	l	
								Extremely weak thinly laminated dark g		5mm)			11.50	73.90	
								lenses (20mm x 20mm x 50mm) of pyri	itised sand and pyrite nodules. Laminat	itions			. +	l	
								are extremely closely spaced locally rain Factual Geolcode [KLB] Factual Geolco					. I	l	
								Geology Code 3 [KLB-MDST]					(1.22)		
								from 12.68m to 12.74m v	with abundant fossilised shell fragn				(1.22)	l	
2) 12.36-12.66	TCR: 92							Weak to medium strong medium bedde	<10mm x 20 (<10mm x 20) ed light grev fossiliferous argillaceous lo				, ‡	l	
	SCR: 76 RQD: 76							peloidal LIMESTONE with medium spa	aced very thin and thin beds of dark gre	ey ' \ ⊟			. ‡	l	
	KQD. 70							mudstone and clay. Occasional fossilise frequent burrows (<15mm x 30mm x 50			==		12.72	72.68	
								Discontinuities: 1) 15 - 25 degrees med	lium to widely spaced undulating rough	n and	 		. ‡	l	
								tight. Factual Geolcode [CB] Factual Geolcode	de 2 [LMST]				. 🛨		
								Geology Code 3 [CB-LMST]		<u>_</u> _	\perp			l	
									scontinuity 80 degrees undulating r lcite and occasional vugs (1mm x 3				, ‡		
		320 580						from 13.33m to 13.34m 1	No. thin lens of stiff dark grey clay	y with _	\sqcap		(1.76)		
		820						abundant fossilised shell fr	ragments (1mm x 2mm) and occas		++++		(1.76)	l	
								from 13 68m to 13 77m	fossilised shells (15mm x 15 n extremely weak dark grey fossilife				. ‡	l	
3) 14.00-14.31									arenaceous muds	Istone	+		. +		
									m to 14.00m assumed zone of core		++++		.]	l	
								Medium strong to strong thinly and med with closely to medium spaced very thin					. ‡	l	
								Discontinuities: 1) 5 - 10 degrees media		ugh.	7		14.48_	70.92	
								Factual Geolcode [FMB] Factual Geolco Geology Code 3 [FMB-LMST]	ode 2 [LINS1]	<u> </u>			. ‡	l	
		140						at 14.48m 1 No. discontinui	ity 5 degrees undulating rough and		\Box		<u>.</u>	l	
		230 600							eak thin laminae of dark grey muds essilised shell fragments (<1mm x 2		┯┷┯┩		(0.92)	-	
		000							scontinuity 90 degrees planar and r				. ‡	l	
	TCR: 97							from 14.50m to 14.61m weak	k brownish grey fine grained calcar	reous	\perp		15.40	70.00	
24) 15.50-15.70	SCR: 97								n fragments (<5mm x 10mm x 20m calcareous worm tubes (10mm x 20				15.40	70.00	
	RQD: 97								scontinuity 20 degrees undulating r				(0.60)	l	
								\	and	d tight			(0.00)	l	
								Extremely weak dark grey MUDSTONE Factual Geolcode [FMB] Factual Geolcode		F			16.00	- 69.40	
								Geology Code 3 [FMB-MDST]					. t	l	
									renaceous with frequent fossilised shell impressions. Occasional fragn				. I	l	
								liaginents (<2min x omin) and s	sileli impressions. Occasional iragii (<5mm x 10mm) of black li		 		. ‡		
		260						at 15.81m 1 No. discontinuity 0 o	degrees planar smooth with clay fil				. +	l	
		493 780						from 15 00m to 15 00m 1 No 11		urface	\perp		(1.48)	l	
		760						110111 15.66111 to 15.93111 1 No. V	ery thin bed of medium strong grey grained sands					-	
								Weak to medium strong thinly to mediu	ım bedded locally cross bedded light gr	rey fine	+		. +	l	
								grained locally fossiliferous argillaceous thinly bedded dark grey fossiliferous mu	s LIMESTONE with very weak closely sudstone and siltstone. Discontinuities:	spaced 1 1) 0 - 5	++++		, ‡	l	
								degrees medium to widely spaced undu					17 48	67.92	
5) 17.55-17.90								black clay film on surfaces. Factual Geolcode [FMB] Factual Geolco	ode 2 [I MST]	I-	+		+	07.02	
								Geology Code 3 [FMB-LMST]					(0.45)	l	
									 16.17m extremely weak grey silts 16.44m extremely weak grey silts 				17.93	67.47	
									nely weak grey siltstone with occas		+		. Ţ	•	
		160 230							fossilised shells (<20mm x 20	0mm)	++++		(0.69)	l	
	TCR: 95	260							ak grey fine grained limestone with				(/	l	
	SCR: 85 RQD: 85								brown lignite fragments (<2mm x 3 m to 17.00m assumed zone of core				18.62	66.78	
	NQD. 00							from 17.19m to 17.30	m weak dark grey fossiliferous silts	tstone			ŧ	00.70	
								from 17.39m to 17.48m very wea	ak dark grey arenaceous mudstone s and shell fragments (<20mm x 35	e with			(0.38)		
6) 19.12-19.32			1					Strong brownish grey and light greenish					19.00	66.40	
0) 19.12-19.32								Factual Geolcode [FMB] Factual Geolc		· []			(0.45)		
								Geology Code 3 [FMB-LMST] Medium strong to strong medium bedde	ed dark grey and light grev fine grainer	┰┦┋			1	65.05	
								argillaceous LIMESTONE with weak thi	inly laminated light greenish grey siltsto	one.			19.45 (0.28)	65.95	
			1					Discontinuities: 1) 0 - 20 degrees close smooth open infilled with clay.	ıy το medium spaced undulating and pl				19.73	65.67	
								Factual Geolcode [FMB] Factual Geolc	ode 2 [LMST]	>	× × × × × × × × × × × × × × × × × × ×		(0.27)		
			-			25/06/2019		Geology Code 3 [FMB-LMST]	ith occasional fossilised shell fragn		20000		20.00	65.40	F
04401=0	TOD 05= -:			DES	TO	17:30	1			HEHRS		$\sqcup \sqcup$		1 *	<u> </u>
SAMPLES DRILLIN	TCR SCR RQD VG TECH				TS Wate		Casing Water	WATER OBSERVATIONS	Description HOLE/CASING	 DIAMET	Legend TER		NATEF	Level R ADDE	Inst
rom To	1 2011	Type		From		1% Flush Type	Date/T				Depth	From	T		olum
	1		Nia .	9.14		00 Air/Mist	24/04/2019	08:50:00 8:20 5 8:10	2.00 200 2.00	200	2.00		+	-	
	Ir	nspection F	'IL	9.14	20.00										
	Ir Cal	nspection F ble Percuss Rotary Core	sion e	9.14	20.00			10 8.10 15 8.10	150 9.14 146 20.00	150	8.70				

1. PAS 128 Type B survey conducted over position.

THIS LOG HAS BEEN REPRODUCED FROM AGS DATA. FOR THE ORIGINAL LOG PLEASE CHECK THE RELEVANT FACTUAL REPORT.

Termination Depth: 20.00m
Achieved Scheduled Depth.



Rotary Borehole Log

FINAL-MON

ML081-CR402

 Project
 Project No.

 ASC C2 & C3 Controlled Data
 C2-C3-CONT-ASC Easting (SnakeGrid)

 HS2
 467457.84

Ground Level (mAOD) 85.40 Northing (SankeGrid) 226322.27

ASC Scheme GI Asset Group

Chainage (SG Grid) 81146.000 Offset (m)

Start Date 23/04/2019 End Date 25/06/2019

Sheet 3 of 3

Scale

1:50

		4	46745	7.84			22632	22.27	Calvert Cutting Group	15	25/00	5/2019		She	et 3 of	13
	TCR					-e	Progr	ess		Strata				Depth		Inet
Samples		FI	PI	Resu	Its	Mat Da	ate & Time	Casing & Water	De	escription		Legend	Geol Code1	(Thick ness)	Level	
Samples	TCR SCR RQD		PI PI	Resu	itts	Water Water	Progr	ess	Medium strong to strong medium bedd argillaceous LIMESTONE with weak th Discontinuities: 1) 0 - 20 degrees close smooth open infilled with clay. Factual Geolcode [FMB] Factual Geolcode (FMB] Factual Geolcode WHL] Factual Geolcode [WHL] Factual Geolcode	Strata ascription led dark grey and light grey fine inly laminated light greenish grey to medium spaced undulatin code 2 [LMST] with occasional fossilised she (<20r from 18.20m to 18.23m ficasional black lignite fragme weak light greenish grey thin E with frequent randomly orient code 2 [MDST] titled orangish brown MUDSTOI code 2 [MDST] 12m to 19.40m orangish browned 2 [C] TSTONE. Bioturbated with frequent green clay and dark browned 2 [SLST] scontinuity 60 degrees undulated in the process of the continuity 60 degrees undulated in th	e grained ey siltstone. go and planar all fragments mm x 30mm) irm grey clay ents (<10mm x 15mm) yl aminated siltstone tated indistinct NE. own mottling quent burrows lignite (10mm		Geol Code1	Depth (Thick	Level	Inst
															-	
															-	
														- - - - - - - - - -	-	
															-	
	TCR SCR RQD Fr					ater D		Casing Water	WATER OBSERVATIONS	Description HOLE/C	CASING DIAME	Legend TER	\		Level	
		Туре	İ	From		Rtn% Flu		Date/T			epth Casing Dia.	Depth	From			olume
From To		21 T			- 1'	. "	.,,,,		08:50:00 8.20 5 8.10			F 1				

1. PAS 128 Type B survey conducted over position.

THIS LOG HAS BEEN REPRODUCED FROM AGS DATA. FOR THE ORIGINAL LOG PLEASE CHECK THE RELEVANT FACTUAL REPORT.

Termination Depth: 20.00m Achieved Scheduled Depth.

Checked By



Start Date

Rev.C01



Data

HS₂

Cable Percussive Borehole Log

Final data

ML081-CR440

ASC C2 & C3 Controlled

C2-C3-CONT-ASC

467453.95

Ground Level (mAOD) 85.97 226359.76

ASC Detailed GI Asset Group Calvert Cutting Grou

Offset 42 m

Chainage (SG Grid)

28/10/2020 30/10/2020 1:50 Sheet 1 of 2

Scale

SAMPLES TESTS PROGRESS STRATA Install/ Depth (Thickness) Casing & Water Level Water Type + Geol Backfill Type + Depth ы Results Date & Time Description Legend Depth Depth Code² Depth TOPSOIL: Grass over dark brown slightly sandy slightly gravelly clay with occasional roots (<5mm). Sand is fine to medium. Gravel is subangular to rounded fine to medium of chert and mudstone. Factual Geolcode [TOP] Factual Geolcode 2 [C] Geology Code 3 [TOP-C Z] Firm brown locally mottled light brown slightly sandy slightly gravelly CLAY with rare roots (<5mm). Sand is fine to medium. Gravel is subangular fine to coarse of mudstone. (B3) 0.10-0.40 PID (1) 0.10 <1ppm (ES2) 0.10 0.45 85.52 (B6) 0.50-0.80 PID (1) <1ppm PL 18 LL 38 PI 20 NMC 15 NMC 23 (D4) 0.50 (ES5) 0.50 0.50 PID (2) <1ppm 60(15)kPa (0.40)rare roots (<\mathref{mini}. \text{ Senior 10.}
of mudstone.

Factual Geolcode [OXC] Factual Geolcode 2 [Z]
Geology Code 3 [OXC-C Z]

Firm to stiff light grey mottled orangish brown slightly sandy CLAY. Sand is fine 68(25)kPa 77(28)kPa 0.50 HV(1) 0.60 0.85 85.12 (B8) 0.90-1.20 (D7) 0.90 HV(2) 0.60 NMC 23 NMC 27 (0.40)HV(3) 0.60 1.25 84.72 (B10) 1.30-1.70 PL 24 to coarse.

Factual Geolcode [OXC] Factual Geolcode 2 [C]
Geology Code 3 [OXC-C Z]

Soft to firm orangish brown CLAY with rare lenses of light brown fine sand. LL 60 PI 36 NMC 35 (0.75)Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z] (U11) 1.70-2.15 U11 50 blows 100% rec. 2.00 83.97 Firm brownish grey and brown slightly sandy CLAY with occasional partially decomposed rootlets and rare yellowish brown limestone nodules. Sand is fine. Factual Geolcode [OXC] Factual Geolcode 2 [C] PL 25 PL 29 LL 57 (B14) 2.20-2.70 (2,3,3,3,3,4) (D12) 2.20 (D13) 2.20-2.65 Geology Code 3 [OXC-C Z] (0.80)LL 59 PI 30 PI 32 NMC 1 NMC 38 2.80 83.17 Stiff thinly laminated dark grey slightly sandy CLAY. Sand is fine. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z] (B16) 2.90-3.20 (D15) 2.90 (U17) 3.20-3.65 U17 75 from 3.20m to 3.70m rare fossilised shell fragments (<5mm). blows 100% rec. PL 23 LL 53 PI 30 (D18) 3.70 (D19) 4.00 NMC 25 PL 20 LL 53 (B21) 4.20-4.70 SPT(S) (D20) 4.20-4.65 4.20 (3.5.5.7.7.10 PI 33 NMC 24 NMC 25 PL 26 LL 62 PI 36 NMC 22 NMC 25 (D22) 5.00 from 5.00m to 5.20m brownish grey. U23 100 (U23) 5.20-5.65 from 5.20m to 8.20m rare bands of weak grey claystone recovered lows 100% rec. as angular to subangular fine gravel (5.40)(D24) 5.70 from 5.70m to 8.20m occasional fossilised shell fragments (<5mm). (EWMW1) 6.00 NMC 28 (D25) 6.20 PL 22 LL 58 PI 36 NMC 23 (B27) 6 70-7 20 SPT(S) N=54 from 6.70m to 8.20m stiff to very stiff. (4,8,12,12,1 ,16) NMC 27 (D28) 7.70 from 7.70m to 8.20m rare to occasional lenses of grey fine sand. (EWMW3) 8.00 (U29) 8.20-8.65 U29 110 blows 100% 8.20 Stiff dark greenish grey sandy CLAY. Sand is fine to medium. Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z] (EWMW2) 8.30 rec. (0.55)(EWMW2(P1)) Geology Code 3 [OXC-C Z]

/Stiff to very stiff dark grey slightly sandy CLAY with occasional fossilised shell fragments (<5mm). Sand is fine to coarse.

Factual Geolcode (OXC) Factual Geolcode 2 [C]

Geology Code 3 [OXC-C Z]

/Very dense grey and light greenish grey clayey fine SAND.

Factual Geolcode (KLB) Factual Geolcode 2 [S]

Geology Code 3 [KLB-S V SV]

/Stiff grey and light greenish grey sandy CLAY.

Factual Geolcode (KLB) Factual Geolcode 2 [C]

Geology Code 3 [KLB-C Z] 8.50 (D30) 8.70 8.75 LL 29 PI 17 (0.45)29/10/2020 NMC 24 6.10 9.00 (EWMW2(P1)) 17:30 9.00 (B33) 9.20-9.70 (D32) 9.20-9.65 SPT(S) 9.20 N=56 5.70 30/10/2020 76.77 NMC 36 (3,6,9,15,15 17) 07:30 e] (0.55)ractian Jeonose (Incl.) ractinal rections 2 [c] Geology Code 3 [KLB-C 2] Very dense grey and light greenish grey slightly gravelly clayey fine SAND. Gravel is medium to coarse of sandstone. Factual Geolcode [KLB] Factual Geolcode 2 [S] 9.75 76.22 (0.30)(D34) 10.00 Geology Code 3 [KLB-S V SV] 10.05 75.92 Date Time DRILLING TECHNIQUE WATER OBSERVATIONS CHISELLING HOLE/CASING DIAMETER WATER ADDED Time Elapsed (mins) From To Strike At Rise To Depth From Volume (ltr) Type Duration Casing Sealed Hole Dia. Depth Casing Dia. 0.00 1.20 10.70 SPT Hammer: S64 1. PAS 128 Type B survey conducted over position. 2. EKFB instructed to cancel the rotary part and terminate the hole on CP refusal

depth.

Unless otherwise stated: Depth (m), Diameter (mm), Time (hhmm), Thickness (m), Level (mOD). Equipment Used

THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE

REFLECTED ON THIS LOG.

Contractor

Hard Strata - CP only, rotary section

JΡ

Energy Ratio (%):

Termination Depth:

Logged By Checked By

67 10.70m

Start Date

Rev.C01



Data

HS2

SAMPLES

Cable Percussive Borehole

Log

PROGRESS

Final data

ML081-CR440

Ground Level (mAOD) Project No.
C2-C3-CONT-ASC 85.97

467453.95

TESTS

ASC Detailed GI Asset Group 226359.76 Calvert Cutting Group

Chainage (SG Grid) 28/10/2020 Offset 30/10/2020 42 m

STRATA

Scale 1:50 Sheet 2 of 2

SAMP	LES		TEST	S		PROGR			STRA	ATA			Donth		Install/
Type + [Depth	Type + Depth	Results	PI	Water Depth	Date & Time	Casing & Water		Description		Legen	Geol Code1	Depth (Thickness)	Level	Backfil
		SPT(S) 10.10	100/170mm (25/52,37,48, 15/20)		·		Depth	Very dense grey and light gre Gravel is medium to coarse o Factual Geolcode [KLB] Factu Geology Code 3 [KLB-S V SV	enish grey slightly gr sandstone. al Geolcode 2 [S]	ravelly clayey fine SANE). <u> </u>		(0.65)	-	
(D36) 10.5	50-10.70	SPT(S) 10.50	100/160mm (25/40,41,49, 10/10)		5.70	30/10/2020	10.50	Geology Code 3 [KLB-S V SV					10.70	75.27	
			10/10)			17:30	[TextStyl						10.70	15.21	
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Туре		Tyne	Results		Water	Date Time	Caeina Water		Description		Legeno		Depth (Thickness)	Level	Inetall/Backfi
		Type G TECHN			CHISEL ard Strata	LING	Guaring system	WATER OBSERV	ATIONS		SING DIAME	TER	WATE	RADDE	D
0.00 1.20	To 1.20 10.70		Type pection Pit Percussion	4.80	5.00	00:30	Date	Strike At Time Elapsed (mins)	Rise To Casing	Sealed Hole Dia. Dept	0 200	Depth 3.20	From	To V	olume (Itr)
1.20	10.70	Cable	e Percussion	7.75 10.10	8.05	00:45					150	10.50			
emarks		_								1		SPT Ha	mmer:		S64
. PAS 1. epth.	28 Туре	e B surve	ey conducte	ed over p	oosition	. 2. EKFB	instruc	ted to cancel the rotary	part and termin	ate the hole on Cl	Tolubul				
opu1.												Energy	Ratio (%):		67



Insulated Hand Tools

THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE

REFLECTED ON THIS LOG.

10.70m

Termination Depth:

Twyford Embankment Landscape Earthworks Cor	ocentual Site Model		Borehole No
1MC06-CEK-EV-NOT-C		1	ML081-CT001
K <mark>eyne</mark> tîx	Rev.C01		Sheet 1 of 1
Project Name Project No	Co-ords: 467444.66 - 226350.00	Cone Used: S15-CFIP.0915	Hole Type
ASC C2 & C3 Controlled Data C2-C3-CONT-ASC Location: 1MC06 North Portal of Chiltern Tunnels to Brackley & 1MC07 Brackley to Long Itchington Wood Green	Level: 85.48 m AOD	CPT Rig: 20.5 Tonne Track-Truck Mounted CPT Unit	IP+CPT Scale
Tunnel South Portal	Level. 65.46 III AOD	+Insulated Hand Tools	1:100
Client: HS2	Dates: 15/06/2017 - 23/06/2017	Operator: UK15+Craig Blackett	Logged By
Our Publisher of MP2	First Date PARA		JC
0 200 400 600 800 1000 1200 1400 1600 1800 ——— Sleeve Friction, fs [kN/m2]	2000	Estimated Soil Type	
Sleeve Filcului, is [KIVIII2]		TOPSOIL: Brown sandy clay with occasional rootlets.	0
		TOP Firm brown mottled grey slightly sandy slightly gravelly CLAY v gravel sized pockets of black organic material and rare rootlets	vith occasional fine to coarse
		subangular to rounded fine to medium of flint and siltstone.	s. Sand is fine to coarse. Gravel is
		ALV Clays - clay to silty clay	
		— BLANK — -	vith occasional fine to coarse s. Sand is fine to coarse. Gravel is 1 2 2 3 3 5 5 6 6 6 7 7
	<u> </u>	<u></u>]	2
		<u>-</u> -	3
		- <u>-</u> -	E
	<u> </u>	Silt mixtures - clayey silt to silty clay; Very stiff fine grained	4
	<u> </u>	DLAIN.	<u> </u>
		<u>- </u>	₽ ,
	XXXXXXXX XX	Clays - clay to silty clay	5
			E
		크	6
	<u> </u>	<u>-</u> -	7
			=
		Silt mixtures - clayey silt to silty clay BLANK	
		Very stiff sand to clayey sand; Sands - clean sand to silty sand BLANK	
		Very stiff sand to clayey sand	
		BLÁNK	9 10
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			14

Tuniford Embank	ment Landscape Earthworks Co	neentuel Site Medel		Borehole No
Twylord Embank	ment Landscape Earthworks Co. 1MC06-CEK-EV-NOT-0		1	ML081-CT400
Keynetix	IMOSS SER EV HOT S	Rev.C01		Sheet 1 of 1
Project Name	Project No	Co-ords: 467179.91 - 226525.72	Cone Used: S15-CFIP.1528	Hole Type
ASC C2 & C3 Controlled Data Location: 1MC06 North Portal of Chiltern Tunnels to Brackley & 1MC07 Br	C2-C3-CONT-ASC	Level: 84.05 m AOD	CPT Rig: Insulated Hand Tools	IP+CPT
Tunnel South Portal	rackley to Long tichington wood Green	Level: 64.05 m AOD	CPT Rig. Insulated Harid Tools	Scale 1:100
Client: HS2		Dates: 26/06/2019 - 26/06/2019	Operator:	Logged By
Our Projetov v v NPD		Establish Datis DCD()		JP
	48 56 64 72			
0 200 400 600 800 1000 1	1200 1400 1600 1800	2000	Estimated Soil Type	
Sieeve Friction, is [Kiviniz]			TOPSOIL: Crop over dark brown and reddish brown slightly sa	andy slightly gravelly clay with 0
			occasional rootlets (<1mm x 25mm). Sand is fine. Gravel is su mudstone and limestone.	bangular to rounded fine of
			TOP Soft to firm orangish brown and brown slightly sandy locally sa	andy slightly gravelly CLAY. Sand is
			fine to medium. Gravel is subangular to rounded fine to mediu	m of mudstone and limestone.
			Firm light brown locally mottled orangish brown slightly sandy ALV	CLAY. Sand is fine.
			Sand mixtures - silty sand to sandy silt; Sands - clean sand to BLANK	silty sand 2
			Sands - clean sand to silty sand BLANK	3
			TO SECURITY	E
				<u> </u>
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			— Clays - clay to silty clay BLANK	5
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				andy slightly gravelly clay with bibangular to rounded fine of singly slightly gravelly CLAY. Sand is m of mudstone and limestone. CLAY. Sand is fine. silty sand 2 4 5 6 7 10 11 11 12





Inspection Pit Log

Final data

ML081-HP002

Scale

ASC C2 & C3 Controlled Pata HS2

Project No.
C2-C3-CONT-ASC
Easting (OSGB)
467281.57

Ground Level (mAOD) 84.41 Northing (SnakeGrid) 226289.72

GI Phase HS2 Main GI Asset Group Chainage (SG Grid) Offset -122 m

Start Date 21/09/2017 End Date 21/09/2017

1:10 Sheet 1 of 1

HS2			40	7281.57		2202	289.72 Calvert Cut	ting Group -122 III		12017		ieet i c	
SAMPLES	s		TE	STS		_ o		STRATA					
	Type/	D 41-	Type/		PI	Water Strikes			1	Geol	Depth (Thickness)	Level	Install/ Backfill
Depth	Ño.	Depth	Ño.	Results	PI	> \(\tilde{\ti}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}		Description	Legend	Code1	(111101111000)		Dackiiii
- 0.10	D1	-					TOPSOIL: Brown gravelly Factual Geolcode [TOP] F. Geology Code 3 [TOP-C Z	actual Geolcode 2 [C]			(0.20)	-	
- 0.20 0.20 - 0.50 - -	D2 B3	- - - -					Firm dark brown slightly gr Gravel is angular to rounde limestone. Factual Geolcode [ALV] Fa Geology Code 3 [ALV-C Z]	avelly sandy CLAY. Sand is fine to coarse. ed fine to medium of flint, quartzite and actual Geolcode 2 [C]			0.20	84.21	
- 0.50 0.50 0.50 - 0.80	D4 ES5 LB6	- 0.50 - - - -	PID	<1ppm							(0.65)		
- 0.85 - - 1.00 1.00 - 1.30	D7 ES8 LB9	- - - 1.00	PID	<1ppm			Firm grey mottled brown si to coarse. Gravel is angula and limestone. Factual Geolcode [ALV] Fa Geology Code 3 [ALV-C Z]	lightly sandy slightly gravelly CLAY. Sand is fine ar to subrounded fine to coarse of flint, quartzite actual Geolcode 2 [C]			- 0.85	83.56	
-		- - - -									(0.65)		
- 1.50 - - - -	D10	- - - - -							(#. (##.)		· 1.50 ·	82.91	
-		-											
PLAN DETAILS	TypeiNo S	Depth	Type/No.	Results		Water Strikes		Remarks	Legend		Depth (Thickness)	Level	Install/Elack/II
		0.7		I	ona Axis	Orientati		PAS 128 Type B survey conducted over posit	ion				
		U./		'	Jong Axis	Onemali	OII.		011				
0.7					Shoring /	Support: Stable	None						
						ater (desc	ription):	THIS LOG HAS BEEN REPRODUCED AGS DATA. CHANGES TO GEOLOGY BE REFLECTED ON THIS	CODES V	ACTUA /ILL N	·-	on Depth: ed Schedu	1.50m Iled





Inspection Pit Log

Final data

ML081-HP003

ASC C2 & C3 Controlled Pata HS2

Project No.
C2-C3-CONT-ASC
Easting (OSGB)
467148.40

Ground Level (mAOD) 86.50 Northing (SnakeGrid) 226387.78

GI Phase HS2 Main GI Asset Group Calvert Cutting Group

Chainage (SG Grid) Offset

-127 m

Start Date 20/09/2017 End Date 20/09/2017

1:10 Sheet 1 of 1

Scale

HS2			46	7148.40		226	387.78 Calvert Cut	ting Group -127 M	20/0	9/2017	J.	neet 1 of 1
SAMPLE	ES		TE	STS		∟ o		STRATA				
Depth	Type/	Depth	Type/	Results	PI	Water Strikes		Description	l age-	Geol	Depth (Thickness)	Level Install/ Backfill
Depth	Ño.	Deptn	Ño.	Results	PI	> \(\tilde{\ti}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}			Legend	Code1	(111101111000)	Backiiii
- 0.10 - 0.20 - 0.25 - 0.50	D1 D2 B3	-					TOPSOIL: Brown slightly of Factual Geolcode [TOP] F Geology Code 3 [TOP-C Z Stiff grey mottled brown sa Factual Geolcode [ALV] Fa Geology Code 3 [ALV-C Z	andy CLAY with occasional rootlets.			(0.20)	86.30
- 0.50 0.50 - 0.80 - 0.55	ES4 LB5 D6	- 0.50	PID	<1ppm			S, T, T, T, T, T, T, T, T, T, T, T, T, T,				(0.60)	
- 0.80	D7	-					Firm grey mottled brown s to coarse. Gravel is angula	lightly sandy slightly gravelly CLAY. Sand is a ar to subrounded fine to coarse of flint and	ine		- 0.80	85.70
- - - 1.00 1.00 - 1.30	ES8 LB9	- - 1.00	PID	<1ppm			limestone. Factual Geolcode [ALV] Fa Geology Code 3 [ALV-C Z	actual Geolcode 2 [C]	Land of Milks, and the second of the second		-	
		-									(0.70)	
- 1.50 -	D10	- - -									1.50	85.00
-		- - -										
_		-										
PLAN DETAIL	S TypeNo	Depth	Type/No.	Results		Water Strikes		Remarks	Legend		Depth (Thickness)	Level Install@ackfill
		0.7			Long Axis	Orientati	on:	PAS 128 Type B survey conducted over p	osition			
_=		0.7			Long Axis	Jiioillall	····		_ >			
0.6					Shoring /		None					
					Groundwa		ription):	THIS LOG HAS BEEN REPRODUC AGS DATA. CHANGES TO GEOLO BE REFLECTED ON T	SY CODES \	ACTUA VILL N	\ <u>_</u>	ion Depth: 1.50m ed Scheduled

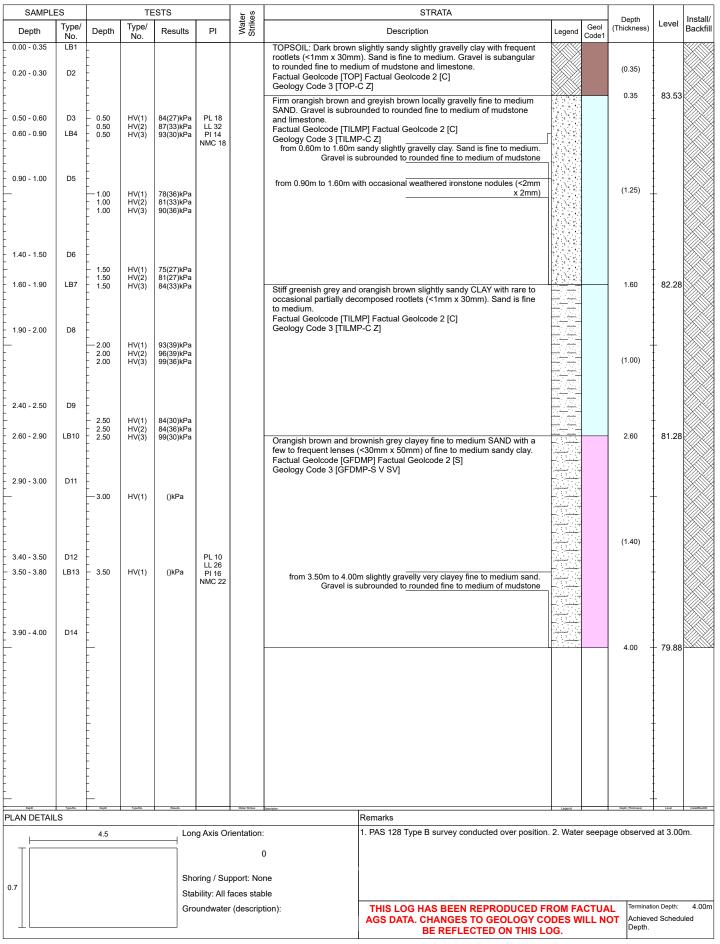
Insulated Hand Tools



FINAL-MON

ML081-TP401

Chainage (SG Grid) Start Date **GI Phase** Scale Ground Level (mAOD) ASC Scheme GI 17/04/2019 1:25 ASC C2 & C3 Controlled Data C2-C3-CONT-ASC 83.88 **Asset Group End Date** Easting (OSGB) Northing (OSGB) Client Offset -17 17/04/2019 Sheet 1 of 1 HS2 467150.74 226524.97 Twyford Emba



JCB Excavator



FINAL

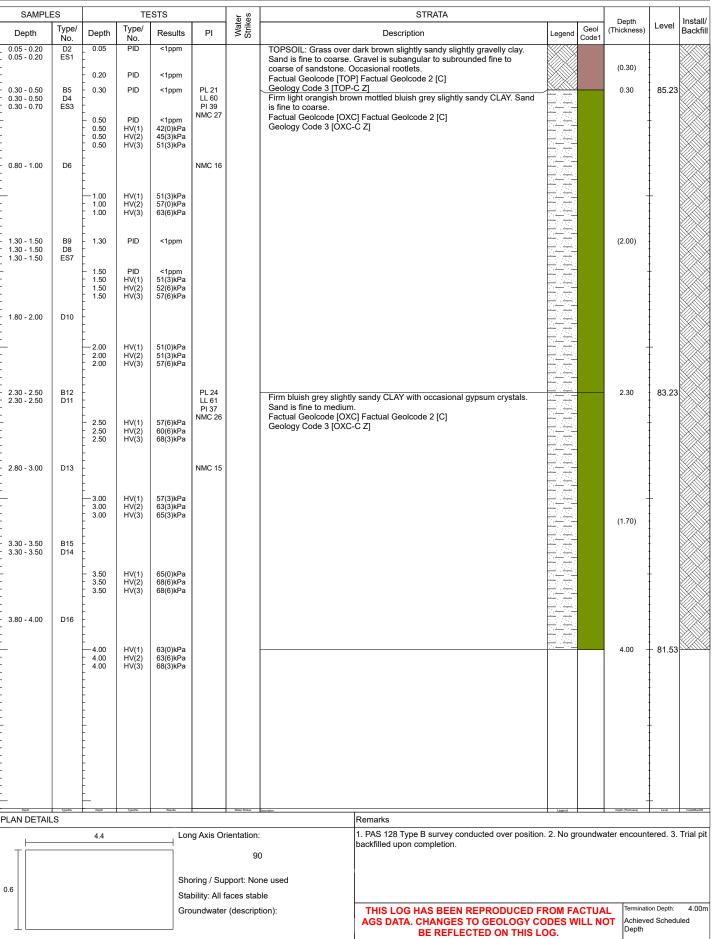
ML081-TP407

Chainage (SG Grid) Start Date **GI Phase** Scale
 Project
 Project No.

 ASC C2 & C3 Controlled Data
 C2-C3-CONT-ASC

 Cilient
 Easting (OSGB)

 HS2
 467332.51
 Ground Level (mAOD) ASC Detailed GI 06/10/2020 1:25 85.53 **Asset Group End Date** Northing (OSGB) Offset 8 06/10/2020 Sheet 1 of 1 226414.91 Calvert Cutting Gr





FINAL

ML081-TP408

 Project ASC C2 & C3 Controlled Data Client
 Project No. C2-C3-CONT-ASC Easting (OSGB)
 Ground Level (mAOD) 84.39 ASC Detailed GI ASC Detailed GI Asset Group
 ASC Detailed GI Asset Group
 C2/10/2021 Offset End Date Calivert Cutting Group
 1:25 End Date Calivert Cutting Group
 C1/20-C3-CONT-ASC End Date Calivert Cutting Group
 C3/20-C3-CONT-ASC End Date End Date Calivert Cutting Group
 C3/20-C3-CONT-ASC End Date End Date End Date End Date Calivert Cutting Group
 C3/20-C3-CONT-ASC End Date End D

HS2			407	326.67		2202	68.46 Calvert Cut	ting Group - 110	20/10/2021		ieet i oi i
SAMPLE				STS		ter		STRATA		Depth	Install/
Depth	Type/ No.	Depth	Type/ No.	Results	PI	Water Strikes		Description	Legend Geol Code1	(Thickness)	Level Backfill
- 0.10 - 0.10 - 0.40 - 0.15	D1 B3 ES2	- - - 0.15 - -	PID	<1ppm			is fine to coarse.	orown sandy clay with occasional rootlets. Sand P] Factual Geolcode 2 [C] C Z]		(0.40)	
- 0.50 - 0.55 - 0.55	D4 ES5	- 0.50 - 0.50 - 0.50 - 0.55	HV(1) HV(2) HV(3) PID	58(32)kPa 60(31)kPa 63(34)kPa <1ppm	PL 23 LL 50 PI 27 NMC 34		occasional rootlets. Sai	C] Factual Geolcode 2 [C]		0.40	83.99
- - - - - - - - - - - -	В6	- 1.00 - 1.00 - 1.00 - 1.00	HV(1) HV(2) HV(3)	77(21)kPa 81(21)kPa 84(23)kPa						(1.60)	
- - - - - - - - - - -	D7	- 1.50 - 1.50 - 1.50 - 1.50 	HV(1) HV(2) HV(3)	73(23)kPa 74(21)kPa 81(28)kPa							
	B8	- 2.00 - 2.00 - 2.00 - 2.00	HV(1) HV(2) HV(3)	80(20)kPa 81(18)kPa 86(25)kPa	PL 23 LL 55 PI 32 NMC 32		gravel size. Sand is fine	C] Factual Geolcode 2 [C]		2.00 -	82.39
- - 2.50 - - - - - - -	D9	- 2.50 - 2.50 - 2.50 - 2.50 	HV(1) HV(2) HV(3)	81(20)kPa 83(23)kPa 86(26)kPa						(1.50)	
- - - - - - - -		- 3.00 - 3.00 - 3.00 - 3.00 	HV(1) HV(2) HV(3)	77(23)kPa 81(18)kPa 88(21)kPa 88(21)kPa 91(23)kPa						-	
- 3.50 - 4.00 	B10	- 3.40 - 3.40 	HV(2) HV(3)	91(23)kPa 91(26)kPa			fragments, ammonites Sand is fine to coarse.	andy CLAY with frequent to abundant shell and bivalves to medium gravel size (<30mm). [2] Factual Geolcode 2 [C] [3] C Z]		(0.50)	80.89
4.00	D11		HV(1) HV(2) HV(3)	93(25)kPa 96(28)kPa 99(23)kPa						4.00 -	80.39
- - - - -	Tune No.	- Deeth	Tiros No.	Renta		Web Street			Landi	Desth (Thidones)	Learni bostal/Escéli
PLAN DETAIL	S	Legal	1 yyes v40.	romand			process grades	Remarks	cogens	space (constituting)	nzausodil
0.9	3.8 Long Shori					ientation: 206 oport: No aces stat	3 ne used	PAS 128 Type B survey conducted over position	n.		
				Gro	undwater	(descrip	tion):	THIS LOG HAS BEEN REPRODUCED AGS DATA. CHANGES TO GEOLOGY OF BE REFLECTED ON THIS I	ODES WILL N	~ <u>-</u>	on Depth: 4.00m ed Scheduled



FINAL-MON

ML081-TP410

 Project ASC C2 & C3 Controlled Data Client
 Project No. C2-C3-CONT-ASC Easting (OSGB)
 Ground Level (mAOD) S5.32 ASC Ground (mAOD) Northing (OSGB)
 GI Phase ASC Scheme GI ASC Scheme GI ASSE Group
 C1/104/2019 End Date Indicates (maching (maching for propriate in the project for

SAMPLE	ES		TE	ESTS		er		STRATA			Depth		Install/
Depth	Type/ No.	Depth	Type/ No.	Results	PI	Water Strikes		Description	Legend	Geol Code1	(Thickness)	Level	Backfill
0.00 - 0.30 - 0.10 - 0.20	LB1 D2	- - - - - -					gravelly clay with frequis subrounded to round Factual Geolcode [TOF-Geology Code 3 [TOP-	dark brown and brown slightly sandy slightly ent rootlets (<1mm x 30mm). Sand is fine. Gravel led fine to medium of mudstone and limestone. P Factual Geolcode 2 [C] C Z] I orangish brown slightly sandy CLAY. Sand is fine			(0.30)	85.02	
- 0.50 - 0.60 - 0.60 - 0.90	D3 LB4	- - - 0.50 - 0.50 - 0.50 -	HV(1) HV(2) HV(3)	81(30)kPa 87(24)kPa 99(24)kPa	PL 23 LL 66 PI 43 NMC 35		to medium.	MP] Factual Geolcode 2 [C]				 	
- 0.90 - 1.00	D5	- - - - - 1.00 - 1.00	HV(1) HV(2) HV(3)	90(21)kPa 96(27)kPa 96(33)kPa				from 0.90m to 1.40m orangish brown			(1.30)		
- 1.40 - 1.50 - 1.60 - 1.90	D6 LB7	- - - - - 1.50 - 1.50	HV(1) HV(2) HV(3)	72(21)kPa 75(27)kPa 81(33)kPa	PL 32 LL 61 PI 29 NMC 39			.60m soft to fi <u>rm greyish brown and orangish brown</u>			1.60	83.72	
- - - 1.90 - 2.00	D8	- - - - - - - 2.00	HV(1) HV(2)	81(27)kPa 87(30)kPa			slightly sandy slightly g decomposed rootlets (subangular to rounded Factual Geolcode [TILN Geology Code 3 [ALV-0	ravelly CLAY with occasional partially 1mm x 15mm). Sand is fine to medium. Gravel is fine of limestone and mudstone. MPJ Factual Geolcode 2 [C] C Z] 0m rare to occasional weathered ironstone nodules			-		
- - - - - 2.40 - 2.50	D9	- 2.00 - 2.00 	HV(3)	90(24)kPa				(<2mm x 2mm)			(1.10)		
2.70 - 3.00	LB10	- 2.50 - 2.50 - 2.50 	HV(2) HV(3)	90(24)kPa 99(27)kPa			Sand is fine.	thinly laminated bluish grey slightly sandy CLAY.			2.70	82.62	
3.00 - 3.10	D11	- - 3.00 - 3.00 - 3.00 - - -	HV(1) HV(2) HV(3)	117(27)kPa 129(33)kPa 135(30)kPa			Geology Code 3 (OAC-	from 3.30m to 4.00m stiff to very stiff			-	<u>+</u> - - - - - - - -	
3.40 - 3.50 - 3.50 - 3.80	D12 LB13	- - - 3.50 - 3.50 - 3.50	HV(1) HV(2) HV(3)	135(45)kPa 144(42)kPa 150(45)kPa			from 3.40m to 4	6.00m brown and greyish brown. Rare to occasional fossilised shell fragments (<2mm x 2mm)			(1.30)		
3.90 - 4.00	D14	- - - - - - -									4.00 -	81.32	
- - - - - - - - -		- - - - - - - -											
PLAN DETAIL	TypeNo.	- Dupth	TypeNo.	Resulta		Wader Strikes	Descritor.	Remarks	Legend		Dupth (Thickness)	Level	lenfall/Backfil
PLAN DE IAIL	_5	4.6		, Lor	ng Axis Or	ientation	<u> </u>	Remarks 1. PAS 128 Type B survey conducted over position	ı. 2. No g	roundw	ater encoun	tered.	
0.7				She	oring / Sup	19 oport: No	0 ne		3				
					oundwater			THIS LOG HAS BEEN REPRODUCED F AGS DATA. CHANGES TO GEOLOGY CO BE REFLECTED ON THIS L	DDES W		~	on Depth: ed Schedi	4.00m uled

HS2 Trial Pit Log

FINAL

ML081-TP426

 Project ASC C2 & C3 Controlled Data Client
 Project No. C2-C3-CONT-ASC Easting (OSGB)
 Ground Level (mAOD) Northing (OSGB)
 GI Phase ASC Detailed GI ASSC Detailed GI Asset Group
 Chainage (SG Grid) O7/10/2020 07/10/2020 1:25 End Date O7/10/2020 07/10/202

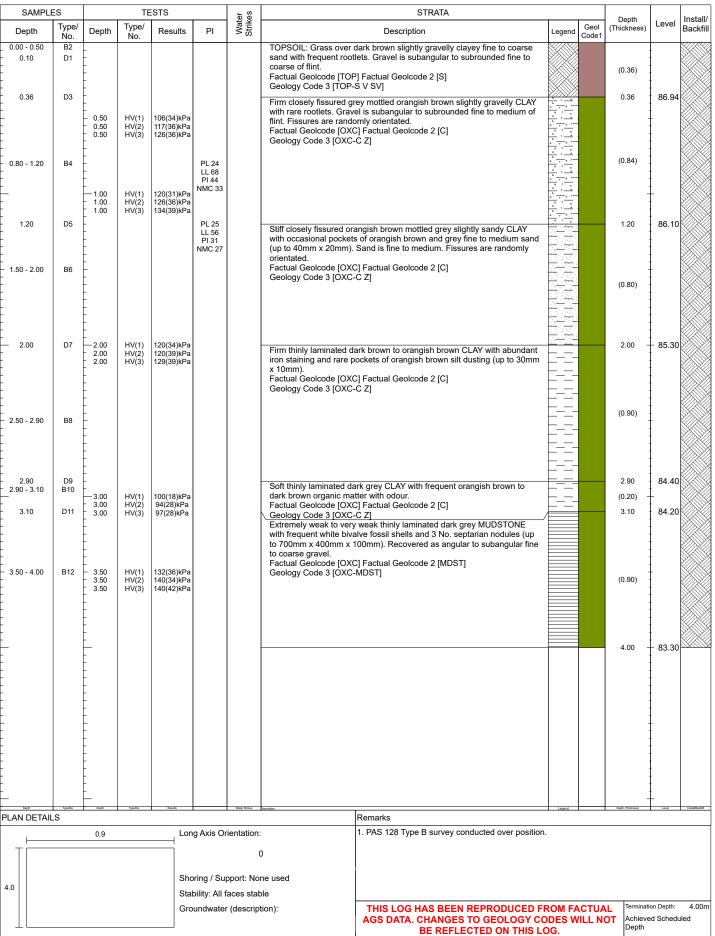
ПОХ				104.23			141.70 Iwylord Err	DAINMEN GIOUP		72020			
SAMPLE				STS		ter		STRATA			Depth	Lavel	Install/
Depth	Type/ No.	Depth	Type/ No.	Results	PI	Water Strikes		Description	Legend	Geol Code1	(Thickness)	Level	Backfill
0.05 - 0.20 0.05 - 0.20 - 0.30 - 0.50 - 0.30 - 0.50 - 0.30 - 0.50	D2 ES1 B5 D4 ES3	0.05 - - - 0.20 - - 0.30	PID PID PID	<1ppm <1ppm <1ppm	PL 13 LL 29 PI 16		Sand is fine to coarse. sandstone and quartz. Factual Geolcode [TOP- Geology Code 3 [TOP- Firm light orangish brow] Factual Geolcode 2 [C]			(0.30)	83.00	
- 0.80 - 1.00	D6	- 0.50 - 0.50 - 0.50 - 0.50 - 0.50	PID HV(1) HV(2) HV(3)	<1ppm 42(0)kPa 42(3)kPa 51(0)kPa	NMC 15 NMC 21		coarse of sandstone, q	uartz and limestone. i1] Factual Geolcode 2 [Z]					
- - - - - -		- - - - - - - - - - - - - - - - - - -	HV(1) HV(2) HV(3)	42(3)kPa 45(0)kPa 48(3)kPa							-		
- 1.30 - 1.50 - 1.30 - 1.50 - 1.30 - 1.50	B9 D8 ES7	- 1.30 - 1.50 - 1.50 - 1.50 - 1.50	PID PID HV(1) HV(2) HV(3)	<1ppm <1ppm 39(3)kPa 42(6)kPa 51(3)kPa							(2.50)		
- 1.80 - 2.00	D10	- - - - - - 2.00 - 2.00 - 2.00	HV(1) HV(2) HV(3)	51(3)kPa 54(3)kPa 54(6)kPa	NMC 15						-		
- 2.30 - 2.50 - 2.30 - 2.50	B12 D11	- 2.50 - 2.50 - 2.50	HV(1) HV(2) HV(3)	51(3)kPa 54(9)kPa 57(9)kPa	PL 16 LL 40 PI 24 NMC 23								
- 2.80 - 2.90 - 2.80 - 2.90	B14 D13	-			LL 26 NMC 12		to rounded fine to coars	ightly clayey fine to coarse SAND and subangular se GRAVEL of sandstone, quartz and limestone. 1] Factual Geolcode 2 [SV] -S V SV]			2.80 (0.10) 2.90	80.50 80.40	<i>\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\</i>
- - - - - - - - -		- - - - - - -											
- - - - - - - - - -		- - - - - - - -									-		
- - - - - - -		- - - - - - -											
DIAN DETA	TypesNo.	- Depth	Τγρα έλο.	Renda		Witner Strikes	Descritor	Domarko	Legend		Supth (Thickness)	Level	Install Backfill
PLAN DETAIL	LS	2.9		Sho	ng Axis Or	248 oport: No	3 ne used	Remarks 1. PAS 128 Type B survey conducted over position	1.				
					bility: All fa			THIS LOG HAS BEEN REPRODUCED F AGS DATA. CHANGES TO GEOLOGY C BE REFLECTED ON THIS L	ODES W			on Depth:	2.90m



FINAL

ML081-TP448

Chainage (SG Grid) **GI Phase** Start Date Scale Ground Level (mAOD) Project No.
ASC C2 & C3 Controlled Data C2-C3-CONT-ASC ASC Detailed GI 05/08/2021 1:25 87.30 Asset Group End Date Northing (OSGB) Easting (OSGB) Client Offset -122 05/08/2021 Sheet 1 of 1 HS2 467124.15 226413.57 Calvert Cutting Gr



360 Excavator

Dynamic Sample Borehole Log

FINAL

ML081- Rev.C01 **WS010**

 Project
 Project No.

 ASC C2 & C3 Controlled Data Client
 C2-C3-CONT-ASC Easting (OSGB)

 HS2
 467407.34

Ground Level (mAOD) 84.82 Northing (SnakeGrid) 226205.65

GI Phase HS2 Main GI Asset Group Calvert Cutting Group

-107

Chainage (Snake grid) Start Date 17/07/2017 Offset End Date 17/07/2017

Sheet 1 of 1

1:50

S2		46740	7.34		226205.6	55	Calvert Cutting Group	-107		17/07/	2017	SII	eet 1 o	t 1
SAMPLES		TEST	S		PROG	RESS		STRATA						
	Type +			Water	1	Casing &				Ι.	Geol	Depth (Thickness)	Level	Insta Bacl
Type + Depth	Depth	Results	PI	Depth	Date & Time	Water Depth		scription		Legend	Code1	(TINONIESS)		Dac
(B2) 0.05-0.20 (D1) 0.05			1				TOPSOIL: Dark brown clay w	vith some rootlets.					-	
							Factual Geolcode [TOP] Fact Geology Code 3 [TOP-C Z]	tual Geolcode 2 [C]				(0.40)	1	
(D3) 0.40 (LB4) 0.50-0.80							Firm to stiff brown mottled gre	ev CLAY.		()X()()X		0.40	84.42	
(LB4) 0.50-0.60							Factual Geolcode [OXC] Fact	tual Geolcode 2 [C]					-	
							Geology Code 3 [OXC-C Z]			 _			Ī	
(LB5) 1.00-1.20													-	
, ,										 -			1	
(D6) 1.30-1.35													-	
(B7) 1.35-2.80													+	
												(2.40)	1	
										H			ļ	
												-	-	
													-	
													Ī	
												2.80	82.02	
(D8) 2.85-2.90 (B9) 2.90-4.95			PL 26				Stiff fissured thinly laminated shell fragments (up to 5mm).	dark grey CLAY wit	h occasional	<u></u>		2.00	02.02	
,			LL 62 PI 36				extremely closely spaced pla	nar smooth.	-					
			NMC 24				Factual Geolcode (OXC) Fact	tual Geolcode 2 [C]		<u> </u>			‡	
							Geology Code 3 [OXC-C Z] from 3.00m to 3.10m a	abundant crystals of	selenite (up to	<u> </u>			‡	
									30mm)	 -			†	
												(0.00)	ł	
										H		(2.20)	ļ.	
										<u> </u>			‡	
										 _				
													-	
													Ī	
(D10) 4.95-5.00							from 4.80m to 5.00m so	ome localised sandy					1	
(D10) 4.95-5.00					17/07/2017 13:40	7 0.00 <i>Dry</i>		_	ر (10mm			5.00 -	79.82	
												-		
													<u> </u>	
Type DRILLING From To	Тур	е	Hard St	Water ISELLING	G	Casing Water	WATER OBSERVATIONS Depth Strike Duration (min) Rise To		HOLE/CASING I		ER Depth		RADDE	
DRILLING T	TECHNIQU	e e		ISELLIN	G	•	WATER OBSERVATIONS	Casing Sealed Hole		DIAMET		WATE	RADDE	D

1. PAS 128 Type B survey conducted over position. 2. Where structure is not described, such features were not observed in the available samples. 3. No groundwater observed.

THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.

Termination Depth: 5.00m Achieved Scheduled Depth

Checked By





Dynamic Sample Borehole Log

FINAL

ML081- Rev.C01 **WS447**

 Project
 Project No.

 ASC C2 & C3 Controlled Data Client
 C2-C3-CONT-ASC Easting (OSGB)

 HS2
 467321.38

Ground Level (mAOD) 84.28 Northing (SnakeGrid) 226211.97

GI Phase ASC Detailed GI Asset Group Calvert Cutting Group

Chainage (Snake grid) Start Date 17/09/2021 End Date -157

1:50 17/09/2021

Sheet 1 of 1

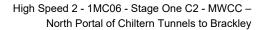
S2		467321	.38		226211.9	7	Calvert Cutting Group -157	17/09/	2021	Sh	eet 1 of 1
SAMPLES		TESTS			PROGR	RESS	STRATA				
Type + Depth	Type +	Results	PI	Water	Date & Time	Casing & Water	Description	Legend	Geol	Depth (Thickness)	Level Inst
(B2) 0.00-0.30	Depth	Results	FI	Depth	Date & Time	Depth	TOPSOIL: Grass over brown slightly gravelly sandy clay with	Legend	Code1		
(D1) 0.00-0.20							plant material. Sand is fine to medium. Gravel is angular to			(0.20) 0.20 (0.20) 0.40	84.08
(B4) 0.40-0.80							subrounded fine to coarse of flint.			(0.20) 0.40	83.88
(D3) 0.40-0.60							Factual Geolcode [TOP] Factual Geolcode 2 [C] Geology Code 3 [TOP-C Z]				†
							Firm brown slightly sandy CLAY. Sand is fine to coarse.				İ
							Factual Geolcode [OXC] Factual Geolcode 2 [C] Geology Code 3 [OXC-C Z]	1	-		Ī
							Firm light brown mottled orangish brown and creamish grey			(1.40)	
(D5) 1.20 (D6) 1.20-1.65	SPT(S) 1.20	N=10 (1,1,2,2,3,3)		0.00			slightly gravelly CLAY with frequent pockets of fine sand and occasional partly decomposed roots (2mm). Gravel is angular	: : : : : : : : : : : : : : : : : : : :			‡
(B13) 1.50-2.00		(, , , , , , , , ,					to rounded fine to coarse of flint.	L			1
(D12) 1.70-2.00							Factual Geolcode [OXC] Factual Geolcode 2 [C]				İ
(D12) 1.70-2.00							Geology Code 3 [OXC-C Z] Firm creamish grey mottled orangish brown CLAY with frequen			1.80	82.48
(D8) 2.00-2.45	SPT(S)	N=11					fine to medium sand pockets and some frequent brown fibrous			-	-
	2.00	(2,2,2,3,3,3)					peat. Factual Geolcode [OXC] Factual Geolcode 2 [C]				1
							Geology Code 3 [OXC-C Z]	H		(1.20)	‡
(B15) 2.50-3.00								<u> </u>		(1.20)	1
(044) 0 00 0 00								<u> </u>			+
(D14) 2.80-3.00											Ī
(D10) 3.00-3.45	SPT(S) 3.00	N=15 (2,2,3,4,4,4)					Stiff fissured grey CLAY, locally with frequent selenite crystals			3.00 -	81.28
	.						to fine gravel size and shell fragments. Factual Geolcode [OXC] Factual Geolcode 2 [C]	<u> </u>			
(B17) 3.50-4.00							Geology Code 3 [OXC-C Z]	<u> </u>		(1.00)	1
								H		(1.00)	+
(D16) 3.70-4.00											1
					17/09/2021			+	-	4.00 -	80.28
					16:00						1
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										-	
Туре	Туре	Results		Water	Date Time	Casing Water	Description	Legend		Depth (Thickness)	Level Install
DRILLING	TECHNIQU	JE		SELLING		•	WATER OBSERVATIONS HOLE/CASING	G DIAMET		WATE	RADDED
DRILLING To	TECHNIQU Typ	JE pe	CHI Hard Str From	SELLING		Casing Water	WATER OBSERVATIONS HOLE/CASING Depth Strike Duration (min) Rise To Casing Sealed Hole Dia. Depth C	G DIAMET	ER Depth	WATE	
DRILLING	TECHNIQU	JE De ion Pit	Hard Str	SELLING ata		•	WATER OBSERVATIONS HOLE/CASING	G DIAMET		WATE	RADDED

1. PAS 128 Type B survey conducted over position.

THIS LOG HAS BEEN REPRODUCED FROM FACTUAL AGS DATA. CHANGES TO GEOLOGY CODES WILL NOT BE REFLECTED ON THIS LOG.

Termination Depth: 4.00m Achieved Scheduled Depth



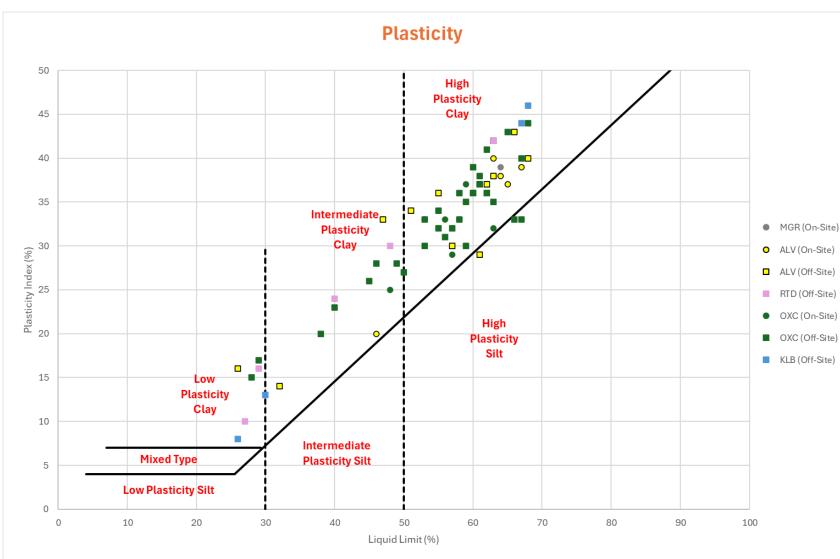




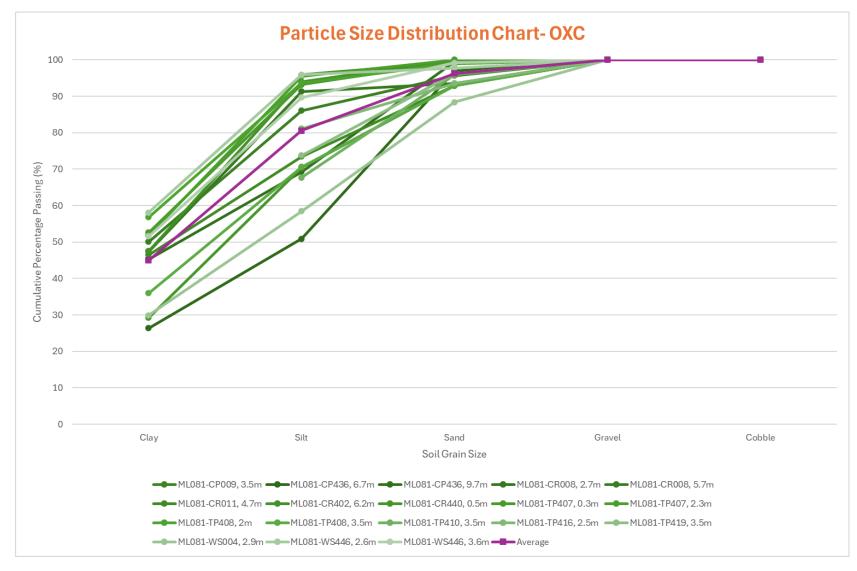
Appendix II-2

ALV, RTD and OXC Soil Classification Figures

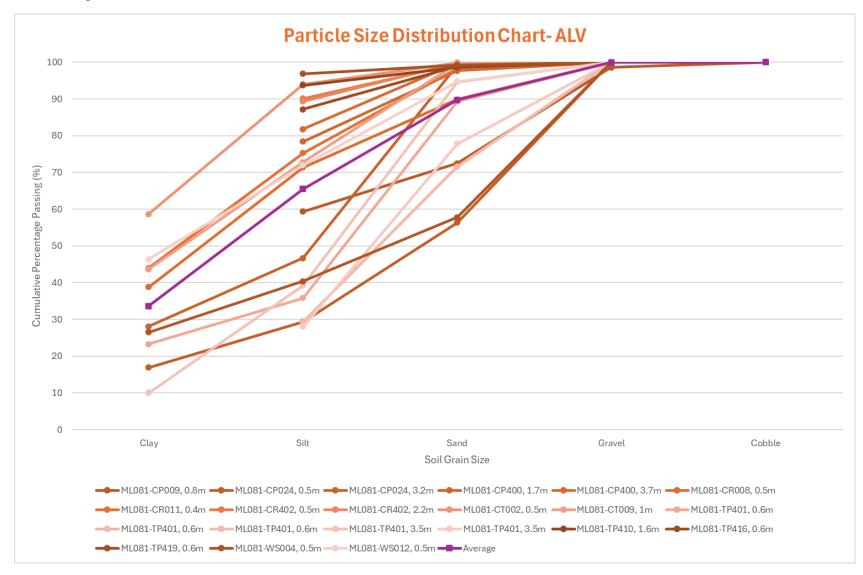
03 pages

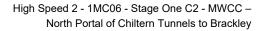












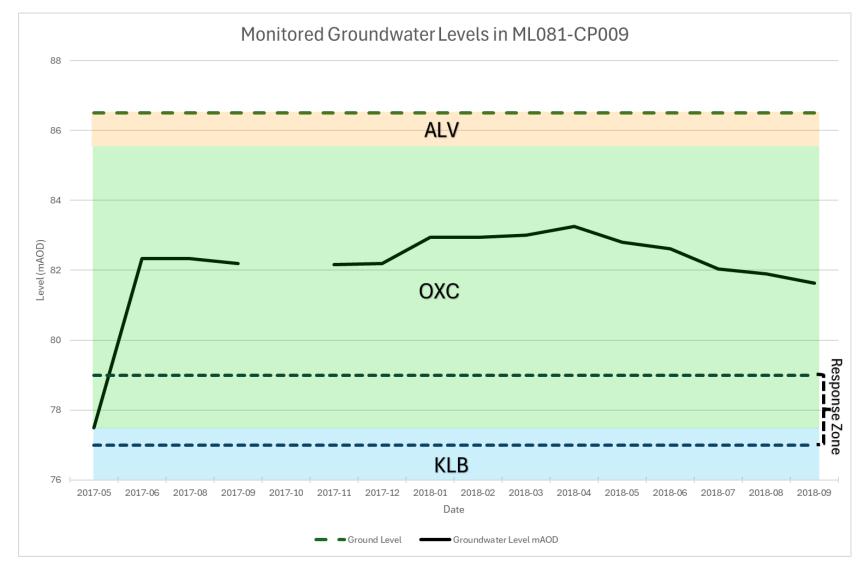


Appendix II-3

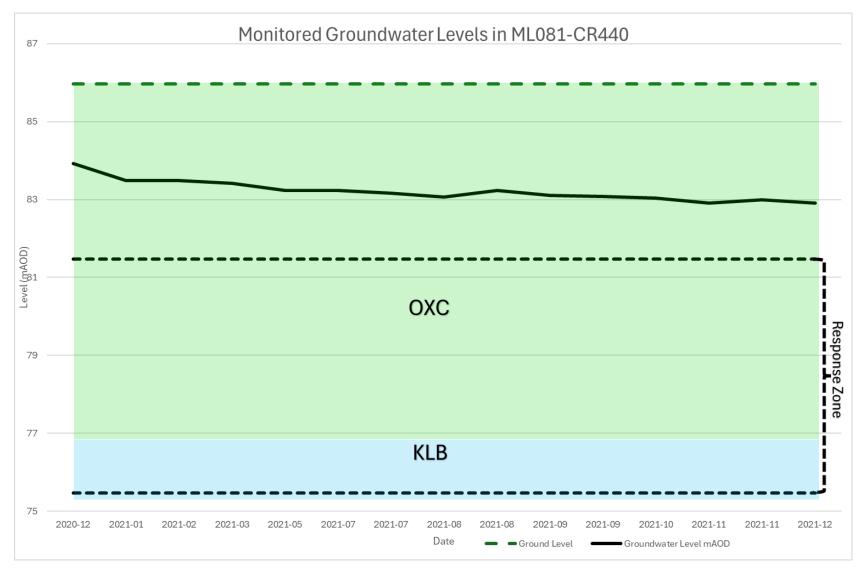
Annotated Groundwater Elevation Graphs

05 pages

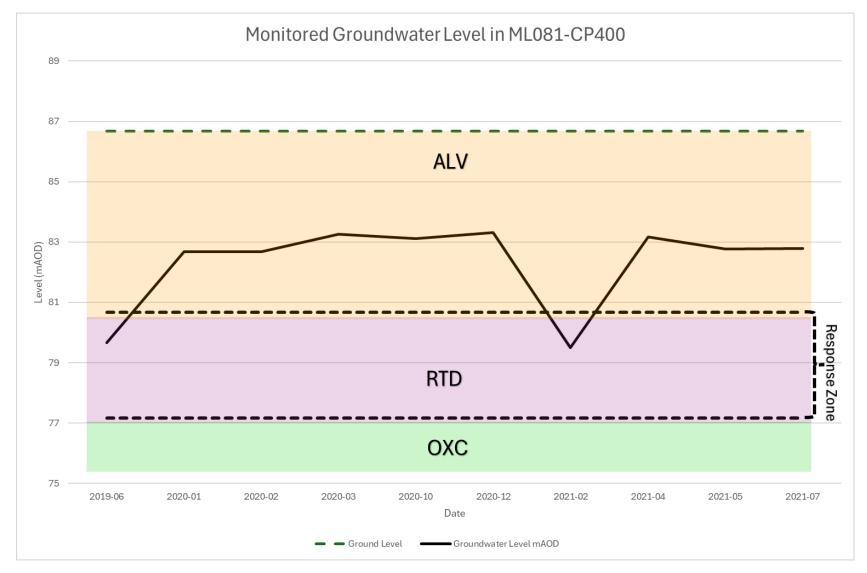




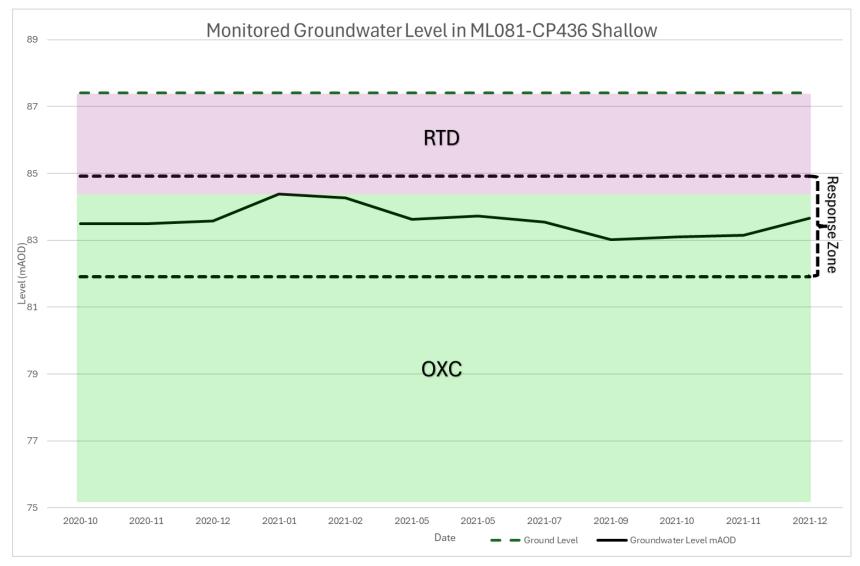




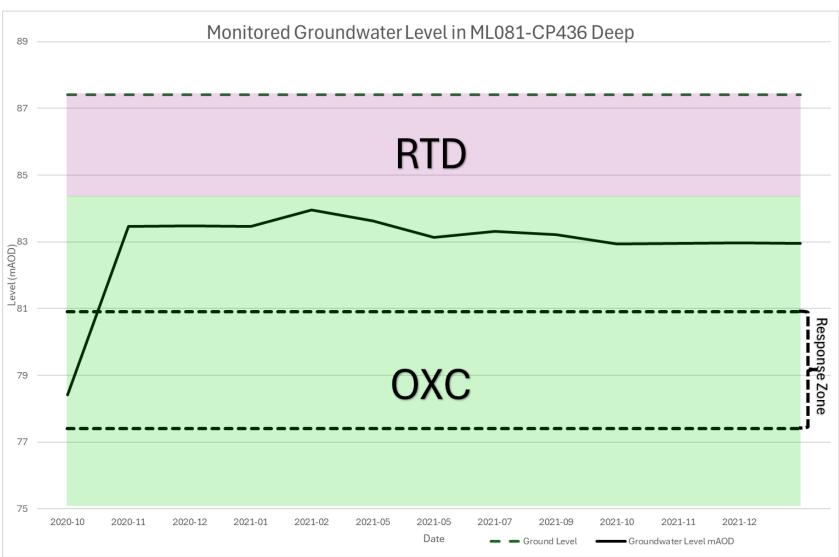










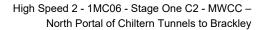




APPENDIX III

III-1 Pre-Remediation Landfill Waste Screened Chemical Data
III-2 Post-Remediation Landfill Waste Screened Chemical Data
III-3 Pre-Remediation / Post-Remediation Comparison

Number of Pages: 04

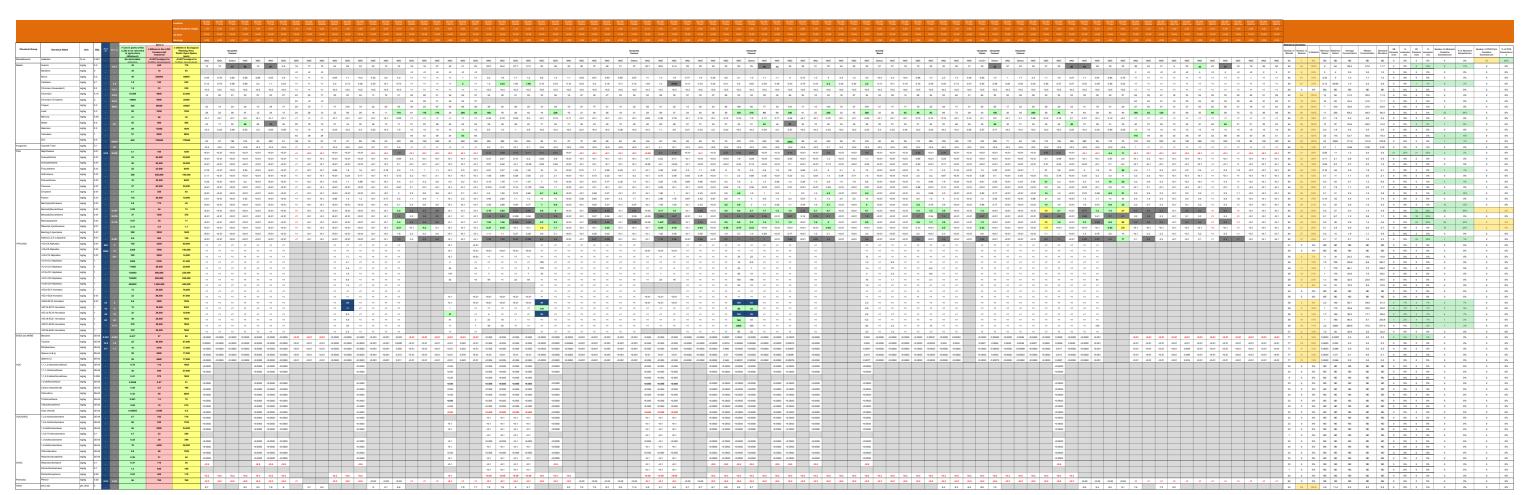




Appendix III-1

Pre-Remediation Landfill Waste Screened Chemical Data

01 page

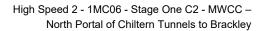


Notes
Sample-deviated holding time for PMIs. Results are:

g considered to be accurate and removed from the

Stad Links of Detection exceeds 1 or more ne-use screening orders.

No occessing value as contaminant of concern is not predicted to reach these of the unsaturated zone within 1,000 years.





Appendix III-2

Post-Remediation Landfill Waste Screened Chemical Data

01 page

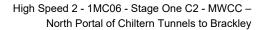
Soils Summary Assessment

						Sample ID	FF1 FF2	FF3	FF4 F	F5 FF6	FF7	FF8 FN167	58 EN16759 EN1	16760 FN 1	9354 FN 193	55 FN 19356	SP1a-IR1 SP	1h-IR2 SP10	csIR3 SP1dsIR	SP10-JR7 SP1F	JR6 SP1F-JR5	SP1K-	SP1LIR9 SP1.LIR	10 SP1H-JR8													
						Date	22/08/2024 22/08/20		_																												
					Zone 3	≤ 300mm in Ecological																		Statist	ical Summar												
Chemical Group	Chemical Name	Unit EQL	Zone 2b Zone 2	>1.2m in parts of the LLAU to be returned to	Commercial/Industrial	Planting Area:	Chrysotile Fibres	С	Chrysotile Fibres		Chrysotile Fibres														er of Number		num Maximum ect Detect	Average Concentration	Median Concentration	Doviction Exce	dan exceedan	Exceedan exce	Number of Allotme edan Guideline	% of Allotment Exceedances	Industrial Guideline	Guideline	Park
Miscellaneous	Asbestos	% v/v 0.001		agriculture (Allotment)	40 0049/bl44-	(park)							T T			1	I I .			T T											_	ces ce			Exceedances	Exceedances	Exceedances
Metals	Arsenic	mg/kg 0.2		No detectable asbestos	further assessment	further assessment				27 25	< 0.001	28 27	NAD N			_			AD NAD	NAD NA	_	NAD 19	NAD NAD	_		88% NE		ND 22.4	ND 25.0		0%			12%	3	3	12%
	Beryllium	mg/kg 2	- 45.3	35	12	170 63				1.1 1.1		1.1 1.7									-							1.1	1.1			0 0		0%	0	0	0%
	Boron	mg/kg 0.2		45	240000	46000	1.2 1.2 0.6 1			1.3 1.5	1.2	1.7 1.1		_	.5 1.3	_		_	0.6 0.8		1.5	0.9 <0.4	0.8 0.9 <0.4 <0.4			76% 0.		1.1	1.1		0%	0 0		0%	0	0	0%
	Cadmium	mg/kg 0.1	25	1.9	190	532	< 0.2 < 0.2			0.2 < 0.2	< 0.2	< 0.2 0.25			0.2 <0.2	_	_	_	.17 0.23	0.75 40		0.29	0.17 0.21	0.27 25		56% 0.1		0.3	0.3	-	0%	0 0		0%	0	0	0%
	Chromium (hexavalent)	mg/kg 0.3	16.7	1.8	33	220	<1.8 <1.8			1.8 < 1.8		< 1.8 < 0.5		_	1.8 <1.8			0.50 <0.	_			<0.50	<0.50 <0.50	-				ND.	ND		0%	0 0		0%	0	0	0%
	Chromium (Trivalent)	mg/kg 2	93.9	18000	8600	33000	35 34	34	41	33 34	36	37 37	12 2	_	16 30	35	29	29 1	14 18	30 34	_	26	24 25	35 25		100% 12		30.1	33.0	7.3 0	0%	0 0		0%	0	0	0%
	Copper	mg/kg 0.2	- 6667	520	68000	44000	27 26		27	24 23	30	28 20		_	9 26	27	42	30 1	10 16			21	18 20			100% 10		26.0	24.0	-	0%	0 0		0%	0	0	0%
	Lead	mg/kg 0.3		80	2300	1300	45 44	43	52	42 41	62	64 35	17 2	_	5 23	25	78	52 1	15 38	39 25		28	20 33	28 25		100% 15	-	38.0	38.0	15.8 0	0%	0 0		0%	0	0	0%
	Mercury	mg/kg 0.05		21	58	30	< 0.3 < 0.3	< 0.3	< 0.3 <	0.3 < 0.3	< 0.3	< 0.3 < 0.0	<0.05 <0	0.05 <0	0.3 <0.3	<0.3	0.07	0.08 <0.	0.05 0.05	0.05 <0.	0.05	<0.05	<0.05 <0.05	<0.05 25	5 5	20% 0.0	5 0.08	0.1	0.1	0.0	0%	0 0	% 0	0%	0	0	0%
	Nickel	mg/kg 0.5	- 67	53	980	800	31 29	29	32	29 28	29	28 30		_	18 35	37	25	21 1	15 15	24 34		31	23 29	51 25	25	100% 15		28.4	29.0	7.8 0	0%	0 0		0%	0	0	0%
	Selenium	mg/kg 0.2		88	12000	1800	<1.0 <1.0	< 1.0	< 1.0	1.5 < 1.0	1	< 1.0 0.83	0.36 1	1.2 < 1	1.0 < 1.0	< 1.0	0.93	0.94 0.5	.58 0.76	0.63 0.		0.48	0.6 1	1.2 25	16	64% 0.3	6 1.5	0.9	0.9	0.3 0	0%	0 0	% O	0%	0	0	0%
	Vanadium	mg/kg 1		91	9000	5000	61 61	60	72	61 57	68	64 61	23 4	45 6	6 63	66	39	47 1	18 33	43 56	37	32	32 32	46 25	25	100% 18	72	49.5	50.0	15.4 0	0%	0 0	% O	0%	0	0	0%
	Zinc	mg/kg 0.5	- 3530	0 620	730000	170000	140 130	130	150 1	30 120	150	170 110	73 1	10 14	40 120	140	230	210 6	54 100	120 11	160	79	75 76	79 25	25	100% 64	230	124.6	120.0	41.0 0	0%	0 0		0%	0	0	0%
Inorganics	Cyanide Total	mg/kg 0.1	- 50				<1.0 <1.0	< 1.0	< 1.0	1.0 < 1.0	< 1.0	< 1.0 < 0.50	<0.50 <0	0.50 <	:1 <1	<1	<0.5 ⋅	<0.5 <0	0.5 <0.5	<0.5 <0.	5 <0.5	<0.5	<0.5 <0.5	<0.5 25	0	0% NE) ND	ND	ND	ND 0	0%	0 0	% O	0%	0	0	0%
PAH	Naphthalene	mg/kg 0.01	0.02 0.02	4.1	190	1200	# #	#	#		#	# <0.0	<0.01 <0	0.01 <0.	.05 <0.05	<0.05	0.14	<0.1 0.:	29 <0.1	<0.1 <0	1 <0.1	<0.1	0.17 <0.1	<0.1 17	3	18% 0.1	4 0.29	0.2	0.2	0.1 3	18%	3 18	% 0	0%	0	0	0%
	Acenaphthene	mg/kg 0.01		34	84,000	29,000	# #	#	#	# #	#	# <0.0	<0.01 <0	0.01 0.0	05 0.08	0.18	<0.1 ⋅	<0.1 <0	0.1 0.72	<0.1 <0.	1 <0.1	<0.1	0.14 <0.1	<0.1 17	5	29% 0.0	5 0.72	0.2	0.1	0.3 0	0%	0 0	% 0	0%	0	0	0%
	Acenaphthylene	mg/kg 0.01		28	83,000	29,000		#	#	# #	#	# <0.0	<0.01 <0	0.01 <0.	.05 <0.05	<0.05	<0.1 ⋅	<0.1 <0	0.1 <0.1	<0.1 <0	1 <0.1	<0.1	0.27 <0.1	<0.1 17	1	6% 0.2	7 0.27	0.3	0.3	ND 0	0%	0 0	% 0	0%	0	0	0%
	Fluoranthene	mg/kg 0.01		52	23,000	6300	# #	#	#	# #	#	# <0.0	<0.01 <0	0.01 0.1	12 0.08	0.16	0.32	0.43 0.	.18 2.1	0.68 <0.	1 1.2	<0.1	1.7 0.46	<0.1 17	11	65% 0.0	8 2.1	0.7	0.4	0.7 0	0%	0 0	% 0	0%	0	0	0%
	Anthracene	mg/kg 0.01		380	520,000	150,000		#	#	# #	#	# <0.0	<0.01 <0	0.01 <0.	.05 <0.05	<0.05	<0.1 ⋅	<0.1 <0	0.1 0.38	<0.1 <0.	1 0.17	<0.1	0.6 0.16	<0.1 17	4	24% 0.1	6 0.6	0.3	0.3	0.2 0	0%	0 0	% 0	0%	0	0	0%
	Phenanthrene	mg/kg 0.01		15	22,000	6200	# #	#	#	# #	#	# <0.0	<0.01 <0	0.01 0.0	0.06	0.32	0.13	0.14 <0	0.1 1.9	0.33 <0.	1 0.47	<0.1	2.1 0.22	<0.1 17	10	59% 0.0	6 2.1	0.6	0.3	0.8 0	0%	0 0	% 0	0%	0	0	0%
	Fluorene	mg/kg 0.01		27	63,000	20,000	# #	#	#	# #	#	# <0.0	<0.01 <0	0.01 <0.	.05 <0.05	<0.05	<0.1 ⋅	<0.1 <0	0.1 0.74	<0.1 <0.	1 <0.1	<0.1	0.44 <0.1	<0.1 17	2	12% 0.4	4 0.74	0.6	0.6	0.2 0	0%	0 0	6 0	0%	0	0	0%
	Chrysene	mg/kg 0.01		4.1	350	93	# #	#	#	# #	#	# <0.0	<0.01 <0	0.01 <0.	.05 <0.05	0.07	0.19	0.23 <0	0.1 0.6	<0.1 <0.	1 0.45	<0.1	0.57 0.2	<0.1 17	7	41% 0.0	7 0.6	0.3	0.2	0.2 0	0%	0 0	6 0	0%	0	0	0%
	Pyrene	mg/kg 0.01		110	54,000	15,000	# #	#	#	# #	#	# <0.0	<0.01 <0	0.01 0.	.1 0.07	0.13	0.28	0.4 0.	.16 1.6	0.61 <0.	1 1.2	<0.1	1.3 0.39	<0.1 17	11	65% 0.0	7 1.6	0.6	0.4	0.5 0	0%	0 0	6 0	0%	0	0	0%
	Benzo(a)anthracene	mg/kg 0.01		2.9	170	49	# #	#	#	# #	#	# <0.0	<0.01 <0	0.01 0.0	05 <0.05	0.06	0.17	0.24 <0	0.1 0.85	<0.1 <0.	1 0.58	<0.1	0.59 0.23	<0.1 17	8	47% 0.0	5 0.85	0.3	0.2	0.3 0	0%	0 0	6 0	0%	0	0	0%
	Benzo(b)fluoranthene	mg/kg 0.01	- 0.16	7 0.99	44	13	# #	#	#	# #	#	# <0.0		0.01 <0.	.05 <0.05	0.07	0.26	_	0.1 1.2	<0.1 <0.		<0.1	0.6 0.28	<0.1 17	7	41% 0.0	7 1.2	0.5	0.3	0.4 0	0%	6 35	% 1	6%	0	0	0%
	Benzo(k)fluoranthene	mg/kg 0.01	- 0.670	37	1200	370	# #	-		# #	#	# <0.0		_	.05 <0.05	-		_	_		1 0.31	_	0.17 0.11	_		29% 0.1		0.2	0.2		0%	0 0		0%	0	0	0%
	Benzo(a)pyrene Dibenz(a,h)anthracene	mg/kg 0.01	- 0.110	6 0.97	35	11	# #		#	# #	#	# <0.0			.05 <0.05	_	-	_	0.1 1.2	<0.1 <0.		<0.1	0.44 0.22	<0.1 17	_	35% 0.1	8 1.2	0.5	0.4		0%	6 35		6%	0	0	0%
	Benzo(g,h,i)perylene	mg/kg 0.01		0.14	3.5	1.1	# #		-	# #	#	# <0.0			.05 <0.05	_		-	0.1 <0.1			<0.1	<0.1 <0.1		0			ND	ND		0%	0 0		0%	0	0	0%
	Indeno(1,2,3-c,d)pyrene	mg/kg 0.01		290	3900	1400	# #	-			#	# <0.0		_	.05 <0.05	_	_					<0.1	0.32 0.18		6	35% 0.1		0.4	0.3		0%	0 0		0%	0	0	0%
TPH CWG	>C5-C6 Aliphatics	mg/kg 0.01	- 0.28	9.5	500	150	# #			# #	#	# <0.0	_		.05 <0.05	_			0.1 0.73	<0.1 <0.		<0.1	0.29 0.18		6	35% 0.1	_	0.4	0.3	0.2 0	0%	4 24		0%	0	0	0%
	>C6-C8 Aliphatics	mg/kg 0.01	469 3	730	3200	95,000	< 0.010 < 0.01			_	_			_	0.1 <0.1	_			0.05 <0.05				<0.05 <0.05		0	0% NE		ND	ND		0%	0 0		0%	0	0	0%
	>C8-C10 Aliphatics	mg/kg 0.01	2500 13	2300	7800	150,000		0 < 0.010 <				< 0.010 < 0.1		_	0.1 <0.1	<0.1	_	_	0.1 <0.1	<0.1 <0.		<0.1	<0.1 <0.1 <0.05 <0.05	<0.1 25		0% NI		ND ND	ND ND	ND 0	0%	0 0		0%	0	0	0%
	>C10-C12 Aliphatics	mg/kg 1	- 231	320 2200	2000 9700	14,000	< 1.0 < 1.0			1.0 < 1.0	< 0.010	< 1.0 2.4		-	1.0 < 1.0				i.2 < 2.0			<0.05	<0.05 <0.05 2.3 2	< 2.0 25		0% NI	5.2	ND 3.8	ND 4.2		0%	0 0		0%	0	0	0%
	>C12-C16 Aliphatics	mg/kg 1		11000	59,000	25,000	<2.0 <2.0			2.0 4	< 1.0	7.4 1.3		_	2.0 < 2.0	_		3 1.	_	<1 <	_	1.2	23 Z	+		40% 1.3		3.6	2.9	2.4 0	0%	0 0		0%	0	0	0%
	>C16-C21 Aliphatics	mg/kg 1		130000	800,000	25,000	<8.0 8.4			8.0 10	1.0	14 <2.0		-	8.0 < 8.0	_	_	5 <2			_	<2.0	<2.0 <2.0			36% 2.	_	7.9	8.4	4.6 0	0%	0 0		0%	0	0	0%
	>C21-C35 Aliphatics	mg/kg 1		130000	800,000	225,000	21 26			34 35	46	46 7.2				8.3	-	21 5			_	7.9	3.5 3.3			88% 3.3		17.5	11.2	13.6 0	0%	0 0	_	0%	0	0	0%
	>C35-C44 Aliphatics	mg/kg 1		260000	1,600,000	450.000	< 8.4 < 8.4			3.9 12	13	14	7.0		8.4 < 8.4	_	20	21 3.	.4 0.2	3.0	0 14	1.5	3.3 3.3	7.1 2.		36% 8.		12.0	12.5		0%	0 0		0%	0	0	0%
	Total >C5-C44 Aliphatics	mg/kg 5			,,230,000	,,,,,,	21 34		_	43 60	81	82			10 <10	15								11	9	82% 15		44.1	36.0	24.9 0	0%	0 0		0%	0	0	0%
	>EC5-EC7 Aromatics	mg/kg 1		13	26,000	76,000		0 < 0.010 <			1		<0.05 <0		0.1 <0.1	_	<0.05 <	0.05 <0.	0.05 <0.05	<0.05 <0.	05 <0.05	<0.05	<0.05 <0.05	<0.05 25	5 0			ND	ND ND		0%	0 0		0%	0	0	0%
	>EC7-EC8 Aromatics	mg/kg 0.01		22	56,000	87,000	< 0.010 < 0.01	0 < 0.010	< 0.010 < 0	1.010 < 0.010	< 0.010			0.05 <0	0.1 <0.1	_		_	1.05 <0.05	<0.05 <0.	15 <0.05	<0.05	<0.05 <0.05	+	5 0	0% N) ND	ND	ND	ND 0	0%	0 0		0%	0	0	0%
	>EC8-EC10 Aromatics	mg/kg 0.01	33 5	8.6	3500	7200	< 0.020 < 0.02	10 < 0.020 <	< 0.020 < 0	1.020 < 0.020	< 0.020	< 0.020 < 0.08	<0.05 <0	0.05 <0	0.1 <0.1	<0.1			0.05 <0.05	<0.05 <0.	05 <0.05	<0.05	<0.05 <0.05	<0.05 25	5 0	0% NI) ND	ND	ND	ND 0	0%	0 0	% 0	0%	0	0	0%
	>EC10-EC12 Aromatics	mg/kg 1	10 4	13	16,000	9200	<1.0 <1.0	< 1.0	< 1.0 <	1.0 < 1.0	< 1.0	< 1.0 < 1.0	< 1.0 <	1.0 < 1	1.0 < 1.0	< 1.0	< 1.0	c 1.0 < 1	1.0 < 1.0	< 1.0 < 1	0 < 1.0	1.5	1.5 1.5	< 1.0 25	3	12% 1.	5 1.5	1.5	1.5	0.0	0%	0 0	% O	0%	0	0	0%
	>EC12-EC16 Aromatics	mg/kg 1	45 15	23	36,000	10,000	< 2.0 2.1	< 2.0	< 2.0 <	2.0 < 2.0	< 2.0	< 2.0 < 1.0	< 1.0 <	1.0 < 2	2.0 < 2.0	< 2.0	< 1.0	c 1.0 < 1	1.0 < 1.0	< 1.0 < 1	0 < 1.0	<1.0	<1.0 <1.0	< 1.0 25	5 1	4% 2.	1 2.1	2.1	2.1	ND 0	0%	0 0	% O	0%	0	0	0%
	>EC16-EC21 Aromatics	mg/kg 1	90 30	46	28,000	7600	<10 <10	< 10	< 10 <	10 < 10	< 10	< 10 3.2	4.1 8	3.3 <	10 < 10	< 10	4.6	7.8 2	2.2 4.3	4.6 3.	13	6	<2 <2	12 25	12	48% 2.5	2 13	6.1	4.6	3.5 0	0%	0 0	% O	0%	0	0	0%
	>EC21-EC35 Aromatics	mg/kg 1	- 1111	370	28,000	7800	12 20	20	24	23 27	26	24 5.2	10 2	20 <	10 < 10	< 10	99	150 7	79 55	26 <2	0 71	8.7	7.2 7.8	12 25	21	84% 5.3	2 150	34.6	23.0	36.8 0	0%	0 0	% O	0%	0	0	0%
	>EC35-EC44 Aromatics	mg/kg 1		370	28,000	7800	< 8.4 < 8.4	< 8.4	< 8.4	8.4 < 8.4	< 8.4	< 8.4		< 8	8.4 < 8.4	< 8.4								11	0	0% N) ND	ND	ND	ND 0	0%	0 0	% O	0%	0	0	0%
	Total >EC5-EC44 Aromatics	mg/kg 5					12 23	20	24	23 27	26	24		<	10 < 10	< 10								11	8	73% 12	27	22.4	23.5	4.7 0	0%	0 0	6 0	0%	0	0	0%
BTEX and MTBE	Benzene	mg/kg 2E-04	0.003 0.002	0.017	27	90	< 5.0 < 5.0	< 5.0	< 5.0	5.0 < 5.0	< 5.0	< 5.0 < 0.00	1 <0.001 <0.	.001 <0.0	002 <0.002	2 <0.002	ব	ব ব	d d	ব ব	4	<1	ব ব	<1 25	0	0% NE) ND	ND	ND	ND 0	0%	0 0	6 0	0%	0	0	0%
	Toluene	mg/kg 2E-04	10.8 1.9	22	56,000	87,000							1 <0.001 <0.								<1			<1 25	0	0% NE	ND ND	ND	ND	ND 0	0%	0 0	6 0	0%	0	0	0%
	Ethylbenzene	mg/kg 2E-04	9.7 1.1	16	5700	17,000	< 5.0 < 5.0	< 5.0	< 5.0	5.0 < 5.0	< 5.0	< 5.0 < 0.00	1 <0.001 <0.	.001 < 5	5.0 < 5.0	< 5.0	<1	<1 <	d <1	<1 <	<1	<1	ব ব	<1 25	0	0% NE	ND ND	ND	ND	ND 0	0%	0 0	% 0	0%	0	0	0%
	Xylene (m & p)	mg/kg 2E-04		29	5900	17,000	< 5.0 < 5.0	< 5.0	< 5.0	5.0 < 5.0	< 5.0	< 5.0 < 0.00	1 <0.001 <0.	.001 < 5	5.0 < 5.0	< 5.0	<1	<1 <	d 4	<1 <	<1	<1	ব ব	<1 25	0	0% NE) ND	ND	ND	ND 0	0%	0 0	% O	0%	0	0	0%
	Xylene (o)	mg/kg 2E-04		28	6660	17,000	< 5.0 < 5.0	< 5.0	< 5.0	5.0 < 5.0	< 5.0	< 5.0 < 0.00	1 <0.001 <0.	.001 < 5	5.0 < 5.0	< 5.0	<1	<1 <	d 4	<1 <	<1	<1	ব ব	<1 25	0	0% NE) ND	ND	ND	ND 0	0%	0 0	% 0	0%	0	0	0%
Phenolics	Phenol	mg/kg 0.02	0.23 0.05	66	760	760							<0.02 <0												_	0% NI				ND 0				0%	0	0	0%
Other	pH (Lab)	pH_Units 4					8 7.9	7.8	7.9	7.9 8	7.2	7.2		7.	.8 8	8	8.3	8.9 9.	8.2	8 8	8.1	8.6	8.2 8.1	8 22	22	100% 7.3	9.2	8.1	8.0	0.5 0	0%	0 0	% 0	0%	0	0	0%
																																					_

Notes

- Sample deviated holding time for PAHs. Results are # considered to be accurate and removed from the
- Red Limit of Detection exceeds 1 or more re-use screen
- predicted to reach base of the unsaturated zone within 1,0 years
 - No result record



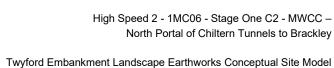




Appendix III-3

Pre-Remediation / Post-Remediation Comparison

02 pages





Total 20

Table III Comparison of Pre- and Post- Remediation Chemical Testing against Made Ground Re-use Criteria.

PRE	- Remed	iaion (82 sa	amples)	- LQ14-0)2 HS2 (SI Data		
	Aquifer	(GW >4mbgl)			Humar	Health		
Criteria	Z	one 2b	Allot	ment	POS	park		nercial/ strial
Chemical Name	# of Exceedances	% of total samples	# of Exceedances	% of total samples	# of Exceedances	% of total samples	# of Exceedances	% of total samples
Arsenic	-	-	9	11%	0	0%	0	0%
Cadmium	-	-	6	7%	0	0%	0	0%
Zinc	-	-	1	1%	0	0%	0	0%
Naphthalene	21	25%	2	2%	0	0%	0	0%
Fluoranthene	-	-	1	1%	0	0%	0	0%
Phenanthrene	-	-	3	4%	0	0%	0	0%
Chrysene	-	-	8	10%	0	0%	0	0%
Benzo(a)anthracene	-	-	10	12%	0	0%	0	0%
Benzo(b)fluoranthene	-	-	25	30%	2	2%	0	0%
Benzo(k)fluoranthene	-	-	0	0%	0	0%	0	0%
Benzo(a)pyrene	-	-	25	30%	2	2%	0	0%
Dibenz(a,h)anthracene	-	-	19	23%	3	4%	0	0%
Indeno(1,2,3-c,d)pyrene	-	-	1	1%	0	0%	0	0%
>EC ₈ -EC ₁₀ Aromatics	4	7%	4	7%	0	0%	0	0%
>EC10-EC12 Aromatics	4	7%	3	5%	0	0%	0	0%
>EC12-EC16 Aromatics	2	3%	4	7%	0	0%	0	0%
>EC16-EC21 Aromatics	1	2%	1	2%	0	0%	0	0%
>EC21-EC35 Aromatics	0	0%	1	2%	0	0%	0	0%
Benzene	2	3%	0	0%	0	0%	0	0%
	# Detect	% Detect	Min (% v/v)	Max (% v/v)	Types	Form		
Asbestos	8	10%	<0.001	Fragment sample	Chrysotile Amosite	Cement Floor Tile Board Fibres		

Key	
	No SSAC derived as CoC not predicted to reach base of the unsaturated zone within 1,000 years
	Exceedance of Criteria recorded
	Contaminant of Concern
	Exceedance not recorded

	Aquifer (G	W >4mbgl)	Human Health								
Criteria	Zon	e 2b	Allot	ment	POS	park	Commercial/ Industrial				
Chemical Name	# of Exceedances	% of total samples	# of Exceedances	% of total samples	# of Exceedances	% of total samples	# of Exceedances	% of total samples			
Arsenic											
Cadmium											
Zinc											
Naphthalene	3	18%	0	0%	0	0%	0	0%			
Fluoranthene											
Phenanthrene											
Chrysene											
Benzo(a)anthracene											
Benzo(b)fluoranthene			1	6%	0	0%	0	0%			
Benzo(k)fluoranthene											
Benzo(a)pyrene			1	6%	0	0%	0	0%			
Dibenz(a,h)anthracene											
Indeno(1,2,3-c,d)pyrene			0	0%	0	0%	0	0%			
>EC ₈ -EC ₁₀ Aromatics											
>EC10-EC12 Aromatics											
>EC12-EC16 Aromatics											
>EC16-EC21 Aromatics											
>EC21-EC35 Aromatics											
Benzene											
	# Detect	% Detect	Min (% v/v)	Max (% v/v)	Types	Form					
Asbestos	3	12%	<0.001	<0.001	Chrysotile	Fibres					

Total 5



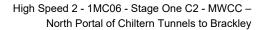


Table III shows that for the post-remediation of the landfill waste, exceedances for metals, TPH, or BTEX for the screening criteria are not recorded, a significant reduction compared to pre-remediation.

Pre-remediation exceedances of 10 PAH compounds were reported variously for re-use Zones 2B, 2C, and 3 (Allotment and POS _(park)). Post remediation exceedances of only 1 PAH compound were reported for Zones 2B, 4 PAH compounds for Zone 2C, and 2 PAH compounds for Zone 3 (Allotment). The percentages of samples with exceedances for the relevant zones are typically lower and at lower concentrations. In some cases, by an order of magnitude (e.g. benzo(a)pyrene allotment criteria - 30% samples pre vs 6% post).

A similar percentage of samples report detections for asbestos both pre (10%) and post remediation (12%) however, post-remediation, following hand picking of visible ACMs, only free fibres are detected at concentrations below the LOD (<0.001% v/v).

The comparison of the pre-remediation and post-remediation results demonstrates that the remediation undertaken has reduced the number of and magnitude of exceedances against the relevant re-use criteria compared to testing undertaken pre-remediation.

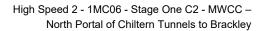




APPENDIX IV

Made Ground Re-Use Zoning Plan

Number of Pages: 01





APPENDIX V

Controlled Water Made Ground Chemical Acceptance Criteria

Number of Pages: 06

Table E-1 Made Ground Acceptance Criteria

Contonio		lled Waters nsim derive				Human Health Screen	0			
Contaminants (mg/kg, unless stated)		Zone 1a	Zone 1b	Zone 2a	Zone 2b	Zone 2c	>1.2m in parts of the LLAU to be returned to agriculture (Allotment)	≤ 300mm in Ecological Planting Area: Public Open Space (park)	≤ 600mm in the LOD: Commercial/ Industrial	Comment
Asbestos		N/A	N/A	N/A	N/A	N/A	No detectable asbestos	<0.001% subject to furthe	er assessment ♦	
Metals										
Arsenic	<1	-	-	45.3*	-	45.3*	43	170	640	
Beryllium	<1	-	-	-	-	-	35	63	12	
Boron	<1	-	-	-	-	-	45	46,000	240,000	
Cadmium	<0.2	-	-	2.5	-	2.5	1.9	532	190	
Chromium III	<1	93.9*	93.9*	93.9*	-	93.9*	18,000	33,000	8,600	
Chromium VI	<1	16.7	50	16.7	-	16.7	1.8	220	33	
Copper	<1	-	-	6,667	-	6,667	520	44,000	68,000	
Lead	<2	-	-	-	-	-	80 #	1,300 #	2,300 #	C4SL Value used fo Human Health (no S4UL value available)
Mercury	<0.3	-	-	-	-	-	21	30	58	



	Limit of Detection	Controlled Waters SCAC (mg/kg). All values are Consim derived, unless stated otherwise					Human Health Screer	M (mg/kg) unless	Commont	
Contaminants	-t-td\	Zone 1a	Zone 1b	Zone 2a	Zone 2b	Zone 2c	>1.2m in parts of the LLAU to be returned to agriculture (Allotment)	≤ 300mm in Ecological Planting Area: Public Open Space (park)	≤ 600mm in the LOD: Commercial/ Industrial	Comment
Nickel	<2	-	-	67	-	67	53	800	980	
Selenium	<1	-	-	-	-	-	88	1,800	12,000	
Vanadium		-	-	-	-	-	91	5,000	9,000	
Zinc	<2	-	-	35,300	-	35,300	620	170,000	730,000	
Inorganics										
Total Cyanide	<1	-	-	50	-	50	-	-	-	No published human health value
TPH Aliphatics										
C ₅ -C ₆	<0.01	882	5,000 † (16,667)	405	469	3	730	5,000† (95,000)	3,200	
>C ₆ -C ₈	<0.01	3,750	5,000 † (75,000)	1,765	2,500	13	2,300	5,000† (150,000)	5,000† (7,800)	Screening driven by visual and olfactory observation (see Table E-2, E-3) rather than Human Health risk
>C ₈ -C ₁₀	<0.1	333	3,000	231	-	231	320	5,000† (14,000)	2,000	
>C ₁₀ -C ₁₂	<0.1	-	-	-	-	-	2,200	5,000† (21,000)	5,000 † (9,700)	screening values
>C ₁₂ -C ₁₆	<0.1	-	-	-	-	-	5,000 † (11,000)	5,000 † (25,000)	5,000† (59,000)	



	Limit of Detection Controlled Waters SCAC (mg/kg). All values are Consim derived, unless stated otherwise				Human Health Screer	Commont				
Contaminants	ants (mg/kg, unless stated)	Zone 1a	Zone 1b	Zone 2a	Zone 2b	Zone 2c	>1.2m in parts of the LLAU to be returned to agriculture (Allotment)	≤ 300mm in Ecological Planting Area: Public Open Space (park)	≤ 600mm in the LOD: Commercial/ Industrial	Comment
>C ₁₆ -C ₃₅	<0.1	-	-	-	-	-	5,000† (260,000)	5,000† (450,000)	5,000 † (1,600,000)	
TPH Aromatics										
>EC ₅ -EC ₇	<0.01	-	-	-	-	-	13	5,000† (76,000)	5,000† (26,000)	Screening driven by visual and olfactory observation (see Table E-2, E-3) rather than Human
>EC ₇ -EC ₈	<0.01	-	-	-	-	-	22	5,000† (87,000)	5,000† (56,000)	
>EC ₈ -EC ₁₀	<0.1	75	5,000 † (5,882)	17.6	33	5	8.6	5,000† (7,200)	3,500	
>EC ₁₀ -EC ₁₂	<0.1	18	500	6.9	10	4	13	5,000† (9,200)	5,000† (16,000)	Health risk screening values
>EC ₁₂ -EC ₁₆	<0.1	90	5,000	15	45	15	23	5,000† (10,000)	5,000† (36,000)	
>EC ₁₆ -EC ₂₁	<0.1	45	129	30	90	30	46	5,000† (7,600)	5,000† (28,000)	Screening driven by
>EC ₂₁ -EC ₃₅	<0.1	1,011	-	1,111	-	1,111	370	5,000† (7,800)	5,000† (28,000)	visual and olfactory observation (see Table E-2, E-3)
<ec<sub>35-EC₄₄</ec<sub>	<0.1	-	-	-	-	-	370	5,000 † (7,800)	5,000† (28,000)	rather than Human Health risk screening values
BTEX										



Contoninanta	Limit of Detection	on are Consim derived, unless stated otherwise					Human Health Screer	Commont		
Contaminants (mg/kg, unless stated)	unless	Zone 1a	Zone 1b	Zone 2a	Zone 2b	Zone 2c	>1.2m in parts of the LLAU to be returned to agriculture (Allotment)	≤ 300mm in Ecological Planting Area: Public Open Space (park)	≤ 600mm in the LOD: Commercial/ Industrial	Comment
Benzene	<0.001	0.005	0.1	0.002	0.003	0.002	0.017	90	27	
Toluene	<0.01	23.3	1750	5.38	10.8	1.9	22	5,000† (87,000)	5,000† (56,000)	
Ethylbenzene	<0.01	21.4	1500	4.92	9.7	1.1	16	5,000† (17,000)	5,000 † (5,700)	Screening driven by visual and olfactory
o xylene	<1	-	-	-	-	-	28	5,000† (17,000)	660	observation (see Table E-2, E-3) rather than Human Health risk screening values
m xylene	<1	-	-	-	-	-	31	5,000† (17,000)	5,000 † (6,200)	
p xylene	<1	-	-	-	-	-	29	5,000† (17,000)	5,000 † (5,900)	oorooming values
Total Xylenes		35.7	2500	8.33	16.7	1.7	No published value	-	-	
PAH≠										
Naphthalene	<0.01	0.033	0.1	0.028	0.02	0.028	4.1	1,200	190	Screening driven by
Benzo(k)fluoranthene	<0.1	0.417	-	0.676	-	0.676	37	370	1,200	visual and olfactory observation (see
Benzo(b)fluoranthene	<0.1	0.125	-	0.167	-	0.167	0.99	13	44	Table E-2, E-3) rather than Human Health risk screening values
Benzo(a)pyrene	<0.1	0.135	-	0.116	-	0.116	0.97	11	35	
Indeno(123cd)pyrene	<0.1	0.25	-	0.281	-	0.281	9.5	150	500	Screening driven by



		lled Waters nsim derive				Human Health Screening Criteria (S4UL) 1% SOM (mg/kg) unless stated otherwise Zone 3				
Contaminants	(mg/kg, unless stated)	Zone 1a	Zone 1b	Zone 2a	Zone 2b	Zone 2c	>1.2m in parts of the LLAU to be returned to agriculture (Allotment)	≤ 300mm in Ecological Planting Area: Public Open Space (park)	≤ 600mm in the LOD: Commercial/ Industrial	Comment
Benzo(ghi)perylene	<0.1	-	-	-	-	-	290	1,400	3,900	visual and olfactory observation (see
Acenaphthene	<0.1	-	-	-	-	-	34	29,000	84,000	Table E-2, E-3) rather than Human
Acenaphthylene	<0.1	-	-	-	-	-	28	29,000	83,000	Health risk screening values
Anthracene	<0.1	-	-	-	-	-	380	150,000	520,000	
Benzo(a)anthracene	<0.1	-	-	-	-	-	2.9	49	170	
Chrysene	<0.1	-	-	-	-	-	4.1	93	350	
Dibenz(a,h)anthracene	<0.1	-	-	-	-	-	0.14	1.1	3.5	
Fluoranthene	<0.1	-	-	-	-	-	52	6,300	23,000	
Fluorene	<0.1	-	-	-	-	-	27	20,000	63,000	
Phenanthrene	<0.1	-	-	-	-	-	15	6,200	22,000	
Pyrene	<0.1	-	-	-	-	-	110	15,000	54,000	
Phenolics										
Phenol	<0.05	0.59	428	0.05	0.23	0.05	66	760	760	Screening driven by visual and olfactory



High Speed 2 - 1MC06 - Stage One C2 - MWCC North Portal of Chiltern Tunnels to Brackley

	Limit of Detection	Control are Cor	lled Waters nsim derive	SCAC (m d, unless s	g/kg). All stated oth	values erwise	Human Health Screen	M (mg/kg) unless	C	
Contaminants	(mg/kg, unless stated)	Zone 1a	Zone 1b	Zone 2a	Zone 2b	Zone 2c	>1.2m in parts of the LLAU to be returned to agriculture (Allotment)	≤ 300mm in Ecological Planting Area: Public Open Space (park)	≤ 600mm in the LOD: Commercial/ Industrial	Comment
										observation (see Table E-2, E-3) rather than Human Health risk screening values

⁻ No Derived Criteria as CoC not predicted to reach base of the unsaturated zone within 1,000 years, hence an appropriate human health risk screening criterion (S4UL or C4SL) based on proposed land use will be adopted.

^{*} Background concentration adopted as discussed in Derivation of Made Ground Assessment Criteria for the Protection of Controlled Waters [12].

[≠] Note: The Soil Chemical Acceptance Criteria (SCAC) are not to be applied to tarmac and road surfacing materials. Tarmacadam is to be segregated from Made Ground and stockpiles of Tarmac bound materials (such as existing road surfaces) to be tested for speciated PAH to inform the potential re-use or disposal options.

^{# (}C4SL, Allotment, 6 % SOM).

[◆] Detectable asbestos <0.001% or low levels of cement bound fibres can be used at depths < 600/300 mm, subject to further assessment which may include Detailed Quantitative Risk Assessment (DQRA).

[†] Screening for hydrocarbons will be driven by visual/olfactory observations of the materials to be used in accordance with Table V-2 below rather than Human Health risk screening values. Material which appears to be visibly impacted by hydrocarbon contamination (presence of odours or oily sheens), will not be considered suitable for re-use. For TPH fractions a target value of 5,000 mg/kg has been applied for the re-use criteria where the S4UL and derived values are >5000mg/kg. Concentrations in soil above this value will require treatment.



Records of visual/olfactory observations during the watching brief are primarily to support pre-screening and subsequent segregation of Made Ground. These details should be recorded on the EKFB Land Quality Sampling Record for Made Ground Materials during the watching brief for inclusion in the final Verification Report. The criteria are discussed in Table V-2 and V-3.

Table E-2 - Visual / Olfactory Assessment Criteria for Hydrocarbon Impacted Material

Contaminant / Indicator	Criteria for Unacceptable Contamination
Polycyclic Aromatic Hydrocarbons (PAH)	Visual: Black liquid or semi-solid tar in veins or zones. Heavily stained or coated surfaces. Solid tar/bitumen. Headspace (1): Over 100 ppm, Olfactory (2)
Mineral Oils (Total Petroleum Hydrocarbons – TPH)	Visual: Liquid oil, oil saturated solids in veins or zones. Heavily stained or coated surfaces. Headspace ⁽¹⁾ : Over 100 ppm, Olfactory ⁽²⁾

Notes

- 1. Headspace analysis to be conducted where required/applicable. Headspace analysis criteria shall be subject to calibration of instruments.
- 2. Olfactory assessment shall always be confirmed by headspace analysis.

Additionally, the following provides a scale of aesthetic criteria.

Table E-3 - Aesthetic criteria for appropriate stockpile

Category	Visual	Olfactory
1	Occasional-frequent staining	Faint to distinct but no strong odour in soil
2	Heavy staining of soil	Strong odour in soil
3	Visible hydrocarbon product	Strong to overwhelming odour